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HRVATSKI VINSKI BISER
A PEARL AMONG CROATIAN WINES

IVAN PEJIĆ · EDI MALETIĆ · DARKO PREINER · DARKO VONČINA · SILVIO ŠIMON
IVANA VLADIMIRA PETRIC · ZVJEZDANA MARKOVIĆ · BORIS MESARIĆ · LOVRO MIKLAUŽIĆ

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ŠKRLET

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BORIS MESARIĆ · LOVRO MIKLAUŽIĆ

SADRŽAJ

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ZAHVALE

Ova knjiga nastajala je u dužem razdoblju, usporedno s višegodišnjim projektom klonske selekcije koji nas je uveo u svijet Škrleta. Stoga za njezin konačni sadržaj i izgled moramo iskazati zahvalnost većem broju institucija i osoba.

Osobitu zahvalnost dugujemo Udruzi vinogradara i voćara „Lujo Miklaužić" iz Kutine koja je s Danom Šimunićem (1932. – 2021.) na čelu inicirala i u početku financirala prvu fazu projekta klonske selekcije. Udruga je također potakla i naručila izradu ove knjige, a veliku pomoć u realizaciji pružio je sadašnji predsjednik gospodin Krešimir Lenić.

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Expert reviewers Professor Nikola Mirošević, a doyen of Croatian viticultural science with extensive experience with Škrlet, and distinguished professors Jasminka Karoglan Kontić (Faculty of Agriculture, University of Zagreb) and Jasenka Ćosić (Faculty of Agrobiotechnical Sciences, University J. J. Strossmayer Osijek)

Veliku zahvalnost dugujemo neslužbenim suradnicima na projektu klonske selekcije, gospodi Vladi Mikši (1933. – 2017.) iz vinarije Mikša, Marku Miklaužiću iz vinarije Miklaužić te Borisu Mesariću, gospodarstveniku i vinaru. Oni su niz godina s velikim entuzijazmom i bez ikakve naknade ulagali vrijeme, materijalne resurse i svoj ugled u ovaj projekt i prihvatili nas kao svoje prijatelje. Kao dobri duh projekta klonske selekcije istaknuo se naš kolega Ivan Gašpar (1939. – 2021.) koji je na brojne načine značajno pridonio njegovu uspješnom dovršetku. Vrijedan stručni doprinos u razmnožavanju klonskih linija i prvog certificiranog sadnog materijala dala je i tvrtka Fragaria d.o.o. iz Zagreba.

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PROF. DR. SC. IVAN PEJIĆ I PROF. DR. SC.
EDI MALETIĆ, UREDNICI

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PROFESSOR IVAN PEJIĆ AND PROFESSOR
EDI MALETIĆ, EDITORS

PREDGOVOR

Na području Sisačko-moslavačke županije od davnina se uzgaja vinova loza i proizvodi vino. Oduvijek su to uglavnom mali, ali brojni obiteljski nasadi koji rijetko imaju više od tisuću trsova i koji danas pretežno zauzimaju tipične vinogradarske južne položaje obronaka Moslavačke gore i okolice Petrinje. U drugoj polovici prošlog stoljeća bilo je uspješnih pokušaja podizanja većih vinograda i plantažnog uzgoja kao što je to bio slučaj u Voloderu. Ondje je tijekom 1970-ih podignut plantažni kompleks Moslavačko vinogorje od 105 ha (od čega oko 4 ha Škrleta) s pratećom suvremenom vinarijom odgovarajućega kapaciteta. Međutim, ovaj objekt i tip upravljanja nisu preživjeli društveno-gospodarsku tranziciju tijekom uspostave i razvitka Republike Hrvatske.

Zadnjih 30 godina pak svjedočimo postupnom zanemarivanju tradicionalnih malih obiteljskih vinograda iz kojih se u domaćim kletima prave vina za vlastite potrebe, ali nasreću raste broj malih obiteljskih vinarija koje se ubrzano razvijaju. Ovi novi, profesionalni proizvođači, postupno povećavaju površine pod vinogradima, grade suvremene vinarije te proizvode i trže sve bolja vina.

Udio površina pod vinogradima na području Sisačko-moslavačke županije (SMŽ) u odnosu na cijelu Hrvatsku je skroman. Tu se pretežno uzgajaju bijele sorte vinove loze, a sortiment uključuje najvažnije suvremene internacionalne, kao i nekoliko autohtonih sorti. Glavnu polugu razvoja sektora čine napredni proizvođači udruženi u nekoliko vinogradarsko-vinarskih udruga koje pretežno podupire

FOREWORD

In Sisak-Moslavina County, grapevine has been grown and wine produced since ancient times. These have always been small though numerous family plantations, rarely with more than 1000 vines, and today primarily cover the typical wine region on the southern slopes of the Moslavačka Gora hills and the environs of the town Petrinje. In the latter half of the 20th century, there were successful attempts to raise larger vineyards and plantations. One such example was seen at Voloder in the 1970s, when the company 'Moslavačko Vinogorje' planted a 105 ha plantation complex (including about 4 ha of Škrlet), and built a modern winery with adequate capacity. However, this facility and type of management did not survive the socioeconomic transition that unfolded during the establishment and development of the Republic of Croatia.

Over the past 30 years, we have witnessed the gradual neglect of small, traditional family vineyards where the locals produce wine in their wine huts for themselves. Fortunately, the number of small family wineries is developing rapidly. These new, professional producers, are gradually increasing their vineyard surfaces, constructing modern wineries, and producing and selling wines that are constantly improving.

The area under vineyards in Sisak-Moslavina County is modest in comparison to the total area in Croatia. This region primarily features white varieties of grapevine, including the most important contemporary international varieties, and several indigenous varieties. The main driver of sector development are advanced producers, who work together in several viticulture and

lokalna uprava. Ukratko, moglo bi se zaključiti kako se vinogradarstvo i vinarstvo SMŽ-a ni po čemu značajnom ne razlikuju i ne izdvajaju od drugih hrvatskih županija i vinogorja. Međutim, posebnost ovog područja i vinogorja čini upravo jedna autohtona sorta – Škrlet bijeli. U ovom trenutku ukupna površina vinograda pod Škrletom u RH iznosi oko 66 ha, što je vrlo malo s obzirom na potencijal sorte i područja. Glavnina ovih površina danas je u Moslavini (preko 80 %).

Škrlet se od davnina uzgaja na ovom području, a zadnjih desetljeća postupno se širi i u susjedna vinogorja. Nepoznato je točno mjesto i vrijeme nastanka sorte, ali povijesna i znanstvena istraživanja potvrđuju da se stoljećima uzgaja na prostoru Pokuplja i Moslavine, dok se u drugim regijama Hrvatske i susjednih zemalja danas ne uzgaja. Moglo bi se zaključiti da je vrlo vjerojatno i nastao kao sorta upravo ovdje. Povijesno gledano, povremeno je percipiran kao sorta za kvalitetna vina, a u nekim je vremenima čak smatran nedovoljno kvalitetnom sortom. Slično je i s proizvodnim površinama, nema povijesnih podataka i spoznaja o masovnom uzgoju ili dominaciji u strukturi vinograda, ali je uvijek bio prisutan.

Sve se, međutim, za Škrlet počelo mijenjati ne tako davno i u ne baš idealnoj situaciji. U drugoj polovici 20. stoljeća u bivšoj Jugoslaviji zagovarao se i poticao plantažni uzgoj s manjim brojem internacionalnih sorti uz primjenu tehnologija usmjerenih na proizvodnju masovnih vina, a za koje je bila ustrojena proizvodnja cjepova. Autohtone sorte uglavnom nisu bile u fokusu tadašnjih razvojnih planova. Međutim, Škrlet je tu iznimka i za svoj današnji ugled njegovi proizvođači (i obožavatelji) mnogo duguju nekolicini pojedinaca, među kojima je bio i inženjer Ljudevit Lujo Miklaužić koji 1970-ih sudjeluje u planiranju i

wine-making associations that receive support from the local governments. It could be concluded that viticulture and wine-making in the county do not differ significantly in any way from other Croatian counties and wine regions. However, the specificity of this region and wine region is one of its indigenous varieties - Škrlet bijeli. Currently, there are about 66 ha of Škrlet vineyards in Croatia, which is very low considering the potential of the variety and the region. Most (more than 80%) of these vineyards are found in the Moslavina area.

Škrlet has been grown in this area since ancient times, and in recent decades has been gradually spreading into the neighbouring wine regions. The exact time and place of the origin of the variety are not known, though historical research have confirmed that this variety has been grow in the Pokuplje and Moslavina areas for centuries, but not in other Croatian regions or neighbouring countries. Therefore, it could be concluded that it is highly likely that this variety originated here. Historically speaking, it is occasionally perceived as a variety for quality wines, while in some time periods it was considered a variety of insufficient quality. The situation is similar for the production areas, and there are no historical data or findings about its massive growing or domination in the structure of vineyards, though it has always been present.

However, the situation began to change for Škrlet in the not-so-distant past, under less than ideal conditions. In the latter half of the 20th century during the former Yugoslavia, development plans were based on stimulating plantation growing with a small number of international wine varieties, using technology to serve mass wine production, and the organisation of graft production. Indigenous varieties were mostly outside the focus of the development

podizanju velikog plantažnog nasada Ruškovica u Voloderu, a u sklopu kojega se podiže i prvi moderni monosortni nasad Škrleta. Tako ova sorta konačno dobiva priliku odmjeriti svoja svojstva s drugim sortama poput Graševine i Moslavca, kako u vinogradu, tako i u podrumu. Na ovom objektu idućih godina počinju se provoditi znanstvena istraživanja, nabavlja se profesionalna oprema i primjenjuje vrhunska tehnologija, a što će kroz prijenos znanja uvelike unaprijediti zanimanje za vinogradarstvo i proizvodnju na obiteljskim imanjima. Čini se da je glavni ishod tog plodnog perioda upravo Škrlet, sorta koja dobro kombinira rodnost i kvalitetu vina i koja se sve više može naći u vinogorjima Moslavine postupno se etablirajući kao vodeća i ekonomski najuspješnija sorta podregije Moslavina. Osobiti doprinos širenju Škrleta dala je suradnja s Agronomskim fakultetom iz Zagreba, ponajprije s prof. dr. Nikolom Miroševićem u domeni vinogradarstva te s prof. dr. Dubravkom Premužić u domeni vinarstva. Značajan doprinos širenju i pozicioniranju Škrleta dala je i Petrokemija d. d. iz Kutine stavljanjem na tržište folijarnih gnojiva na bazi mikroelemenata (prije svega bora), a čija je redovita primjena riješila jedan od golemih problema Škrleta – neredovitu rodnost zbog oprhnuća cvjetova i loše oplodnje u pojedinim godinama.

Početkom 1990-ih ponovno raste vinogradarsko-vinarski entuzijazam kao posljedica afirmacije privatnog poduzetništva i veće dostupnosti novih tehnologija u vinogradima, a posebno u podrumima. Uz osobna ulaganja u podizanje većih vinograda i modernih podruma nekoliko vinarskih poduzetnika, agronoma i drugih entuzijasta osnivaju se i strukovne udruge koje organiziraju stručna predavanja i ekskurzije te ocjenjivanja i izložbe vina. U brojnim i raznovrsnim vinima proisteklim iz različitih

plans of that time. However, Škrlet was an exception, and producers (and fans) know that its current appearance is due greatly to just a handful of individuals, including engineer Ljudevit Lujo Miklaužić. In the 1970s, he participated in planning and erecting the large plantation Ruškovica at Voloder, which included the first modern varietal plantation of Škrlet. That is how this variety finally received the opportunity to stand up against other varieties, such as Graševina and Moslavac, both in the vineyard and in the cellar. In the years that followed, scientific research was performed at this facility, professional equipment was procured and first-class technology applied. Through the transfer of knowledge, this would do wonders for interest in wine-growing and wine-making at family estates. It would appear that the main outcome of this fruitful period was Škrlet, as a variety that combines high yields with good quality wine. It can be found more often in the Moslavina wine-growing hills, and it has gradually taken its place as the leading and commercially most successful variety in the Moslavina subregion. Cooperation with the Faculty of Agriculture at the University of Zagreb also contributed to the expansion of Škrlet, first with Professor Dr. Nikola Mirošević in the area of viticulture, and then with Professor Dr. Dubravka Premužić in the area of wine-making. Another contribution in the expansion and positioning of Škrlet came from the company Petrokemija Inc. from Kutina, which introduced foliar microelement-based fertilisers to the market (mostly boron). The regular application of these fertilisers resolved one of the main issues surrounding Škrlet – irregular yields due to the loss of flowers and poor fruit set in certain years.

In the early 1990s, a new enthusiasm arose for viticulture and wine-making, as a result of

sirovina i tehnologija vina Škrleta postaju sve popularnija, ne više samo u Moslavini.

Škrlet je danas glavno i najpoznatije vino Sisačko-moslavačke županije. Prema recentnim podacima o površinama vinograda u Moslavini i Pokuplju Škrlet zauzima oko 30 %, a Graševina (vodeća sorta u Hrvatskoj) 23 % ukupnih površina. Proizvodi se najčešće kao svježe, suho mirno vino, ali se danas može kupiti i kušati kao mlado i odležano vino, u obliku pjenušca, predikata te kao ekološko vino. Ova vina osvajaju visoka odličja na domaćim i međunarodnim natjecanjima. Premda se proizvođači Škrleta (kao i većina drugih proizvođača) suočavaju s brojnim problemima, od klime do složenoga gospodarsko-administrativnog okvira poslovanja, njihov je glavni problem zadnjih godina – nedovoljna količina proizvedenog vina! Već nekoliko godina zaredom potražnja za Škrletom premašuje proizvodnju.

Tijekom proteklih 20 godina vrlo se intenzivno radilo na unapređenju spoznaja o Škrletu kao sorti, što je stvorilo osnovu za proizvodnju boljeg i grožđa i vina. Učinjeno je također mnogo i na promociji i marketingu, pa čak i brendiranju cijele Županije, a posebno Moslavine kao vinske destinacije. Ova knjiga rezultat je zajedništva moslavačkih vinogradara i vinara okupljenih u nekoliko udruga, lokalnih vlasti te znanstvenika i bivših studenata Agronomskog fakulteta u Zagrebu i nastoji objediniti sve postojeće stručne spoznaje o Škrletu. Nadamo se da će spasiti od zaborava važne ljude i događaje, ali i ukazati na trenutačne izazove u proizvodnji toga grožđa i vina te potaknuti na razmišljanje i djelovanje sve dionike u cilju njihova rješavanja.

the affirmation of private enterprise and greater access to new technologies in vineyards, and especially in the cellars. Personal efforts were invested in raising larger plantations and building modern cellars owned by several wineries, agronomists and other enthusiasts. Also, professional associations were established, expert lectures and excursions organised, and wine exhibitions and evaluations were held. With the many diverse wines arising from a range of grapes and technologies, Škrlet wine became more popular, and not just in Moslavina.

Today, Škrlet is the main and best-known wine of Sisak-Moslavina County. According to recent data, Škrlet accounts for about 30% of all vineyard surfaces in Moslavina and Pokuplje, as opposed to Graševina (the leading variety in Croatia) that covers 23% of those surfaces. It is most often produced as a fresh, dry, still wine, though today it can be tasted and purchased both as a new wine and as a matured wine, as a sparkling wine, predicate wine or organic wine. These wines have won many prizes at domestic and international competitions. Though Škrlet producers (like most other producers) face numerous problems, from climate issues to complex economic and administrative issues in doing business, their main problem in recent years is – insufficient quantities of wine produced! For several years in a row, the demand for Škrlet has exceeded production.

Over the past 20 years, intensive efforts were invested to raise awareness of Škrlet as a variety. This has laid the foundation for producing better grapes and wine. Much has been done in marketing and promotions, and even in branding the entire county and especially the Moslavina region as a wine destination. This book is the result of the joint forces of Moslavina viticulturalists and wine-makers operating in

several associations, in conjunction with local authorities, and the scientists and former students at the Faculty of Agriculture, University of Zagreb to bring together all the existing expert knowledge about Škrlet. We hope that it will protect these important people and events from falling into oblivion, and will also indicate the current challenges this grape and wine are facing. It is also intended to encourage all participants in the process to think and act towards their solution.

ŠKRLET

CROATIA

01. UVOD
INTRODUCTION

UVOD

Škrlet je autohtona sorta vinove loze relativno male ukupne populacije koja se danas dominantno uzgaja u podregijama Moslavina, Pokuplje i Prigorje-Bilogora, a što je najvećim dijelom na području Sisačko-moslavačke i Zagrebačke županije. Naziv Škrlet vjerojatno dolazi od crvene boje bobice (pa i osunčanog dijela grozda) u zriobi, a koja se u starijoj stručnoj literaturi često rabila za opis boje plodova. Takav primjer nalazimo kod opisa plodova jabuke (Radić, 1905.). Podrijetlo riječi škrlet je latinsko: riječ *scarlatum* znači crvena boja.

Najstariji poznati zapis naziva ovoga grožđa pojavljuje se u *Gospodarskim novinama* iz 1854. Ime Škrlet kao glavno ime sorte etabliraju Miklaužić (1962., 1972.) i Licul i sur. (1980.) navodeći Ovnek (žuti) kao najčešći sinonim, a o kojemu postoji mnogo više ranih povijesnih izvora. Iako ima indicija da se sorta pod imenom Czeiger nekada uzgajala i u Mađarskoj, do danas nismo uspjeli pronaći nijedan rasadnik koji u novije vrijeme prodaje sadnice pod ovim nazivom, kao nijednu mađarsku vinariju koja na tržište stavlja istoimeno vino.

U prošlosti Škrlet vjerojatno nikada nije uzgajan masovno, pa u povijesnoj građi uglavnom pronalazimo samo spomen imena sorte i poneki osvrt na kvalitetu vina. U stručnoj literaturi iz 20. stoljeća o njemu također nije mnogo napisano. Za razliku od nekih drugih sorti na kojima

INTRODUCTION

Škrlet is an indigenous variety of grapevine with a relatively small overall population. Today, it is predominantly grown in the subregions of Moslavina, Pokuplje, and Prigorje-Bilogora, which mostly fall within the Sisak-Moslavina and Zagreb Counties. The name Škrlet likely comes from the red colour of the berries (and the sunny part of the cluster) in maturing, and in the older literature, this term was often used to describe fruit colour. Such an example can be found for the description of apples (Radić, 1905). The origin of the word *škrlet* comes from the Latin word *scarlatum,* meaning scarlet red.

The oldest known record of the name of this grape variety appeared in the publication *Gospodarske novine* [Commercial News] from 1854. The name Škrlet, as a prime name, was confirmed for this variety by Miklaužić (1962, 1972) and Licul et al. (1980) listing Ovnek (žuti) as the most common synonym, a grape about which much is known from earlier historical sources. Though there are indications that the variety was once grown in Hungary under the name Czeiger, to date we have been unable to find a single nursery that sells planting material under this name, or any Hungarian wineries that sell wine of this name.

In the past, Škrlet was likely never mass produced, so the historical materials usually denote only the name of the variety and a brief note

su rađena brojna, često i ponavljana istraživanja radi utvrđivanja bioloških karakteristika, optimizacije uzgoja i tehnologija vinifikacije, za potrebe uzgoja Škrleta uglavnom su se koristila iskustva s drugim sličnim sortama.

Prvi poticaj za stručni pristup ovoj sorti daje inženjer Ljudevit Miklaužić koji tijekom 1960-ih godina uočava pozitivna svojstva Škrleta iz perspektive suvremenog vinogradarstva i vinarstva, odabire, označava i prati reprezentativne trsove u starim vinogradima koji će kasnije poslužiti za podizanje prvog eksperimentalnog (i matičnog) nasada 1970. u Volodеru, a iz kojega će se nešto kasnije proizvesti i cjepovi za podizanje prvog većeg monosortnog vinograda (3,22 ha) u suvremenom sustavu uzgoja (Mirošević, 1986.).

Za potrebe elaborata o zaštiti geografskog podrijetla kvalitetnog vina Moslavački škrlet unutar ovog nasada provedena su preliminarna ampelografska istraživanja i potvrđen do tada poznati ampelografski status ove sorte (Licul i sur., 1980.). Prvo znanstveno istraživanje čiji rezultati osiguravaju potpun ampelografski opis i ključne fenološke i fiziološke značajke Škrleta provodi Nikola Mirošević, profesor zagrebačkog Agronomskog fakulteta, početkom 1980-ih godina. Ovim istraživanjem stvorene su pretpostavke za stručni razvoj i unapređenje proizvodnje grožđa i vina od ove sorte. Jedno od otvorenih pitanja u njezinu poznavanju koje Mirošević navodi u zaključcima svojeg rada jest i pitanje selekcije tipova koji se razlikuju po kakvoći i prirodi. Proći će još 15-ak godina prije početka projekta klonske selekcije Škrleta, prvog takve vrste u Hrvatskoj, a koji će na više načina povećati spoznaje o posebnosti sorte i njezinim potencijalima.

U razdoblju 1998. – 2001. profesori Ivan Pejić i Edi Maletić, tada mladi znanstvenici

about the quality of the wine. In the expert literature of the 20th century, little was written about it. Unlike other varieties, which have been subjected to numerous and often repeated research to determine their biological properties, growing optimisation and vinification technology, the methodologies applied to Škrlet are usually those based on experiences gained from growing similar varieties.

The first to take an expert approach to this variety was engineer Ljudevit Miklaužić, who in the 1960s observed the positive properties of Škrlet from the perspective of contemporary viticulture and wine-making. He performed the selection, labelling and tracking representative vines in old vineyards that would later serve to raise the first experimental (and mother) plantations in Voloder in 1970. This plantation would later serve as a source of buds to produce grafts to raise the first larger monovarietal vineyard (3.22 ha) in a contemporary growing system (Mirošević, 1986).

Preliminary ampelographic research was conducted at this plantation as part of a report on the protection of the geographic origin of the quality wine Moslavački Škrlet, which confirmed the known ampelographic status of the variety (Licul et al., 1980). The first scientific research to give a complete ampelographic description and the key phenological and physiological properties of Škrlet was conducted during the 1980s by Nikola Mirošević, professor at the Faculty of Agriculture, University of Zagreb. This research laid the foundation for the expert development and improvement in producing grapes and wine from this variety. One of the outstanding issues that Mirošević listed in his conclusions was the issue of the selection of types, since they differed both in their quality and nature. Another 15 years would pass

Prvi radni sastanak u klijeti Borisa Mesarića na kojemu je dogovorena provedba projekta klonske selekcije Škrleta (20. rujna, 1999.) S lijeva na desno u prvom redu: Ivan Gašpar, Dane Šimunić, Boris Mesarić, Ivan Pejić, Edi Maletić i Marko Miklaužić.

The first working meeting in the cellar of Boris Mesarić at which the implementation of the Škrlet clonal selection project was agreed (September 20, 1999). From left to right in the first row: Ivan Gašpar, Dane Šimunić, Boris Mesarić, Ivan Pejić, Edi Maletić and Marko Miklaužić.

zagrebačkog Agronomskog fakulteta, provode istraživački projekt „Genetička identifikacija autohtonih sorata vinove loze" unutar kojega su uz pomoć klasičnih ampelografskih i molekularnih metoda identificirali, dokumentirali i kolekcionirali brojne autohtone hrvatske sorte vinove loze. Postignuti su iznimni rezultati: zasnovana je kolekcija autohtonih sorti na pokušalištu Jazbina Agronomskog fakulteta u Zagrebu, otkriveno je podrijetlo nekih važnih svjetskih sorti (američki Zinfandel), utvrđeno je roditeljstvo, odnosno dokazana autohtonost najvažnijih hrvatskih sorti te su otkriveni brojni sinonimi. Terenska istraživanja ovog projekta obuhvatila su naravno i Moslavinu, pa tako i Škrlet.

Istraživanja su ponajprije bila usmjerena na spašavanje autohtonih genotipova te njihovu primarnu evaluaciju. Međutim, iz razgovora s lokalnim proizvođačima i uvida u fenotipsku varijabilnost unutar populacije sorte postaje očita potreba sustavne obrade i potpune procjene

before the start of the project of clonal selection of Škrlet, the first project of its kind in Croatia, and which would significantly increase the knowledge about the distinctiveness of the variety and all its potential.

In the period from 1998–2001, professors Ivan Pejić and Edi Maletić, then young scientists at the Faculty of Agriculture, University of Zagreb, carried out the research project entitled "Genetic identification of indigenous varieties of grapevine". Within this project, classical ampelographic and molecular methods were used to identify, document and form a collection of numerous indigenous Croatian varieties of grapevine. The results were exceptional: a collection of indigenous varieties was established at the experimental station Jazbina of the Faculty of Agriculture, University of Zagreb, the origin of several important global varieties was discovered (Zinfandel), the parentage and proof of indigenous status of the most important Croatian varieties established, and numerous synonyms revealed. The field research within this project also included Moslavina, and its Škrlet.

The research was above all focused on saving indigenous Croatian genotypes and conducting their initial evaluation. However, in discussions with local producers, phenotypic variability was observed within populations of the varieties, indicating the need for more systematic examination and a complete assessment of the commercial potential of several rare varieties, as the only way to recommend them for production and ensure they could become commercially more significant. With that aim, the Department of Viticulture and Enology and the Department of Plant Breeding, Genetics and Biometrics of the Faculty of Agriculture, University of Zagreb, with the support of local associations and the authorities, began to work on clonal selection

gospodarskog potencijala nekih rijetkih sorti jer jedino na taj način mogu biti preporučene za proizvodnju i postati ekonomski značajne. U tom pravcu Zavod za vinogradarstvo i vinarstvo i Zavod za oplemenjivanje bilja, genetiku i biometriku Agronomskog fakulteta Sveučilišta u Zagrebu, uz potporu lokalnih udruga i vlasti, počinju rad na klonskoj selekciji nekoliko vrijednih autohtonih sorti vinove loze, među kojima je prvi bio Škrlet. Potrebu za ovim istraživanjem ističe i pretvara u stvarnost tadašnja Udruga vinogradara i voćara „Lujo Miklaužić" iz Kutine. Bio je to prvi takav projekt u Hrvatskoj.

Na temelju dotadašnjih spoznaja bilo je jasno da je kvalitativni potencijal Škrleta prilično visok, ali reputacija njegovih vina nije bila u skladu s tim ponajviše iz razloga što se o njemu nije mnogo znalo. Međutim, s vremenom je u podregiji Moslavina vino Škrleta postalo najtraženije i najprofitabilnije. S obzirom na uočenu posebnost pojedinih trsova unutar proizvodnih nasada na više različitih lokacija nametnulo se pitanje bi li se primjenom metode klonske selekcije iz populacija Škrleta mogla izdvojiti superiorna potomstva (klonovi) koja bi davala znatno kvalitetnije grožđe u odnosu na prosjek populacije.

Godine 2000. počeo je projekt klonske selekcije Škrleta koji je provodio stručni tim Agronomskog fakulteta iz Zagreba uz financijsku potporu i suradnju najprije Udruge vinogradara i voćara „Lujo Miklaužić" iz Kutine, a potom niz godina Sisačko-moslavačke županije. Projekt je počeo selekcijom elitnih trsova u starim vinogradima širom Moslavine i Pokuplja, a dovršen je službenom registracijom i upisom na Sortnu listu 2015. (vidi poglavlje 6). Usporedno s dugoročnim programom klonske selekcije Škrleta čiji je cilj bio staviti na tržište vrhunski sadni materijal, provedena su i brojna druga istraživanja u

of several valuable indigenous varieties of grapevine, with Škrlet as one of the first. It was the Lujo Miklaužić Association of Wine-growers and Fruit-growers from Kutina that was the first to highlight the need for this kind of research, and to turn it into a reality. It was the first project of its kind in Croatia.

From the knowledge up until that time, it was clear that Škrlet had strong potential to create good quality wines, though the reputation of its wines was not up to this potential, mostly due to the fact that so little was known about it. However, over time, Škrlet has become the most widely sought after and most profitable wines in the Moslavina subregion. Considering that certain vines within the production plantations over various locations were observed to have distinctive properties, the question arose of whether the clonal selection method could be applied on the Škrlet populations to select the superior clones that would give a significantly better-quality grape in relation to the population average.

In 2000, the project of clonal selection of Škrlet began, and was carried out by the expert team from the Faculty of Agriculture, University of Zagreb, with the financial support and cooperation first from the Lujo Miklaužić Association of Wine-growers and Fruit-growers from Kutina, and then later for a number of years from Sisak-Moslavina County. The project began with the selection of elite vines in old vineyards throughout Moslavina and Pokuplje, and was completed with the official registration and entry into the official Variety List in 2015 (see Chapter 6).

Parallel with the long-term programme of clonal selection of Škrlet, aimed at introducing premium quality propagation material onto the market, numerous other studies were conducted

kojima su korišteni pokusni nasadi i biljni materijal stvoreni tijekom projekta. Provođena su istraživanja vezana uz genetičku unutarsortnu varijabilnost, zdravstveno stanje selekcioniranog materijala, izbor odgovarajućih podloga, opterećenje rodnim pupovima, utjecaj gnojidbenih tretmana, aromatskih spojeva u grožđu i vinu Škrleta, ekološki uzgoj i sl. (vidi poglavlje 3). Ispitivane su i različite metode vinifikacije, a sve će to pružiti nužna saznanja potrebna da bi se iz novoselekcioniranih klonova izvukao maksimum. Izvrsni rezultati već se naziru iz preliminarnih pokusa i mikrovinifikacija, a u široj evaluaciji novih klonova Škrleta već sudjeluje nekoliko moslavačkih vinara koji samostalno istražuju nove tehnologije uzgoja prikladne pojedinim klonovima, a sve u svrhu postizanja vrhunske kvalitete vina. Sve će to proširiti naša

using experimental plantations and plant material created during the project. Research was conducted to determine the genetic variability within the variety, the health condition of selected material, selection of the appropriate rootstock, bud load, influence of different fertilisation treatments, the aromatic compounds in the Škrlet grape and wine, opportunities for organic breeding and more (see Chapter 3). Different methods of vinification were analysed to give deeper insight into how to extract the maximum from the newly selected clones. Excellent results were already achieved in the preliminary experiments and micro-vinification. Several Moslavina wine-makers are already participating in the broader evaluation of these Škrlet clones, conducting their own research on new growing technologies that suit individual

znanja o Škrletu, sorti koja u potpunosti zaslužuje stručnu i znanstvenu pozornost.

Dosadašnji rezultati pokusa pokazuju superiornost selekcioniranog materijala, kako u vinogradu, tako i u podrumu. Tijekom dosadašnjih istraživanja u projektu klonske selekcije Škrleta sudjelovalo je više domaćih i inozemnih istraživača te studenata diplomskih i poslijediplomskih studija raznih fakulteta u Hrvatskoj, koji su tijekom ovih istraživanja izradili svoje diplomske radove i doktorske disertacije. Stečena su vrijedna znanja i iskustva na korist ukupnog hrvatskog vinogradarstva, a Škrlet je postao prva hrvatska autohtona sorta s registriranim klonovima. Uvjereni smo da pojava certificiranog sadnog materijala Škrleta i drugih autohtonih sorti na tržištu predstavlja značajnu tehnološku, pa i povijesnu prekretnicu u vinogradarstvu i vinarstvu Republike Hrvatske.

Svrha knjige jest na temelju iskustava stečenih tijekom ovih istraživanja dati sveobuhvatan pregled svih dosadašnjih spoznaja o Škrletu, od njegova podrijetla i povijesti uzgoja preko aktualnih spoznaja važnih za vinogradare i vinare do recentnih rezultata istraživanja i novih trendova u proizvodnji vina. U knjizi se opisuje i postupni uspon vina Škrleta i njegova današnja pozicija na tržištu te se analiziraju suvremeni izazovi za daljnji napredak u proizvodnji te potencijali u razvoju turističke ponude. Želja nam je potaknuti proizvođače, istraživače, studente i sve druge dionike, na nove projekte i istraživanja koja će voditi povećanju površina vinograda, količina i kvalitete vina Škrleta, a time i općeg prosperiteta hrvatskog vinogradarstva i vinarstva.

clones, all with the aim of achieving wine of a premium quality. All these efforts are sure to expand our knowledge of Škrlet, as a variety that fully deserves expert and scientific attention.

The experimental results to date have proven the superior quality of the selected materials, both in the vineyard and in the cellar. The research to date in the clonal selection project has included many domestic and foreign researchers and graduate and post-graduate students from different universities in Croatia, who drafted their graduate papers and doctoral dissertations based on this research. Valuable knowledge and experience have been gained, to the benefit of Croatian viticulture as a whole, and Škrlet has become the first Croatian indigenous variety with registered clones. We deeply believe that the appearance of the certified planting material for Škrlet and other indigenous varieties on the market mark a significant technological and even a historical turning point in the viticulture and wine-making in the Republic of Croatia.

The purpose of this book, based on the experiences gained during this research, is to give a comprehensive overview of all the knowledge of Škrlet to date, from its origins and history, to current knowledge important for viticulture and wine-makers, to recent research results and new trends in wine production. The book gives an overview of the gradual rise of Škrlet wine and its current position on the market, and analyses the contemporary challenges for further progress in production and the potential to develop tourism. It is our desire to stimulate producers, researchers, students and all other stakeholders to initiate new projects and research that will contribute to an increase in the area of vineyards, the quantity and quality of Škrlet wine, and with that, the general prosperity of Croatia's viticulture and enology.

02. PODRIJETLO, POVIJEST I DANAŠNJI ZNAČAJ ŠKRLETA

ORIGIN, HISTORY AND CURRENT SIGNIFICANCE OF ŠKRLET

PODRIJETLO, POVIJEST I DANAŠNJI ZNAČAJ ŠKRLETA

2.1. O IMENU ŠKRLET I NJEGOVIM SINONIMIMA

Škrlet svoje ime vjerojatno duguje riječi za posebnu boju bobica u zriobi, a koja se u suvremenom hrvatskom jeziku gotovo više i ne upotrebljava. Naime, u vrijeme dozrijevanja, posebno na osunčanoj strani, na kožici bobice pojavljuju se crveno-ljubičaste (škrletne) pjege koje s veće udaljenosti stvaraju dojam obojenosti. Nije rijetkost kod bijelih sorti da se pod utjecajem izravne sunčeve svjetlosti stvaraju pigmenti na kožici bobica. Pjege mogu biti više ili manje izražene, a kod nekih sorti dijelovi ili cijele bobice poprimaju tamniju boju. Kod Škrleta je ova pojava česta, mogli bismo reći sortna karakteristika, i otud vjerojatno i njegovo ime.

U svojoj knjizi *Voće i njegova upotreba* iz 1905. i *Voćarstvo* iz 1909., Ivan pl. Radić upotrebljava pridjev *škrletno* za opis boje ploda jabuka uz istovremeno navođenje naziva sorti na njemačkom jeziku: 'Škrletni kusino' = 'Purpurrotter coussinot'; 'Parmenka škrletno crvena' = 'Scharlachrote Parmaene'. U navedenim knjigama obrazlaže se i korijen riječi (očito preuzet iz nekog rječnika): iz grčkog jezika: *purpur* = purpur, grimiz, ljubičasto-crvena boja, skrlet; iz latinskog jezika: *purpureus* = grimizan, crven, ljubičast, crvenkast; iz njemačkog jezika: *scharlach* = živa crvena boja, škrletna boja te iz talijanskog

ORIGIN, HISTORY AND CURRENT SIGNIFICANCE OF ŠKRLET

2.1. ABOUT THE NAME ŠKRLET AND ITS SYNONYMS

Škrlet likely owes its name to the words for the special coloration of the berry in maturation, words which are virtually no longer used in the contemporary Croatian language. As this variety matures, reddish-purple (scarlet) spots appear on the skin of the berry, particularly on the sunny side of the bunch, and from a distance, give the impression of the overall colouration. It is not rare that white grape varieties create pigments on the skin under direct sunlight. These spots can be more or less pronounced, while in some varieties the skin can partially or completely take on a darker colour. This is a common occurrence in Škrlet, and could even be considered a characteristic of the variety, and likely hence its name.

In his books *Voće i njegova upotreba* [Fruit and its Uses] from 1905 and *Voćarstvo* [Fruit Growing] from 1909, nobleman Ivan pl. Radić used the adjective *škrletno* [scarlet] to describe the colour of apples, while also listing the German names of the varieties: 'Škrletni kusino' = 'Purpurrotter coussinot'; 'Parmenka škrletno crvena' = 'Scharlachrote Parmaene'. In those volumes, he explained the root of the word (obviously taken from a dictionary), i.e., from the Greek *purpur* = purple, crimson, purplish-reddish colour, scarlet;

jezika: *scarlatina*, *scarlatto* = skrlet, skrletna boja. U Rječniku hrvatskog jezika (Šonje, 2000.) nalazimo sljedeće: škrlet (turcizam) – „izvorna domaća odlika vinove loze i vina iz Moslavine". Otud vjerojatno i uporište za tumačenje imena jer na turskom *iskerlet* znači grimiz.

Najstariji do danas poznati pisani izvor u kojem se spominje Škrlet odnosi se na jednu objavu u *Gospodarskim novinama* iz 1854. (lipanj, br. 22) koje je izdavalo Gospodarsko društvo za Hrvatsku i Slavoniju. Riječ je o prijavi uzoraka vina za nadolazeću izložbu među kojima je i uzorak bijelog vina br. 34 koji dostavlja Jožef Gregorić, župnik iz Peščenice. Vino je iz berbe 1853., iz vinograda koji se nalazi „na Kravarskoj gori koja se proteže do Letovanića na Kupi, preciznije na lokaciji Dolnji Gradec, južno dva sata od Peščenice". Vino je napravljeno od mješavine grožđa nekoliko sorti čiji su omjeri u vinogradu precizno navedeni. Glavna sorta je Lipovina (oko 60 %), ali vinar navodi da u vinu još ima Pikanine (1/8), potom Imbrine (1/16), Černine (1/8), Černine sladke (1/16), Ovneka drobnog (1/8), **Škerlata žutog** (1/16) i Drobne beline (1/16).

Drugi stari zapis imena **Škrlat žuti** nalazimo u *Jugoslovenskom imeniku bilja* iz 1879. na 394. stranici čiji je autor Bogoslav Šulek i koji ga tumači kao „suvrst vinove loze iz Kravarskog". Šulek isto tako na 273. stranici svojeg *Imenika* navodi i Ovnek, ali ne kao sinonim Škrleta, već na sljedeći način: „Ovnek, gruener Kanigl (*Križev.*)".

Ljudevit Miklaužić u svojem djelu *Malo vinogradarstvo* (1972.) sortu Škrlet opisuje kao „... masovnu sortu, rasprostranjenu u Moslavačkom vinogorju, bujnog rasta i neobično otpornu prema bolestima. Rano dozrijeva i daje vino vrlo ugodne arome, a zbog čega se zadnjih godina u Moslavini jako širi." Pri tome uz ime Škrleta

from the Latin: *purpureus* = crimson, red, purple, reddish; from the German: *scharlach* = lively red colour, scarlet colour, and from the Italian: *scarlatina*, *scarlatto* = scarlet colour. The *Rječnik hrvatskog jezika* [Croatian Language Dictionary] (Šonje, 2000) lists the following: *škrlet* (of Turkish origin) – "indigenous domestic grapevine and wine from Moslavina". This is further support for the interpretation of the name, since in the Turkish language, *iskerlet* means crimson or scarlet.

The oldest known written source mentioning the name Škrlet pertains to a report from the publication *Gospodarske novine* [Commercial News] from 1854 (June edition, no. 22) published by the Croatian-Slavonic Economic Society. This is a report of wine samples for the upcoming exhibition, which included a sample of white wine no. 34, submitted by Jožef Gregorić, the parish priest from Peščenica. The wine was from the 1853 vintage, from a vineyard located "on the Kravarska Gora hills that extend from Letovanić on the Kupa River, at the more precise location Dolnji Gradec, two hours south of Peščenica". This wine was made of a blend of grapes of several varieties, whose ratios in the vineyard were precisely listed. The main variety was Lipovina (about 60%), but the wine-maker denotes that the wine also includes Pikanina (1/8), Imbrina (1/16), Černina (1/8), Černina sladka (1/16), Ovnek drobni (1/8), **Škerlat žuti** (1/16) and Drobna belina (1/16).

The second old record mentioning the name **Škrlat žuti** is found in the *Jugoslovenski imenik bilja* [Yugoslav Directory of Plants] from 1879 by author Bogoslav Šulek; on page 394, he interprets this as a "co-type of grapevine from Kravarsko". On page 273 of the Directory, Šulek also states the name Ovnek, but not as a

ne spominje sinonime, a prema kvalitativnom potencijalu ga svrstava u skupinu „podprosječne sorte za stolna vina".

Mirošević (1986.) u svojoj disertaciji navodi da usporedbom prikupljenih ampelografskih podataka i provedene komparacije s drugim u literaturi opisanim sortama nije uspio utvrditi da bi Škrlet bio sinonim za neku drugu, već poznatu inozemnu sortu, te je smatra vrlo starom domaćom sortom s područja vinogradarskih podregija Pokuplje i Moslavina. Kao argument navodi da je i tada (1980-ih) ova sorta jedino zastupljena u starim vinogradima na tom području, a tek se počela širiti na podregije Prigorje i Plešivica.

Kao sinonime (druga imena) danas glavnog i službenog imena Škrlet bijeli, Mirošević (1986.) navodi: u Moslavini Škrlec, Škrteč, Šupljak i Divljak, na Vukomeričkim goricama Ovnek žuti, Škrlet tusti, Vinek žuti, Ovinek slatki te na području Petrinje Ovnek žuti, Žutak, Žutina i Osukač.

Zanimljivo je da župnik Jožef Gregorić 1854. navodi sorte naziva Škerlat žuti i Ovnek drobni (sitni) kao dvije zasebne sorte, dok noviji autori Škrlet i Ovnek shvaćaju kao sinonime. Kada je riječ o Ovneku, i kod njega se pojavljuje nekoliko varijanti imena: žuti, drobni i bijeli. Treba međutim imati na umu da u to vrijeme genetika kao znanost još nije bila rođena, pa tako ni sam koncept sorte kakav danas rabimo nije bio u primjeni. Pouzdana identifikacija (i razlikovanje) sorti u proizvodnim vinogradima nije nimalo jednostavan postupak. Tek se u djelima Miroševića (1986.) i Mirošević i Turković (2003.) iscrpno navode glavne ampelografske karakteristike i daju reprezentativne slike grozda i lista Škrleta. Stoga ne možemo biti sigurni da su naši preci s prijelaza 19. u 20. stoljeće sa sigurnošću prepoznavali i razlikovali genetički različite sorte

synonym for Škrlet, but in the following way: "Ovnek, gruener Kanigl (*Križev.*)".

Ljudevit Miklaužić in his book *Malo vinogradarstvo* [Small-scale Viticulture] (1972) describes the variety Škrlet as "...a common variety distributed in the Moslavina wine-growing hills, with vigorous growth and unusually resistant to diseases. Ripenes early and gives wine of a very pleasant aroma, and for this reason has become increasingly popular in Moslavina in recent years." He lists no synonyms of Škrlet, while in terms of the qualitative potential, he places it in the category of "subaverage table wine varieties".

Mirošević (1986) in his dissertation states that based on a comparison of the collected ampelographic data and comparisons with other varieties described in the literature, he was not able to establish whether Škrlet was a synonym for another, already known foreign variety, and instead considers it an old domestic variety from the areas of the Pokuplje and Moslavina wine-growing subregions. His argument to support that claim was that then (in the 1980s), this variety was only found in old vineyards in that area, and only later began to spread into the Prigorje and Plešivica subregions.

Along with the main and official name Škrlet bijeli, Mirošević (1986) lists a number of synonyms: in the Moslavina – Škrlec, Škrteč, Šupljak and Divljak; in the Vukomeričke Gorice hills – Ovnek žuti, Škrlet tusti, Vinek žuti, and Ovinek slatki; and in the Petrinja region – Ovnek žuti, Žutak, Žutina and Osukač.

It is interesting that in 1854, parish priest Jožef Gregorić lists the varieties with the names Škerlat žuti and Ovnek drobni (sitni) as two separate varieties, while newer authors perceive Škrlet and Ovnek as synonyms. Concerning Ovnek, it also has several known variations

prema današnjoj definiciji i sukladno tome im dodjeljivali različita imena. Oni su zasigurno dobro zapažali karakteristike grozda, lista i trsova u cjelini, ali su uočene razlike lako mogle biti tek posljedica modifikacija na uzgojne uvjete i kao takve nenasljedne, a što struka tada još nije znala. Ili su variranja u izgledu grozda i lista bila posljedica unutarsortne genetičke varijabilnosti, a to su različiti tipovi (mutanti) unutar populacije jedne sorte. Ovo lako dovodi do zablude da je riječ o sasvim različitoj sorti.

Također, iz tekstova u *Gospodarskim novinama* iz sredine 19. stoljeća primjetna je tendencija austrijskih eksperata koji dolaze u naše krajeve u stručne posjete, npr. Franje Trummera (Gospodarsko pokušalište u Grazu), ali i domaćih educiranijih uzgajivača, često svećenika, da sve sorte koje se nalaze u domaćim vinogradima nazivaju i paralelnim njemačkim nazivom, što pretpostavlja da su one podrijetlom iz Austrije ili Njemačke. Danas smo prilično sigurni da su mnoge sorte iz tog vremena bile autohtone i genetički nesrodne s austrijskim ili drugim stranim sortama. Dobar primjer za to su dvije kvalitetne sorte iz Moslavine i Pokuplja (Škrlet i Dišeća ranina). Ako pretpostavimo da je Ovnek odgovarajući sinonim za Škrlet, onda je u većini starih tekstova Ovnek sa svojim hrvatskim sinonimima Osukač i Mastnec gotovo redovito navođen kao sinonim sorte Kanigl grüner. Međutim, austrijska sorta Kanigl grüner po svojim ampelografskim karakteristikama (prije svega ženskim cvijetom) ne podudara se sa Škrletom, a isto tako ni po profilu DNA-a. Slično je i s Dišećom raninom koja se u više tekstova navodi kao sinonim za Muskirte Urbanitraube, ali i Auguster, međutim, genetički profil ove sorte ne poklapa se s profilima tobožnjih sinonima, kao ni s jednom drugom sortom u europskoj bazi podataka. Pažljivim iščitavanjem otkrivaju

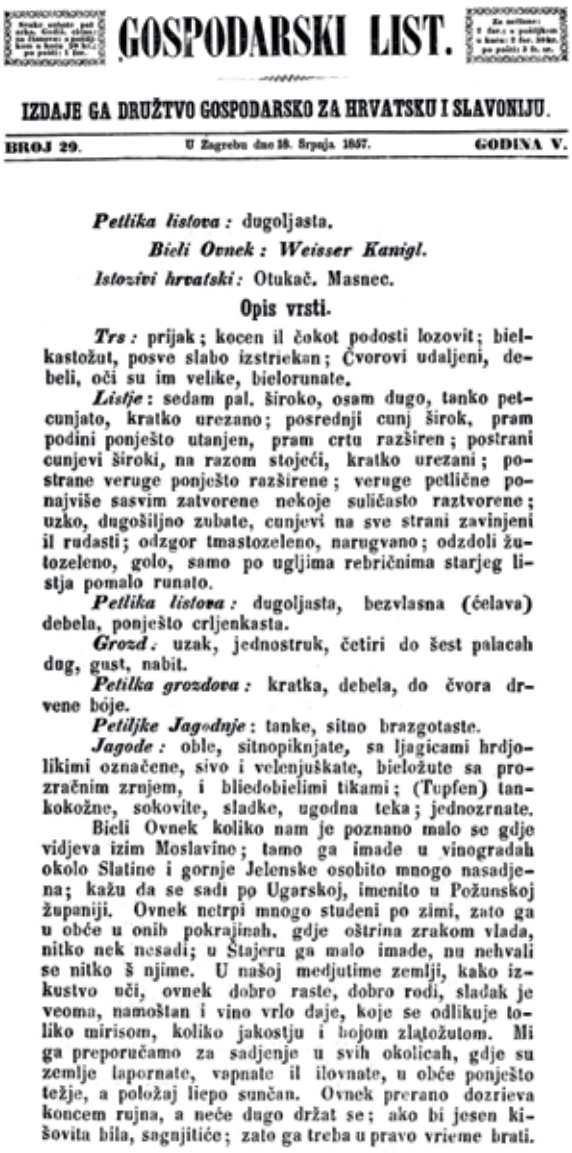
of the name: *žuti* [yellow], *drobni* [tiny] and *bijeli* [white]. However, one should also keep in mind that genetics as a science was still not developed, and therefore the concept of a variety as used today was not then in application. Reliable identification (and differentiation) of varieties in producing vineyards is no easy task. It is only in the works of Mirošević (1986) and Mirošević and Turković (2003) that the main ampelographic characteristics are exhaustively stated and representative images of the cluster and leaves of Škrlet are given.

Therefore, we cannot be certain that our ancestors at the turn of the 20th century were able to recognise and differentiate genetically different varieties with any certainty according to today's definitions, and accordingly to assign them different names. They were certainly able to observe the characteristics of the grapes, leaves and vines as a whole, though the observed differences could easily be a modification to growing conditions and as such were not heritable, which the profession did not yet know. Either these variations in the appearance of the grapes and leaves were the consequence of intravarietal genetic variability, as different types (mutants) within a population of a variety. This can easily lead to confusion that these are different varieties.

From the articles in *Gospodarske novine* [Commercial News] from the mid-19th century, there is an evident tendency for Austrian experts visiting Croatia, such as Franjo Trummer (from the Agricultural Experimental Station in Graz), and local educated wine-growers and often priests, to call all the varieties found in the Croatian vineyards by a parallel German name, giving the assumption that they originated from Austria or Germany. Today we are quite certain that many of the varieties

se i druga nesuglasja s današnjim spoznajama, primjerice Kleščec bijeli, koji se navodi kao sinonim za Ortlieber b., a danas se zna da to nije točno.

Sve to govori da različita imena sorti iz stare literature, a ponekad i izjave starih vinogradara (naših očeva i djedova), ne treba uzimati nekritički. Sigurnost nekog imena kao sinonima



GOSPODARSKI LIST.

IZDAJE GA DRUŽTVO GOSPODARSKO ZA HRVATSKU I SLAVONIJU.

BROJ 29. U Zagrebu dne 18. Srpnja 1857. GODINA V.

Petlika listova: dugoljasta.

Bieli Ovnek: Weisser Kanigl.

Istoznivi hrvatski: Otukač. Masnec.

Opis vrsti.

Trs: prijak; kocen il čokot podosti lozovit; bielkastožut, posve slabo izstriekan; Čvorovi udaljeni, debeli, oči su im velike, bielorunate.

Listje: sedam pal. široko, osam dugo, tanko petcunjato, kratko urezano; posrednji cunj širok, pram podini ponješto utanjen, pram crtu razširen; postrani cunjevi široki, na razom stojeći, kratko urezani; postrane veruge ponješto razširene; veruge petlične ponajviše sasvim zatvorene nekoje suličasto raztvorene; uzko, dugošiljno zubate, cunjevi na sve strani zavinjeni il rudasti; odzgor tmastozeleno, narugvano; odzdoli žutozeleno, golo, samo po ugljima rebričnima starjeg listja pomalo runato.

Petlika listova: dugoljasta, bezvlasna (ćelava) debela, ponješto crljenkasta.

Grozd: uzak, jednostruk, četiri do šest palacah dug, gust, nabit.

Petilka grozdova: kratka, debela, do čvora drvene bóje.

Petiljke Jagodnje: tanke, sitno brazgotaste.

Jagode: oble, sitnopiknjate, sa ljagicami hrdjolikimi označene, sivo i velenjuškate, bieložute sa prozračnim zrnjem, i bliedobielimi tikami; (Tupfen) tankokožne, sokovite, sladke, ugodna teka; jednozrnate.

Bieli Ovnek koliko nam je poznano malo se gdje vidjeva izim Moslavine; tamo ga imade u vinogradah okolo Slatine i gornje Jelenske osobito mnogo nasadjena; kažu da se sadi po Ugarskoj, imenito u Požunskoj županiji. Ovnek netrpi mnogo studeni po zimi, zato ga u obće u onih pokrajinah, gdje oštrina zrakom vlada, nitko nek nesadi; u Štajeru ga malo imade, nu nehvali se nitko š njime. U našoj medjutime zemlji, kako izkustvo uči, ovnek dobro raste, dobro rodi, sladak je veoma, namoštan i vino vrlo daje, koje se odlikuje toliko mirisom, koliko jakostju i bojom zlatožutom. Mi ga preporučamo za sadjenje u svih okolicah, gdje su zemlje lapornate, vapnate il ilovnate, u obće ponješto težje, a položaj liepo sunčan. Ovnek prerano dozrieva koncem rujna, a neće dugo držat se; ako bi jesen kišovita bila, sagnjitiće; zato ga treba u pravo vrieme brati.

of that time were indigenous and genetically unrelated to Austrian or other foreign varieties. A good example of this are two good quality varieties from Moslavina and Pokuplje (Škrlet and Dišeća ranina). If we assume that Ovnek is a suitable synonym for Škrlet, then in most of the older texts, Ovnek and its Croatian synonyms Osukač and Mastnec were almost regularly listed as synonyms of the variety Kanigl grüner. However, in terms of its ampelographic properties (especially the female flower), the Austrian variety Kanigl grüner does not correspond to Škrlet, and its DNA profile also is not a match. A similar situated is seen with the variety Dišeća ranina, which is listed in multiple texts as a synonym for Muskirte Urbanitraube, and Auguster; however, the genetic profile of these varieties does not overlap with the profiles of these synonyms, or with any other variety in the European database. Careful examination also reveals other inconsistencies with today's knowledge, such as Kleščec bijeli, which is listed as a synonym for Ortlieber b., which today is known to be incorrect.

All this indicates that the different names of varieties from the old literature, and occasionally the statements of old viticulturalists (our fathers and grandfathers) should be taken with a grain of salt. The certainty of a name as a synonym must be based on the ampelographic description or other biological and enological characteristics, while today it is based primarily on sharing the same DNA profile.

One such detailed description of Ovnek (Kanigl), which we still today believe to be a synonym for Škrlet, was left by Ljudevit Vukotinović in edition 29 of the *Gospodarski list* [Commercial Paper] from 1857 in his column "Trsovi hrvatski" [Croatian vines]. Vukotinović gives a detailed description of the leaf, bunch

mora se zasnivati na ampelografskom opisu ili nekim drugim biološkim ili enološkim karakteristikama, a u današnje vrijeme primarno istovjetnosti profila DNA.

Jedan takav, prilično detaljan opis Ovneka (Kanigl), a za koji danas vjerujemo da je sinonim za Škrlet, ostavio nam je Ljudevit Vukotinović u *Gospodarskom listu* br. 29 iz 1857. u kolumni „Trsovi hrvatski". Vukotinović iscrpno opisuje list, grozd i bobicu, ali nažalost bez ikakvih crteža. Navodi *rđaste točkice*, ali ne rabi pojam *škrletno*. Kao stručno ime sorte navodi Ovnek bieli, iako se u većini izvora koristi atribut žuti. Ipak, ovo je izuzetno vrijedan i detaljan opis dopunjen informacijama o području uzgoja i proizvodnim karakteristikama. Ovnek bieli (po Vukotinoviću) ima sljedeće karakteristike: „Bujnost visoka, mladice debele, internodiji dugi. Listovi srednji do veliki, na naličju goli. Bobica okrugla, posuta točkicama ('oble, sitnopiknjate, sa ljagicama hrđolikim označene...')." Sve to odgovara ampelografskom opisu Škrleta.

Posebno je koristan navod da se pretežno uzgaja u Moslavini, ali da „kažu da se dosta sadi po Ugarskoj, imenito u Požunskoj županiji". Unatoč činjenici da Vukotinović kao sinonim nikada ne navodi Škrlet, vrlo je vjerojatno da je riječ o istoj sorti.

2.2. CZEIGER

Navedeni sinonimi Škrleta ostaju nam tek kao preostalo jezično bogatstvo lokalnog stanovništva. Naime, zbog propadanja vinogradarstva u povijesnim regijama gdje se on uzgajao danas više nema vinogradara koji proizvode i etiketiraju vina s drugim imenima pa status sinonima nije moguće znanstveno potvrditi. Međutim, provjera pretpostavljene sinonimije sa sortama

and berry, but unfortunately included no illustrations. He lists the *rust-coloured spots* but does not use the term *škrletno* [scarlet]. He lists the name Ovnek bieli [white] as the professional name for the variety, even though most sources used the adjective *žuti* [yellow]. However, this exceptionally valuable and detailed description was also supplemented with information about the area of its growth and production properties. According to Vukotinović, Ovnek bieli has the following properties: "Lush and tall, thick shoots, long internodes. Leaves medium to large, bare on the face. Berry round, sprinkled with spots (round, tiny points with rusty markings around the edges...')." All this corresponds also to the ampelographic description of Škrlet. The note that it was primarily grown in the Moslavina area is particularly useful, though he also stated that "they say it is quite commonly planted in Hungary, especially in the Pozsany area". Despite the fact that Vukotinović did not ever list Škrlet as a synonym, it is very likely that this is the same variety.

2.2. CZEIGER

Above mentioned synonyms of Škrlet remain only as part of the linguistic heritage of the local population. Due to the decline of viticulture in historical regions where it was once known, there today are no longer any wine-makers who make and label wine with other names, and so the status of synonyms cannot be scientifically confirmed. However, verifying the assumed synonyms with varieties from other countries that have been well studied or are widely grown is a relatively simple task today. As such, it is completely clear that Kanigl grüner is not a synonym for Škrlet and in fact is quite different from it.

iz drugih zemlja koje su dobro proučene i/ili su u uzgoju, danas je prilično jednostavan stručni posao. Tako je sasvim jasno da Kanigl grüner nije sinonim Škrleta i da je u odnosu na njega vrlo različit.

Međutim, u istraživanjima smo otkrili jedan novi sinonim koji etimološki ima vrlo posebno ime, a pojavljuje se u geografski i kulturno znatno različitom području. Riječ je o Czeigeru koji se u više znanstvenih izvora navodi kao „mađarska autohtona sorta karpatskog bazena" (Galbacs i sur., 2009.), a zasigurno ima istovjetan genotip kao i Škrlet.

Tijekom naših istraživanja hrvatskih autohtonih sorti proveli smo detaljnu inventarizaciju svih hrvatskih vinogradarskih regija i sve potencijalno autohtone sorte genotipizirali metodom DNA-markera, koristeći pri tome suvremenu i međunarodno prihvaćenu metodologiju. Štoviše, sudjelovali smo u velikom europskom konzorciju *GrapeGen06*[1] čiji je cilj bila genotipizacija i ampelografska karakterizacija svih europskih i svjetskih sorti, iz kojega je proistekla nadograđena baza podataka *(Vitis International Variety Catalogue* – VIVC, www.vivc.de). Tijekom realizacije tog projekta (2006. – 2010.) genetički profil Škrleta koji smo s profilima drugih hrvatskih sorti unijeli u europsku bazu podataka pokazao je genetičku istovjetnost sa sortom Czeiger iz Mađarske!

U komunikaciji s mađarskim kolegama došli smo u posjed *Mađarskog ampelografskog atlasa* (Nemeth, 1966.) u kojemu se ampelografski opisuje Czeiger. Međutim, koncepcija te knjige je takva da u njoj nema fotografija i opisa pojedinih sorti, već su samo prikazani rezultati na razini ampelografskih opisnika. Njihovim samostalnim tumačenjem nije moguće precizno utvrditi stupanj morfološke sličnosti sa Škrletom. U komunikaciji s mađarskim kolegama

However, in the research, we discovered a new synonym which is etymologically highly significant, as it appears in a different geographic and cultural area. This is Czeiger, which in multiple scientific sources is listed as a "indigenous Hungarian variety belonging to the Carpathian Basin" (Galbacs et al., 2009), and this variety has the same genotype (DNA profile) as Škrlet.

During our research of Croatian indigenous varieties, we conducted a detailed inventory of all Croatian wine-growing regions and all potential indigenous varieties were genotyped using DNA-marker technology, based on the contemporary, internationally accepted methodology. Furthermore, we participated in the large European consortium *GrapeGen06*[1] aimed at genotyping and giving an ampelographic characterisation of all European and global varieties. The result was the upgraded Vitis International Variety Catalogue (VIVC, www.vivc.de). During our work on this project (2006–2010), the genetic profile of Škrlet was entered into the European database, along with other Croatian varieties, and it proved to be genetically identical to the variety Czeiger from Hungary!

In communications with Hungarian colleagues, we were able to obtain a copy of The Hungarian Ampelographic Atlas (Nemeth, 1966) (Nemeth, 1966) which gives a full ampelographic description of Czeiger. However, the concept of this book is such that it contains no photographs and descriptions of individual varieties, instead it only lists the results at the level of the ampelographic descriptors. By their independent interpretation, it is not possible to precisely determine the degree of morphological similarity with Škrlet. In communication with Hungarian colleagues, we received the answer that the sample of tissue used for DNA analysis

1 www1.montpellier.inra.fr/grapegen06/page_summary/summary.php

1 www1.montpellier.inra.fr/grapegen06/page_summary/summary.php

došli smo do odgovora da je uzorak tkiva korišten za analizu DNA podrijetlom iz kolekcije sorti Instituta za vinovu lozu Sveučilišta u Pečuhu. Osim tvrdnje da je riječ o staroj autohtonoj sorti iz Karpatskog bazena, nitko od njih nije nam mogao dati informaciju iz kojeg je točno dijela Mađarske podrijetlom te uzgaja li se danas i proizvodi li se od nje sortno vino. Ni internetsko pretraživanje svih mađarskih vinskih regija nije urodilo plodom i do danas nismo uspjeli doznati uzgaja li itko u Mađarskoj ovu sortu grožđa i pravi li od nje vino. Pretpostavljamo da bismo s obzirom na činjenicu da postoji obilje podataka na internetu o vinskim sortama i regijama naišli na podatak o tome da netko uzgaja upravo ovu sortu. Ostaje pretpostavka da je uzorak ove sorte došao iz nekog starog miješanog vinograda u kojemu je bilo loza Škrleta. Obzirom na činjenicu da genetički istovjetan materijal egzistira na značajnoj geografskoj udaljenosti i duže vrijeme te da sorta može nastati samo na jednom mjestu, ili u Hrvatskoj ili u Mađarskoj, pretpostavlja se da je riječ o sorti koja je imala određenu gospodarsku vrijednost zbog koje je s namjerom prije više godina prenesena ili iz Mađarske u Hrvatsku, ili iz Hrvatske u Mađarsku. Amaterskim pretraživanjem etimologije imena Czeiger nismo pronašli značenje te riječi u mađarskom jeziku. Kao sinonimi za ovu sortu u *Mađarskom ampelografskom atlasu* navode se sljedeća imena: Czeiger Sima, Czeiger Szırıs, Sima Czeiger, Szıros Czeiger.

Pojam 'czeiger' ne nalazimo u rječnicima stranih riječi niti ima neko posebno značenje na mađarskom jeziku. Internetsko pretraživanje pokazalo je da je Czeiger rijetko mađarsko prezime židovskog podrijetla, a najčešće u dvije mađarske susjedne županije (Tolna i Baranya).

U ampelografiji je poznato da više sorti vinove loze nosi ime ili prezime ljudi (Babić, Manzo-

was originally from the collection of varieties of the Institute for the Grapevine of the University of Pécs. Other than the claim that this is an old, indigenous variety from the Carpathian Basin, no one was able to give any information as to precisely which part of Hungary this variety originated and whether it is still grown today and used to make a varietal wine. An internet search of all of Hungary's wine regions also failed to turn up any results, and to this date, we have been unable to learn whether anyone in Hungary grows this variety of grape and makes wine from it. We assume that given the great quantities of information about the wine regions and varieties available on the internet, we would have found some data as to whether anyone grows this variety. Thus, the assumption remains that the sample of this variety came from an old, mixed variety vineyard, which also contained vines of Škrlet. Given the fact that genetically identical material exists at a significant geographic distance and over a long time period, and that the variety could have only originated from one place, either Croatia or Hungary, it can thus be assumed that this is a variety had a certain commercial value at that time, given the intent to transport it long ago either from Hungary into Croatia, or from Croatia into Hungary. An amateur search of the aetiology of the name Czeiger gave no results as to the meaning of the word in the Hungarian language. The Hungarian Ampelographic Atlas lists the following names as synonyms for this variety: Czeiger Sima, Czeiger Szırıs, Sima Czeiger, Szıros Czeiger.

The term 'czeiger' was not found in any foreign language dictionaries, nor does it have any special significance in the Hungarian language. An internet search indicated that Czeiger is a rare Hungarian surname of Jewish origin, and

ni, Bouschet, Pirovano...). Vrlo slobodno moglo bi se nagađati da je osoba imenom Czeiger iz Pokuplja ili Moslavine prenijela nekom zgodom reznice Škrleta u Mađarsku, i da je ta sorta u početku ispitivanja (pokusnog uzgoja) na nekom mjestu evidentirana pod imenom te osobe. Stranica o primatu i točnom podrijetlu Škrleta ili Czeigera zasigurno tek treba biti ispisana.

Za sortu Škrlet u prošlosti su korišteni razni nazivi (sinonimi). U ampelografiji je to čest slučaj za stare sorte i sorte velikog areala uzgoja i velike gospodarske važnosti. S obzirom na to da Škrlet prema dostupnim podacima nikada nije bio sorta velikog areala uzgoja i gospodarske važnosti, logično se može pretpostaviti da je on vrlo stara sorta koja se očuvala zahvaljujući svojoj održivosti i kvaliteti te da je uzgajana tijekom mnogih naraštaja i na dovoljno širokom prostoru, zbog čega je dobila mnogo različitih lokalnih imena. U ovom kontekstu treba se prisjetiti i starih Rimljana koji su osvajali i obitavali na prostorima Pokuplja i Moslavine. Mnogi vjeruju da Moslavina svoje ime duguje rimskom nazivu *Mons Claudius*. Ako je tako, Škrlet bi mogao biti i njihova ostavština.

Iz navedenih primjera očito je da sve što je zapisano u starim knjigama i zapamćeno u usmenoj predaji oko naziva ove sorte treba uzeti s rezervom. U recentnim istraživanjima uz pomoć identifikacije DNA markerima otkriveni su brojni novi i neočekivani sinonimi koji su srušili mit autohtonosti za mnoge jedinstvene lokalne (autohtone) sorte (Pejić i Maletić, 2010.). S druge strane, detaljna istraživanja sortimenta u starim nasadima pokazuju da je još uvijek moguće pronaći trsove jedinstvenih genetičkih profila bez imena i poznatog ampelografskog opisa (Žulj Mihaljević i sur., 2012.). To ostavlja prostor i potrebu za buduća istraživanja kako bismo upotpunili znanja o našim

is found most often in two neighbouring Hungarian counties (Tolna and Baranya).

In the ampelography, many varieties of grapevine are known to carry the name or surname of people (Babić, Manzoni, Bouschet, Pirovano, etc.). It could freely be speculated that a person by the surname Czeiger from Pokuplje or Moslavina transported somehow cuttings of Škrlet into Hungary, and that the variety was initially tested (experimental growing) in a place listed under the name of that person. It is evident that the page on the exact origin of Škrlet or Czeiger is yet to be written.

A number of different names (synonyms) were used in the past for the variety Škrlet. In the ampelography, this is often the case that old varieties and varieties found in a large growing area or with high commercial value. According to the available data, Škrlet was never a variety with either a wide growing area or high commercial value, it can be logically assumed that this is a very old variety that was preserved thanks to its sustainability and quality, and that it was grown over many generations over a wide enough area, meaning that it was given a number of different local names. In this context, one should remember the ancient Romans, who also conquered and inhabited the areas of Pokuplje and Moslavina. Many believe that Moslavina owes its name to the Roman name *Mons Claudius*. If that is the case, then Škrlet could also be a part of that legacy.

From the above examples, it is evident that all that is written in the old books and remembered in the oral tradition concerning the names of these varieties need to be taken with some reserve. Recent research using DNA identification has revealed numerous new and unexpected synonyms that broke the myth of the indigenous status of many unique local

starim lokalnim sortama vinove loze. Ta istraživanja primarno podrazumijevaju primjenu klasičnih ampelografskih i metoda molekularno-gentičke identifikacije, ali morala bi uključivati i stručno provedena istraživanja povijesnih dokumenata. Pored toga, otkrivenu i proučenu *germplazmu* starih sorti treba i brižno čuvati u genskim bankama vinove loze jer ovaj materijal može biti potencijalno vrijedan u budućnosti koju ubrzano oblikuju klimatske promjene.

2.3. POVIJEST UZGOJA ŠKRLETA

U 15. i 16. stoljeću na području Moslavine događaju se stalni prodori Osmanlija zbog čega se stanovništvo masovno iseljavalo. Velik broj gradišćanskih Hrvata potječe upravo s tih prostora. Odlaskom Osmanlija Moslavina ostaje gotovo prazna i krajem 17. stoljeća počinje ponovno naseljavanje. Najprije je naseljavaju žitelji Posavlja i Polonja. Posavci iz Donje Posavine koji prelaze Lonjsko polje zauzimaju zemlju i naseljavaju njegove sjeverne rubove podno Moslavačke gore. To je i danas vidljivo po govoru, običajima i narodnim nošnjama u selima uz Lonjsko polje (Kutinsko Selo, Repušnica, Donja Gračenica, Krivaj...), a koji su isti kao u selima Posavine. Obronke Moslavačke gore naseljavali su i Prigorci i Zagorci, kasnije su još došli stanovnici iz Like, Gorskog kotara i Primorja, a također i Talijani iz pokrajine Beluno.

Tijekom 19. stoljeća, posebno u drugoj polovici, pod vlašću Austro-Ugarskog Carstva postupno se razvijaju vinogradarstvo i vinarstvo, a vino kao roba ima veliku gospodarsku važnost. Razvija se komunalna infrastruktura i školstvo te se pojavljuju stručne knjige i časopisi koji prate vinogradarstvo i vinarstvo. Značajan doprinos u edukaciji i razvoju daje poznati ilirac,

(indigenous) varieties (Pejić and Maletić, 2010). On the other hand, detailed research of the varieties in old plantations shows that it is still possible to find vines with a unique genetic profile that have no name or known ampelographic description (Žulj Mihaljević et al., 2012). This leaves space and a need for future research, so as to fill the gaps in our knowledge about our old, local varieties of grapevine. This research above all implies the application of classical ampelographic methods and molecular methods and gene identification, and must also include an expert review of the historical documents. Further, the discovered and examined germplasm of the old varieties should be carefully protected in grapevine gene banks, as this material could be potentially valuable in the future, which is being rapidly shaped by climate change.

2.3. THE HISTORY OF GROWING ŠKRLET

In the 15th and 16th centuries, the Moslavina area was the site of constant conquests by the Ottoman forces, causing massive emigrations of the population. A large number of the Burgenland Croats[1] originate from this area. Following the retreat of the Ottomans, the Moslavina area was nearly completely devoid of people, with resettlement only beginning again in the late 17th century. The first settlers came from the Posavina and Polonja areas[2]. Those arriving from Donja Posavina, by crossing the Lonjsko Polje wetland, settled the lands along the northern edges of that area, under the Moslavačka Gora hills. Even today, this is evident in the dialect spoken, and the customs and folk costumes in the villages along the Lonjsko Polje field (Kutinsko Selo, Repušnica, Donja Gračenica,

1 A large number of the Burgenland Croats, the Croatian ethnic minority in eastern Austria and neighbouring Hungary and Slovakia, originate from this area.
2 areas surrounding the Sava and Lonja Rivers

sudac i zastupnik moslavačkoga kotara Ljudevit Vukotinović (1813. – 1893.), zaljubljenik u vinogradarstvo i autor brojnih stručnih članaka objavljenih u *Gospodarskom listu*. Kako navodi Bedić (1973.) jezgru moslavačkog tradicionalnog vinogradarstva sredinom 19. stoljeća čine posjedi na prostoru Ludine i Popovače gdje je veći dio najboljih vinogradarskih položaja imao grof Georg Erdődy. Strukturu vinogorja čine vlastelinski i seljački vinogradi. Grof Erdődy šalje svoja vina na ocjenjivanje i izložbe u Beču. Krajem 19. stoljeća dolazi do značajnih političkih promjena, agrarne krize i pojave filoksere, što dovodi do velikog pada proizvodnje vina i promjena u strukturi vlasništva. Vlastelini (najčešće mađarskog podrijetla) sve češće prodaju svoje vinograde seljacima, a oni se na prostoru Moslavine počinju udruživati u zadruge.

Geograf i povjesničar Marko Bedić detaljno opisuje i dokumentira stanje vinogradarstva i vinarstva na području Moslavine u 19. i prvoj polovici 20. stoljeća u monografiji izdanoj u povodu 60. godišnjice „Hrvatske vinarske zadruge moslavačkih vinogradara" u Voloderu (1973.), a posebno iscrpno u svojem diplomskom radu (1971.). Iz ovih izvora saznajemo da je u drugoj polovici 19. stoljeća na prostoru Moslavine više od 2.000 ha vinograda, vinogradari su udruženi u vrlo uspješne zadruge, a moslavačka vina imaju dobru reputaciju i sudjeluju na ocjenjivanjima u Beču i Zagrebu. U monografiji se detaljno elaborira razvoj vinogradarsko-vinarskog sektora od osnutka vinarske zadruge 1913. godine uz mnogo podataka o količinama, kvaliteti i cijeni proizvedenih vina, ali se nažalost struktura sortimenta navodi tek za 1973. godinu, pri čemu se spominje i Škrlet (Ovnek). Primjećuje se da su vinogradi sve vrijeme miješani, tj. sadržavali su veći broj različitih sorti, a vrlo su rijetko bili monosortni. Kako se uz autora monografije

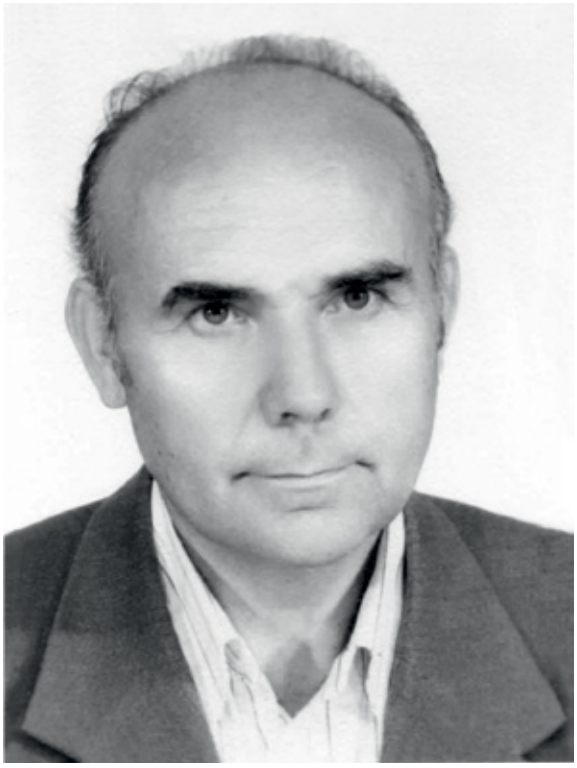
Krivaj...), which are the same as those in the Posavina villages. The slopes of the Moslavačka Gora hills were settled by the people of Prigorje and Zagorje, and later new settlers arrived from Lika, Gorski Kotar and Primorje, and also Italians from the Belluno Province.

During the 19th century, particularly in the latter half when this area was under Austro-Hungarian rule, viticulture and wine-making began to develop, and wine became a commodity of great commercial importance. Municipal infrastructure and public schooling were developed, with expert books and journals on the topic of viticulture and enology becoming available. A significant contribution to education and development was made by the well-known Illyrian, judge and member of the district assembly of Moslavina Kotar, Ljudevit Vukotinović (1813–1893). He was passionate about viticulture and he authored several expert articles that were published in the *Gospodarski list* [Commercial Paper]. As stated by Bedić (1973), the core of Moslavina's traditional viticulture in the mid-19th century was based on estates around Ludina and Popovača, where Count George Erdődy held the majority of the best wine-growing position. The structure of the wine-growing hills was made up of landowner and peasant vineyards. Count Erdődy sent his wines for appraisal and exhibition to Vienna. In the late 19th century, significant political changes arose, with the onset of the agrarian crisis and the appearance of the vine disease phylloxera, which caused severe declines in wine production and a change in the ownership structure. The landowners (most of Hungarian origin) began to sell more of their vineyards to the peasants, who then began to join forces in cooperatives established in the Moslavina area.

Marka Bedića kao stručni suradnik navodi i diplomirani inženjer Ljudevit Miklaužić (agronom), najvjerojatnije je on autor dijela teksta o sortimentu. Škrlet se opisuje kao sorta u usponu koja se mnogo sadi jer natprosječno rodi i daje vina ugodne arome. Nadalje autor navodi da je otporan na trulež i da je „po izgledu loze, lista i grozda vrlo sličan staroj domaćoj sorti Plavcu žutom". A onda se navodi jedna dosta neobična konstatacija: „Škrlet je u Moslavini novija sorta, koja se nalazi u svim vinogradima mlađim od 50 godina, a u starijim je nasadima nema. Ampelografski i enološki nije obrađen. U budućem sortimentu pripada mu, kao masovnoj sorti, jedno od prvih mjesta". Zaključno, u monografiji se, u tekstu o sortimentu, kao tržišno najperspektivnije sorte predlažu za buduću sadnju Graševina, Škrlet, Burgundac (Pinot) bijeli i Frankovka crna.

Agronom Ljudevit Miklaužić (1926. – 1991.) od kraja 1940-ih godina radi u Institutu za voćarstvo i vinogradarstvo iz Zagreba kao asistent ampelografa i šefa vinogradarskog odsjeka Zdenka Turkovića. Od 1950. ovaj institut prikuplja građu za vinogradarsku inventarizaciju sortimenta sjeverne Hrvatske. Početkom 1950-ih Miklaužić obilazi sve vinogradarske regije sjeverne Hrvatske i utvrđuje sortiment i njegovu strukturu u vinogradima tog vremena i o tome sastavlja službena izvješća. Iz ovih izvješća, koji su osobna arhiva gospodina Marka Miklaužića, moguće je steći prilično preciznu sliku o zastupljenosti Škrleta u vinogradima sjeverne Hrvatske sredinom 20. stoljeća, njegovim sinonimima i percepciji kvalitete. Prema ovoj inventuri, Škrlet bijeli je kao i danas najzastupljeniji u Moslavini, ali je značajno prisutan i u okolici Petrinje i Vukomeričkim goricama, gdje ga se svrstava u glavne sorte tog područja. U vinogradima Moslavine i Pokuplja sredinom 20. stoljeća

Geographer and historian Marko Bedić gave a detailed and documented overview of the state of viticulture and wine-making in the Moslavina region in the late 19th century and first half of the 20th century, in his monograph issued to celebrate the 60th anniversary of the "Croatian Wine Cooperatives of Moslavina Wine-growers" in Voloder (1973), and gave a particularly detailed account in his graduate thesis (1971). From these sources, we learn that in the second half of the 19th century, there were more than 2000 hectares of vineyards in Moslavina, the wine-growers were associated in highly successful cooperatives, and the Moslavina wines had a good reputation and participated in appraisals in Vienna and Zagreb. The monograph gives a detailed account of the development of the viticulture and wine-making sector, from the establishment of the Wine-makers Cooperative in 1913, giving great detail as to the quantities, quality and price of wines produced. However, the first mention of the structure of varieties produced was not given for years until 1973, when Škrlet (Ovnek) is mentioned. During this entire period, it is evident that the vineyards contained different varieties of grapevine, and the wine was produced from these multiple varieties of grape; very rarely were varietal wines produced. Marko Bedić lists agricultural engineer Ljudevit Miklaužić as an expert associate involve in the drafting of the monograph, and it is likely that Miklaužić wrote the section on varieties. Škrlet is described as a variety of rising importance, often planted due to its high yield and since the wine it gives is pleasantly aromatic. Further, the author states that it is tolerant to rot and that "by the appearance of the vine, leaf and grape, it is very similar to the old, indigenous variety Plavec žuti". This is followed by an unusual statement, "Škrlet is a



Ljudevit (Lujo) Miklaužić, dipl. ing. agr. (1926. – 1991.), poznavatelj i zagovornik uzgoja Škrleta u monosortnim nasadima.
Ljudevit (Lujo) Miklaužić, B.Sc. ing. agr. (1926-1991), connoisseur and advocate of Škrlet cultivation in monovarietal plantations

dominiraju bijele sorte (80 – 90 %), a Škrlet je zastupljen 10 – 45 %, ali ne u monosortnim nasadima, već dominantno u mješovitim nasadima u kojima se još pojavljuju razne Beline, Dišeća ranina, Graševina, Kraljevina, Rajnski rizling, Plemenka i dr. Miklaužić ističe da ga se u području Petrinje i Pokuplja (južno od Save i Kupe) primarno naziva Ovnek žuti, dok se na području Vukomeričkih gorica i Moslavine dominantno koristi naziv Škrlet. Iz razgovora s vinogradarima tog područja Miklaužić izvodi jasan zaključak da je Škrlet zbog dobre rodnosti i relativno dobre otpornosti na bolesti vrlo perspektivna sorta koju treba širiti u novim vinogradima. Sažetak ovog istraživanja moguće je pročitati u publikaciji *Ampelografski problemi*

newer variety in Moslavina, which is found in all vineyards less than 50 years old, while it is absent in older vineyards. It has not been studied in the ampelographic or enological sense. In the future, as a massively planted variety, it will deserve one of the top spots in future wines". In conclusion, the section on varieties in the monograph proposes the planting of Graševina, Škrlet, Burgundac (Pinot) bijeli (white) and Frankovka crna (red) as the most promising commercial varieties.

Agronomist Ljudevit Miklaužić (1926–1991) started his career in 1941 at the Institute of Pomology and Viticulture in Zagreb as an assistant ampelographer and head of the viticulture department under Zdenko Turković. This institute started in 1950 to collect materials for a viticulture inventory of the varieties of northern Croatia. In the early 1950s, Miklaužić visited all the wine-growing regions of northern Croatia and determined the varieties and their structure in the vineyards of that time, and compiled official reports on his findings. From these reports, which are the personal archive of Mr. Marko Miklaužić, one obtains quite a precise overview of the representation of Škrlet in the vineyards of northern Croatia in the mid-20th century, its synonyms and perceptions of quality. According to this inventory, Škrlet bijeli was then, as it is now, most common in Moslavina, but it was also present in significant measure in the areas around Petrinja and the Vukomeričke Gorice hills, where it comprised the main variety. In the vineyards of Moslavina and Pokuplje in the mid-20th century, white varieties were predominant (80–90%), with Škrlet accounting for 10–45% of all vines, though not in varietal plantations, but mostly in mixed plantations together with different varieties: Beline, Dišeća ranina, Graševina, Kraljevina, Rajnski Rizling,

sjeverne Hrvatske (Turković i Miklaužić, 1953.) u kojemu se navodi istovjetnost Škrleta i Ovneka žutog te se on utvrđuje kao deveta najrasprostranjenija sorta zapadne Hrvatske prisutna u pet vinogorja.

Osim u Moslavini i Pokuplju, Miklaužić pronalazi Škrlet i u miješanim vinogradima u Plešivici i okolici Zagreba, ali isto tako je evidentiran i u jednom vinogradu kod Nove Gradiške, gdje odlično uspijeva na vinarskim izložbama, ali u pojedinim godinama u vinogradu pokazuje svoju dobro poznatu manu, jako osipanje (oprhnuće) cvjetova i bobica. Još zanimljivije, Miklaužić je otkrio prisutnost Škrleta i u vinogradima Podravine, gdje dobre rezultate daje u ilovastom tlu (Hlebine), ali ne na pjeskovitim tlima tipičnim za Podravinu. Lokalni vinogradari ističu da Škrlet ovdje nije domaća sorta, nego je odnekud donesen.

2.4. POČECI RASTA UGLEDA VINA ŠKRLETA

Razvojem industrije u Moslavini, posebno Naftaplina i Petrokemije, taj do tada siromašni kraj doživljava procvat. Standard stanovništva naglo raste, više se ne ide nadničariti u vinograde i u Posavinu. I ruralno stanovništvo Posavine postaje sve starije jer mladi mahom odlaze u Sisak koji se industrijski snažno razvija i više nema tko raditi posavske vinograde, tako da se oni masovno prodaju, a vinogradarstvo kao djelatnost je u velikom padu.

Na temelju nama dostupne literature i pisanih dokumenata uzgoj Škrleta u monosortnim nasadima i proizvodnja vina isključivo od grožđa Škrleta povezuje se tek s podizanjem plantažnih nasada u Ruškovici pokraj Volodera početkom 1970-ih godina. Svi raniji povijesni dokumenti

Plemenka and others. Miklaužić stressed that in the area of Petrinja and Pokuplje (south of the Sava and Kupa Rivers), this variety was mostly called Ovnek žuti, while in the areas of Vukomeričke Gorice and Moslavina, the name Škrlet was mostly used. From discussions with viticulturalists of that area, Miklaužić gave the clear conclusion that Škrlet was a variety with great prospects, due above all to its high yields and good tolerance to disease, and that it should be planted in new vineyards. The summary of that research can be read in the publication *Ampelografski problemi sjeverne Hrvatske* [Ampelography Issues in Northern Croatia] (Turković and Miklaužić, 1953) which states that Škrlet and Ovnek žuti are one and the same, and that it was found to be the ninth most widely distributed variety in Western Croatia, present in five wine-growing regions.

In addition to Moslavina and Pokuplje, Miklaužić also found Škrlet in the mixed vineyards in Plešivica and the surroundings of Zagreb, and it was also noted as present in one vineyard near Nova Gradiška, where it achieved great success at wine exhibits. However, in certain years, the variety showed its well-known flaw in the vineyard, the flower and fruit abscission. Even more interesting, Miklaužić revealed the presence of Škrlet in the vineyards of Podravina (Drava River region), where it had good results in the loamy soil (such as at Hlebine), but not in the sandy soils typical for the Podravina area. Local viticulturalists stressed that Škrlet was not an indigenous variety here, but had been brought from elsewhere.

ukazuju na uzgoj i preradu Škrleta u smjesi s drugim bijelim sortama. Međutim, poznato je da su mnoge stare i svjetski poznate sorte svoje ime (prepoznatljivost i reputaciju) izgradile upravo na monosortnim vinima. Ostaje nepoznato je li Škrlet kroz svoju nesporno dugu povijest opstao kao sorta „dobra u vinogradu" (rodnost i relativna otpornost na bolesti) ili je nekad u prošlosti reputaciju i ime stekao po svojim vinima iz monosortnih nasada. Ovu enigmu ostavljamo kao izazov našim povjesničarima.

Povod za nagli prelazak sa sadnje mješovitih vinograda na podizanje monosortnih (čistih) nasada Škrleta od sredine prošlog stoljeća vjerojatno se može objasniti povećanim uplivom vinogradarsko-vinarske struke prilikom planiranja i podizanja suvremenih nasada, prije svega dostupnošću gotovog sadnog materijala (cjepova). Zbog inventarizacije starih vinograda i procjene kvalitete pojedinih sorti u njima, a koje sredinom 20. stoljeća provode Turković i Miklaužić, postupno se uviđaju dobra vinogradarska svojstva Škrleta i provodi se obilježavanje trsova i organizirano sakupljanje pupova za proizvodnju gotovih cjepova Škrleta, a što je pretpostavka za plantažni uzgoj. Osigurana dostupnost grožđa isključivo od Škrleta i stručno provedena vinifikacija konačno su omogućili spoznaju i valorizaciju vina Škrleta.

Nažalost, o akterima i detaljima tranzicije uzgoja iz mješovitih u monosortne nasade Škrleta nema cjelovitih pisanih svjedočanstava, već se rekonstruira iz brojnih različitih dokumenata.

Iz jednog intervjua s inženjerom Ljudevitom Miklaužićem objavljenog u *Moslavačkom listu* saznajemo da je sredinom 1960-ih godina na njegovu zamolbu Đuka Deklman iz Volodera u svojem mješovitom vinogradu obilježio trsove Škrleta s kojih su potom uzeti pupovi za proizvodnju cjepova i s kojima je onda podignut

2.4. ŠKRLET WINES GAIN A REPUTATION

With the development of industry in Moslavina, particularly in the petroleum industry (Naftaplin and Petrokemija), this previously impoverished area experienced a boom. The standard of living rose quickly, and there was no longer a need to work for day wages in the vineyards and in Posavina. The rural population of Posavina became older as the young massively migrated towards Sisak where industry was developing rapidly, and there was no longer anyone to work in the Posavina vineyards. One by one they were put up for sale, and viticulture as an activity experienced a sharp decline.

According to the available literature and the written documents, growing Škrlet in varietal plantations and producing wine exclusively from Škrlet grapes is associated only with the raising of the plantations in Ruškovica near Voloder at the start of the 1970s. All earlier historical records indicate that Škrlet was grown and made in blends with other white varieties. However, it is well known that many old and renowned global varieties built their name (recognisability and reputation) on varietal wines. It remains unknown whether Škrlet survived through its obviously long history as a variety that was "good in the vineyard" (yield and disease resistance), or whether it gained a reputation and a name in the past for its wines made from vines in varietal plantations. This enigma is something we leave as a question for our historians.

The reason for the sudden shift from planting mixed vineyards to raising pure varietal plantations of Škrlet starting in the mid-20th century can likely be explained by an increased influence of the viticulture and enology profession

prvi eksperimentalni monosortni nasad Moslavačkog vinogorja.

O rođenju prvog monosortnog vina i današnjoj slavi Škrleta postoji tek usmena predaja s karakteristikama anegdote: Moslavačko vinogorje otkupljivalo je grožđe od seljaka vinogradara pa se tu našlo i Škrleta. Podrumar u podrumima Moslavačkog vinogorja Joža Jambrešić godinama je radio taj posao i bio je vrlo poznat i cijenjen. Njemu je jedne godine palo na pamet da u berbi izdvoji Škrlet i sa svojim radnicima je proizveo jednu bačvu vina Škrleta za „sluge dok gazde nema". Ali došao je državni inspektor u kontrolu i s direktorom je obilazio podrum. Pregledavali su bačve i onda je inspektoru za oko zapela jedna bačva koja nije bila na popisu. Joža nije imao kud pa je priznao svojem direktoru Luji (Ljudevitu) Miklaužiću da su se malo poigrali i napravili vino čistog Škrleta. Naravno i inspektor i Lujo željeli su kušati to vino i ostali su ugodno iznenađeni. Možda je upravo to bio početak uspješne priče o Škrletu kao sortnom vinu Moslavačkog vinogorja.

Izgradnjom tvornice dušičnih gnojiva (današnja Petrokemija) 1968. i njezine druge faze 1982. godine na područje Kutine dolazi mnogo novih stanovnika, posebno mladih i visokoobrazovanih ljudi. Petrokemija je u to vrijeme jedna od deset najvećih i najmodernijih tvornica mineralnih gnojiva u svijetu. Svojim je radnicima osigurava stanove, ali kod njih se počela javljati potreba za malo zemlje, vikendicom i vinogradom. Tako mnogi moslavački i posavski vinogradi ponovno mijenjaju svoje vlasnike. U Petrokemiji se zapošljava i mnogo mladih agronoma koji rade na terenu s kupcima, djeluju kao savjetnici te razvijaju nove proizvode. Boravkom i radom u ovakvom okruženju dodatno raste i zanimanje za vinogradarstvo koje se sada ubrzano razvija uz potporu agronomske struke.

in planning and planting contemporary plantations, and above all in the access to propagation material (grafts). Due to the inventory of old vineyards and the assessment of the quality of certain varieties within them, conducted in the mid-20th century by Turković and Miklaužić, the good viticulture properties of Škrlet became gradually evident, with new efforts to mark vines and organise the collection of buds for producing grafts of Škrlet, as the main assumption for plantation-type cultivation. Securing the accessibility to grapes exclusively from Škrlet and the expertly conducted vinification finally enabled better knowledge of and evaluation of Škrlet wine. Unfortunately, there are no comprehensive written testimonies of the people involved, and the details of the transition from cultivation in mixed vineyards to varietal plantations of Škrlet; instead, this can only be reconstructed from numerous different documents.

From an interview with Ljudevit Miklaužić published in *Moslavački list* [Moslavina Daily Paper], we learn that in the mid-1960s, he asked Mr. Đuka Deklman from Voloder to mark the Škrlet vines in his vineyard from which buds were then taken for the production of grafts, later used to raise the first experimental varietal plantation in the Moslavina wine region. Therefore, there are only verbal accounts and anecdotes of the birth of the first pure wine and the present-day fame of Škrlet: the company Moslavačko vinogorje purchased grapes from rural wine-growers, including Škrlet. Joža Jambrešić, a wine-maker in the cellars of the company had been at this job for years and was very respected. One year, he decided to separate the Škrlet grapes during the harvest, and he and his staff produced a single barrel of Škrlet wine for "the help while the master was away". However, the state inspector paid

Ipak, perjanicu moslavačkog vinogradarstva i vinarstva do 1990. godine predstavlja Moslavačko vinogorje proisteklo iz ranije spomenute voloderske Vinogradarsko-vinarske zadruge, koje podiže i prve veće monosortne nasade Škrleta.

Struka u Petrokemiji posebno se zainteresirala upravo za Škrlet, sortu koja daje jedinstveno vino dobre kvalitete. Vino je dobro, ali urodi Škrleta nisu redoviti zbog njegove dobro poznate mane, a to je osipanje (oprhnuće) cvjetova u cvatnji. Zbog toga je Škrlet ili Ovnek stekao još jedno ime – Puzlek. Često osipanje cvjetova ili tek zametnutih bobica mogući je razlog zašto nije bilo monosortnih nasada Škrleta, već je on redovito bio zastupljen u miješanim nasadima s ostalim sortama. Problem oprhnuća cvjetova

Prof. dr. sc. Nikola Mirošević, prvi je ampelografski istražio i opisao Škrlet te položio stručne temelje njegova suvremenog uzgoja.
Professor Nikola Mirošević was the first to ampelographically research and describe Škrlet and lay the professional foundations of its modern cultivation.

an official visit and toured the cellar with the director. They were inspecting the barrels when the inspector saw one barrel that was not on the list. Jože had no other option by to admit to his director Lujo (Ljudevit) Miklaužić that they had been playing around a bit and made a wine of pure Škrlet. Of course, both Lujo and the inspector wanted to try the wine, and were pleasantly surprised. Perhaps this is in fact the real start to the successful story of Škrlet as a varietal wine of the Moslavina wine region.

Following the construction of the nitrogen fertiliser plant (today's Petrokemija) in 1968 and its second phase in 1982, a large number of new people migrated to live and work in the Kutina area, particularly young, educated people. At that time, Petrokemija was one of the ten largest and most modern mineral fertiliser factories in the world. The company secured housing for its workers, and among then, the need for a little land, a weekend cottage and a vineyard started to appear. And just like that, many of the Moslavina and Posavina vineyards again changed owners. Many young agricultural engineers found work at Petrokemija, and travelled to meet with customers, to act as advisors, and to develop new products. Living and working in this environment only further increased interest in viticulture, which started to rapidly develop with the support of the agriculture profession.

However, until 1990, the gem of Moslavina viticulture and wine-making was the company, that evolved from the Voloder Wine Cooperative, which raised the first large pure plantation of Škrlet.

The experts at Petrokemija took a special interest in Škrlet, as a variety that gives a unique wine of good quality. The wine is good, but the yields of Škrlet were not reliable due to its well known flaw – the abscission of flowers during

pokušavao se riješiti pinciranjem pred cvatnju, ali to je bila vrlo zahtjevna i ne previše uspješna intervencija.

Krajem osamdesetih, točnije 1989., stručnjaci Petrokemije iz Službe primjene gnojiva predvođeni doktorom Arturom Vajbergerom i inženjerom Ivanom Gašparom sa suradnicima, a na temelju rezultata istraživanja primjene borne kiseline pred cvatnju na oplodnju Škrleta (Mirošević, 1986.), razvili su nekoliko vrsta tekućih gnojiva s mikroelementima, a za Škrlet je najvažnije bilo ono obogaćeno borom – Fertina B. Primjenom ovog folijarnoga gnojiva konačno je riješen problem osipanja cvjetova i postignuta stabilnost uroda Škrleta. Danas je u njegovu uzgoju to redovita tehnološka mjera. To je zasigurno dovelo do povećanog zanimanja za podizanje novih vinograda ove sorte.

Drugi važan problem koji je sprečavao revitalizaciju i raniju pojavu Škrleta kao monosortnog nasada bio je i nedostatak sadnica (cjepova). Početna proizvodnja cjepova Škrleta, kao i drugih sorti, odvijala se u Drenovi u Srbiji s pupovima podrijetlom iz Moslavačkog vinogorja, a domaće lozno rasadničarstvo počinje se razvijati tek sredinom 1990-ih.

Pored Moslavačkog vinogorja čije je vino Škrleta 1989. godine ekskluzivno vino hotela Esplanade u Zagrebu, velike zasluge za revitalizaciju i promociju Škrleta ima i Udruga vinogradara i voćara „Lujo Miklaužić". Ova udruga osnovana 1981. godine okuplja brojno članstvo i vode je ugledni stručnjaci, najvećim dijelom zaposlenici Petrokemije. Osim ranije spomenutog doprinosa Petrokemije koja je svojim gnojivima unaprijedila proizvodnju Škrleta, ova tvrtka i njezini stručnjaci uvelike su pomagali rad Udruge i njezinih aktivnosti. Upravo su agronomi Petrokemije razvili posebnu suradnju s Agronomskim fakultetom iz Zagreba i angažirali

blooming. For that reason, Škrlet or Ovnek acquired yet another name – Puzlek. The frequent abscission of flowers or just formed berries is a possible reason why there were no varietal plantations of Škrlet, and instead it was commonly found in mixed plantations with other varieties. Some tried to resolve this issue by pinching back before flowering, though this proved to be a highly demanding and not very successful attempt.

In 1989, the Petrokemija experts from the Applied Fertilised Service, led by Dr. Artur Vajberger and engineer Ivan Gašpar and their associates, and based on the results of research on the application of boric acid before flowering to the fruit set of Škrlet (Mirošević, 1986), developed several different types of liquid fertiliser containing microelements. For Škrlet, the most important was the formula containing boron – Fertina B. With the application of this foliar fertiliser, the issue of flower and fruit abscission was finally resolved, and stability in the yield of Škrlet was achieved. Today, this is a regular technological measure in growing this grape. This certain led to an increased interest in raising new vineyards with this variety.

Another important problem that prevented the revitalisation and earlier appearance of Škrlet as a varietal plantation was the lack of appropriate propagation material (grafts). The start of production of Škrlet grafts, and those of other varieties, arose in Drenova in Serbia, with buds originating from the Moslavina wine-growing region, while production of grapevine propagation materials in Croatia began to develop in the mid-1990s.

Škrlet wine produced by the company Moslavačko vinogorje was the exclusive house wine of the Hotel Esplanade in Zagreb in 1989. Much of the credit for the revitalisation and promotion

Članovi Udruge vinogradara i voćara Lujo Miklaužić iz Kutine i profesorica Dubravka Premužić u prigodi ocjenjivanja vina za izložbu. Objektivna i stručno vođena ocjenjivanja značajno su pridonijela podizanju kvalitete vina Škrleta.

Members of the Association of Winegrowers and Fruit Growers Lujo Miklaužić from Kutina and Professor Dubravka Premužić on the occasion of evaluation of wines for the exhibition. Objective and expertly guided evaluations have significantly contributed to raising the quality of Škrlet wine.

vrhunske stručnjake na unapređenju kvalitete grožđa i vina Škrleta. Na inicijativu iz Petrokemije prve edukacije i visokoprofesionalna ocjenjivanja vina Škrleta vodi ugledna profesorica Dubravka Premužić u prostorima Petrokemije i time daje nemjerljiv doprinos podizanju kvalitete vina moslavačkih vinara. Ta je tvrtka zaslužna i za uspješne izložbe vina koje je uvijek znatno financijski pomagala.

O vinu Škrleta kružile su mnoge priče, a ponajprije ona kako je to jednogodišnje vino koje je dobro samo kada se pije mlado. Činjenica je da ga je u počecima uvijek bilo malo, a kako je zaista dobro kao mlado i svježe, u pravilu bi se popilo do ljeta, pa i nije bilo prilike i potrebe za eksperimente s odležavanjem. Iz današnjeg

of Škrlet goes to the Lujo Miklaužić Association of Viticulturalists and Fruit-growers. This association was established in 1981 and brought together a larger membership, guided by prominent experts, most of whom were employees of Petrokemija. In addition to the stated contribution of Petrokemija, whose fertilisers were used to improve the production of Škrlet, this company and its experts largely supported the work of the association and its activities. The experts at Petrokemija established cooperation with the Faculty of Agriculture, University of Zagreb, and brought in prominent experts to improve the quality of Škrlet grapes and wine. At the initiative of Petrokemija, the first education sessions and professional assessments of Škrlet

iskustva znamo da je vino Škrleta odlično i kao odležano, što je zorno pokazala i nedavna degustacija odležanih Škrleta održana u sklopu programa festivala i izložbe vina MoslaVina 2020. na kojoj su kušana izvrsna vina, neka starija i od 20 godina. Danas ima više mladih proizvođača Škrleta koji svakim danom pokusima s različitim kvascima, različitim uvjetima fermentacije i drugim tehnologijama proizvode niz vina od Škrleta, od mladih i svježih preko pjenušaca pa sve do kompleksnih odležanih vina. Sve je više novih spoznaja koje otvaraju potpuno nove mogućnosti u proizvodnji Škrleta, o čemu će biti više riječi u idućim poglavljima.

2.5. DANAŠNJE STANJE VINOGRADARSTVA U HRVATSKOJ I POZICIJA ŠKRLETA

Prema podacima u Vinogradarskom registru APPRRR na dan 31. prosinca 2020. godine u Republici Hrvatskoj zasađeno je 92.628.311 trsova na 17.370,24 ha vinograda. Prosječna gustoća nasada je 5333 trsa po hektaru. Sukladno Pravilniku o zemljopisnim područjima uzgoja vinove loze („Narodne novine", broj 76/19) područje uzgoja vinove loze u Republici Hrvatskoj dijeli se na četiri regije i 12 podregija temeljeno na administrativnim granicama gradova i općina u skladu s posebnim propisom kojim se uređuju područja županija, gradova i općina u Republici Hrvatskoj.

Najviše je vinograda u regiji Slavonija i hrvatsko Podunavlje (5.949,35 ha, 34,25 %) i regiji Dalmacija (5.745,94 ha, 33,08 %). Prema broju zasađenih trsova najviše ih je u regiji Dalmacija (36.649.817 trsova) s prosječnom gustoćom sadnje 6378 trsova po hektaru. Detaljan prikaz površina prikazan je u tablici 2.1.

wine were performed by Professor Dubravka Premužić in the premises of Petrokemija, and this was an exceptional contribution to raising the quality of the wine made by the Moslavina wine-makers. Petrokemija was also responsible for hosting successful wine exhibits, which it always supported financially in significant measure.

Many stories have been told about the Škrlet wine, above all that this is a one-year wine that is best only when consumed young. The fact is that in its early days there was never much of it, and since it really is fine as a young wine, consumed by the summer as a rule, there was never much opportunity and need to experiment with aging. From today's experience, we know that Škrlet wine is also excellent as an aged wine, which was clear from the recent tasting of aged Škrlet held as part of the programme of the MoslaVina 2020 festival and wine exhibit. Many excellent wines were tasted, some even older than 20 years. Today, there are more and more young producers of Škrlet who are conducting numerous experiments with different yeasts, different fermentation conditions, and different technologies to produce a number of wines from Škrlet grapes, from fresh, young wines to sparkling wines, to complex aged wines. This new knowledge is opening the door to completely new possibilities in the production of Škrlet, and more about this will be covered in the following chapters.

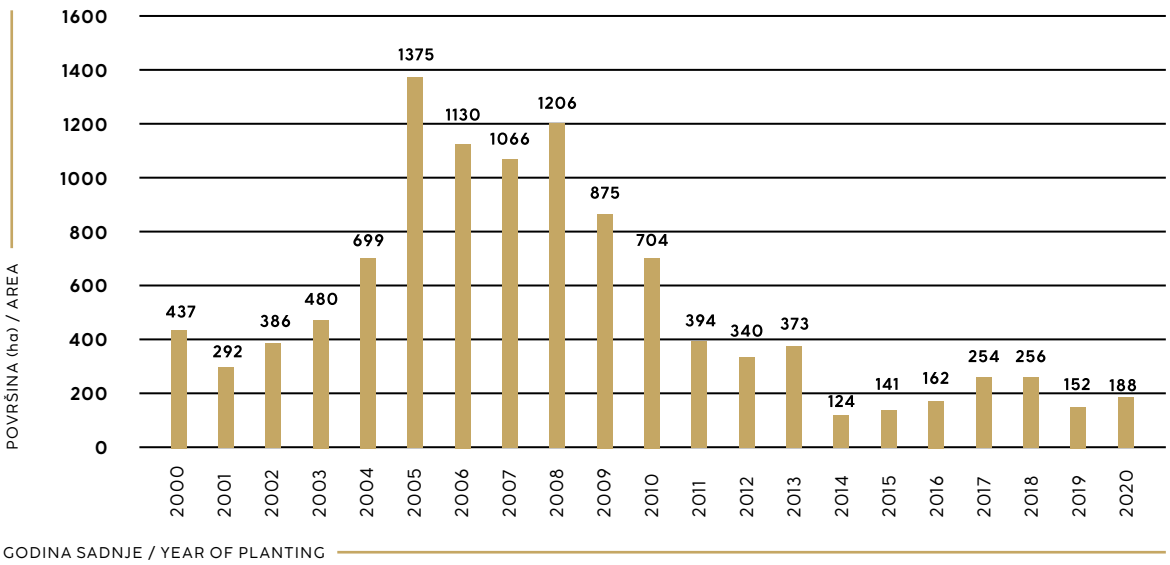
2.5. CURRENT STANDING OF VITICULTURE IN CROATIA AND THE POSITION OF ŠKRLET

According to the data in the Viticulture Register of the Agency for Payments in Agriculture,

TABLICA 2.1. Vinogradarske površine po regijama u Republici Hrvatskoj prema Vinogradarskom registru (APPRRR, 2020.)

TABLE 2.1. *Viticulture areas by region in the Republic of Croatia according to the Viticulture Register (APPRRR, 2020)*

REGIJA REGION	UKUPNO / PODREGIJA TOTAL / SUBREGION	POVRŠINA (ha) AREA (ha)	UDIO (%) SHARE (%)	BROJ TRSOVA (KOM) NUMBER OF VINES (PCS)	UDIO (%) SHARE (%)
	UKUPNO / TOTAL	**5.745,94**	**33,08**	**36.649.817**	**39,57**
DALMACIJA	DALMATINSKA ZAGORA	2.026,63	11,67	10.330.447	11,15
	SJEVERNA DALMACIJA	769,75	4,43	4.733.734	5,11
	SREDNJA I JUŽNA DALMACIJA	2.949,56	16,98	21.585.636	23,30
	UKUPNO / TOTAL	**3.060,27**	**17,62**	**13.704.245**	**14,79**
HRVATSKA ISTRA I KVARNER	HRVATSKA ISTRA	2.844,89	16,38	12.228.832	13,20
	HRVATSKO PRIMORJE	215,38	1,24	1.475.413	1,59
	UKUPNO / TOTAL	**5.949,35**	**34,25**	**26.740.636**	**28,87**
SLAVONIJA I HRVATSKO PODUNAVLJE	HRVATSKO PODUNAVLJE	2.926,18	16,85	12.958.860	13,99
	SLAVONIJA	3.023,17	17,40	13.781.776	14,88
	UKUPNO / TOTAL	**2.594,50**	**14,94**	**7.664.004**	**8,27**
SREDIŠNJA BREGOVITA HRVATSKA	MOSLAVINA	195,37	1,12	1.028.805	1,11
	PLEŠIVICA	393,40	2,26	2.451.127	2,65
	POKUPLJE	43,69	0,25	241.989	0,26
	PRIGORJE - BILOGORA	673,99	3,88	3.942.083	4,26
	ZAGORJE - MEĐIMURJE	1.288,05	7,42	7.754.857	8,37
	SVEUKUPNO / OVERALL	**17.370,24**	**100,00**	**92.628.311**	**100,00**



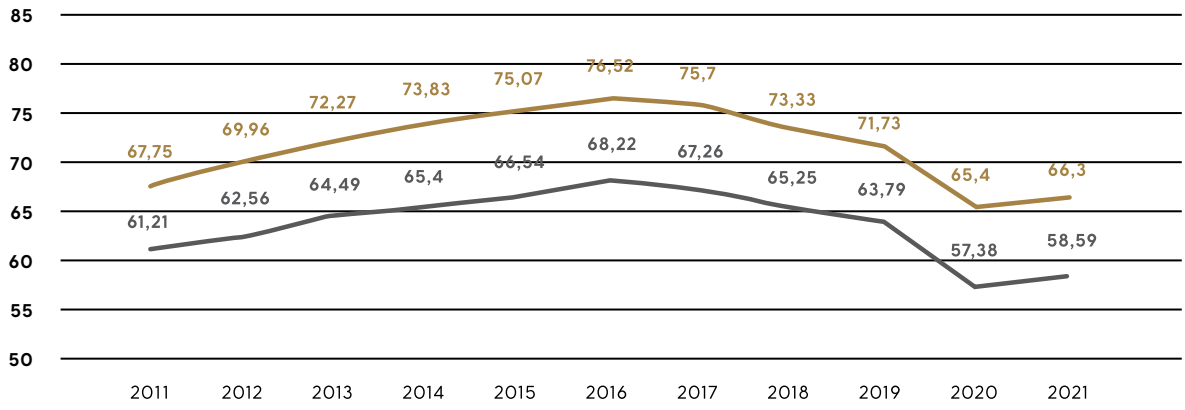
GRAFIKON 2.1. Vinogradarske površine u Hrvatskoj prema godini sadnje

GRAPH 2.1. *Areas in Croatia under vineyards by year of planting*

Najzastupljenija je sorta Graševina (4.524,85 ha), zatim Malvazija istarska (1.625,54 ha) i Plavac mali crni (1.426,62 ha). Najveći broj poljoprivrednih gospodarstava vlasnika vinograda su mali posjednici pri čemu do 0,50 ha ukupne površine vinograda ima 82,73 % poljoprivrednih gospodarstava. Ukupno gledano, 23.797 poljoprivrednih gospodarstava s ukupnom veličinom posjeda do 0,50 ha posjeduje 3.595,21 ha vinograda, odnosno prosječno 0,15 ha ili 1.500 m^2. Istovremeno, njihove površine vinograda čine tek 20,67 % ukupnih površina vinograda. Najveći posjednici vinograda s više od 100 ha (0,05 % proizvođača, n=14) čine čak 21,46 % površina, odnosno posjeduju 3.731,23 ha, prosječno 266,52 ha. Prema strukturi starosti vinograda prevladavaju vinogradi stariji od 25 godina (32,41 %) i vinogradi stari od 11 do 15 godina (28,68 %). Grafičkim prikazom površina vinograda prema godini sadnje u periodu od 2001. do 2020. godine (Grafikon 2.1) vidljiv je trend podizanja vinograda sukladno

Fisheries and Rural Development (APPRRR) as at 31 December 2020, in the Republic of Croatia there are 92,628,311 vines planted in 17,370.24 ha of vineyards. The average planting density was 5333 vines per hectare. Pursuant to the Ordinance on geographical areas of growing grapevine (Official Gazette 76/19), the grapevine growing regions in the Republic of Croatia are divided into four regions and 12 subregions, in line with the administrative borders of towns and municipalities, and in accordance with special regulations that govern the areas of counties, towns and municipalities in the Republic of Croatia.

The most vineyards are found in the region Slavonia and Hrvatsko Podunavlje (5949.35 ha or 34.25%) and the region Dalmatia (5745.94 ha or 33.08%). According to the number of planted vines, the most are found in the region Dalmatia (36,649,817 vines) with an average planting density of 6378 vines per hectare. A detailed overview is given in Table 2.1.



GRAFIKON 2.2. Površine vinograda sorte Škrlet u Republici Hrvatskoj i Sisačko-moslavačkoj županiji u razdoblju 2011. – 2021. godine
GRAPH 2.2. *Surface area of vineyards With the variety Škrlet in Croatia and Sisak-Moslavina County*

POVRŠINE SORTE ŠKRLET U RH (ha)
AREAS UNDER ŠKRLET IN CROATIA
POVRŠINE SORTE ŠKRLET U SMŽ
AREAS UNDER ŠKRLET IN S-M COUNTY

operativnim programima Ministarstva poljoprivrede u sklopu aktivnosti Republike Hrvatske prije stupanja u članstvo Europske unije.

Sorta Škrlet bijeli u Hrvatskoj se uzgaja na manje od 100 hektara. Površine zasađene sortom prikazane su u tablici 2.2. Prema podacima Agencije za plaćanja u poljoprivredi, ribarstvu i ruralnom razvoju (APPRRR) na dan 31. prosinca 2021. godine 333 poljoprivredna gospodarstva bila su vlasnici vinograda sorte Škrlet s ukupnom površinom od 66,38 hektara. Analizom zasađenih površina u razdoblju od 2015. do 2021. godine moguće je utvrditi trend pada koji je vidljiv u grafikonu 2.2.

Sorta se uzgaja u 10 županija: Bjelovarsko-bilogorskoj, Karlovačkoj, Koprivničko-križevačkoj, Krapinsko-zagorskoj, Osječko-baranjskoj, Sisačko-moslavačkoj, Splitsko-dalmatinskoj, Varaždinskoj, Zagrebačkoj županiji i Gradu Zagrebu (Tablica 2.2.).

Najviše zasađenih površina ima u Sisačko-moslavačkoj županiji (58,51 ha) odnosno 88 % svih površina. Navedene površine podijeljene su u 347 parcela koje posjeduje 248

The most common variety is Graševina (4524.85 ha), followed by Malvazija istarska (1625.54 ha) and Plavac mali crni (1426.62 ha). The vast majority of agricultural holdings owning vineyards are small landowners, with 82.73% of all holdings owning up to 0.5 ha of total vineyard area. In total, 23,797 holdings with a total estate size of up to 0.50 ha own 3595.21 ha of vineyards, with an average of 0.15 ha or 1500 m^2 per holding. Meanwhile, their total surface of vineyards accounts for just 20.67% of all vineyards planted. The largest vineyard owners, having more than 100 ha (0.05% of producers, 14 in total) account for 21.46% of vineyard area, and own 3731.23 ha, averaging 266.52 ha per holding. According to the age structure of vineyards, those older than 25 years are most common (32.41%), followed by those from 11 to 15 years old (28.68%). Graph 2. 1 shows the surface area of vineyards based on year of planting in the period from 2001 to 2020. A trend of raising vineyards is evident, pursuant to the operational programmes of the Ministry of Agriculture as part of the activities

TABLICA 2.2. Vinogradi sorte Škrlet po županijama (izvor: APPRRR, 31. 12. 2021.)

TABLE 2.2. *Vineyards of the variety Škrlet by county (source: APPRRR, as of 31 December 2021)*

ŽUPANIJA COUNTY	POVRŠINA (ha) AREA (ha)	BROJ PARCELA NUMBER OF VINEYARDS	BROJ TRSOVA NUMBER OF VINES	BROJ PROIZVOĐAČA* NUMBER OF PRODUCERS*
BJELOVARSKO-BILOGORSKA	2,30	22	10.440	19
GRAD ZAGREB	0,18	3	1.223	3
KARLOVAČKA	0,12	2	360	1
KOPRIVNIČKO-KRIŽEVAČKA	0,42	9	2.180	8
KRAPINSKO-ZAGORSKA	0,17	3	800	3
OSJEČKO-BARANJSKA	0,11	1	500	1
SISAČKO-MOSLAVAČKA	58,59	348	317.468	250
SPLITSKO-DALMATINSKA	0,12	1	400	1
VARAŽDINSKA	0,01	1	80	1
ZAGREBAČKA	4,36	49	29.110	49
UKUPNO / TOTAL	66,3	444	361.761	334*

* Prikazani su proizvođači koji posjeduju vinograde u jednoj županiji. Jedan proizvođač može posjedovati vinograde u nekoliko županije te je u tome slučaju naveden više puta u tablici. Ukupan broj proizvođača prikazuje broj jedinstvenih vlasnika vinograda Škrleta u Republici Hrvatskoj.

* *Producers who own vineyards in one county are shown. One producer can own vineyards in several counties and in that case it is listed several times in the table. The total number of producers shows the number of unique owners of Škrlet vineyards in the Republic of Croatia.*

poljoprivrednih gospodarstava. Prosječna veličina parcele je 0,17 ha i jedno gospodarstvo prosječno posjeduje 0,24 ha sorte Škrlet zasađene na 1,4 parcele. Na području Zagrebačke županije zasađeno je 4,36 ha, i to na području Ivanićgradsko-voloderskog vinogorja koje administrativno pripada u Zagrebačku županiju, ali geografski u Moslavinu. U Bjelovarsko-bilogorskoj županiji zasađeno je 2,3 ha na 22 parcele.

of the Republic of Croatia prior to accession to European Union membership.

The variety Škrlet bijeli is grown on less than 100 hectares in Croatia. The areas under this variety are shown in Table 2.2. According to the data of the Agency for Payments in Agriculture, Fisheries and Rural Development (APPRRR) as at 31 December 2021, a total of 333 agricultural holdings were owners of vineyards of the

U ostalim županijama površine Škrleta su vrlo male i riječ je o individualnim proizvođačima i ponekim neočekivanim vinogradima. Na području grada Sinja u Splitsko-dalmatinskoj županiji nalazi se najjužniji vinograd od 400 trsova Škrleta.

Iz svih prikazanih podataka vidljivo je da se sorta Škrlet uzgaja na vrlo maloj ukupnoj površini i pretežno na malim posjedima, dominantno na području Moslavine. Primjetan je trend smanjivanja ukupnih površina, unatoč velikoj potražnji vina Škrleta. Ostaje za razmišljanje hoće li rastuća potražnja za vinima Škrleta

variety Škrlet with a total surface area of 66.38 hectares. An analysis of the planted areas in the periods from 2015 to 2021 shows a declining trend, as seen in Graph 2.2.

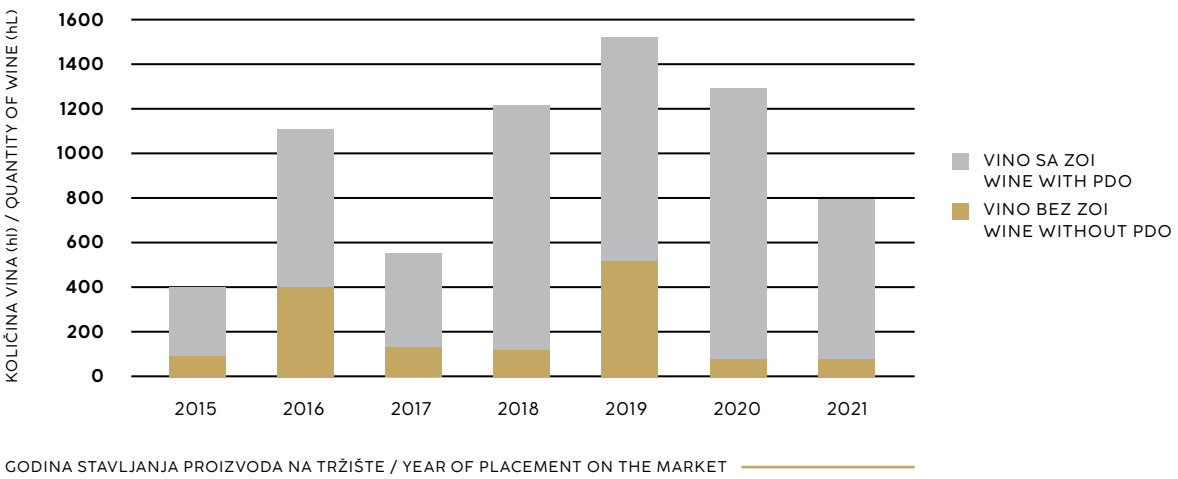
The variety is grown in ten counties: Bjelovar-Bilogora, Karlovac, Koprivnica-Križevci, Krapina-Zagorje, Osijek-Baranja, Sisak-Moslavina, Split-Dalmatia, Varaždin, Zagreb County and the City of Zagreb (Table 2.2.).

The majority of this planted area is found in Sisak-Moslavina County (58.51 ha), or 88% of all areas. These areas are divided into 347 land plots owned by 248 agricultural holdings.

TABLICA 2.3. Vina hrvatskih proizvođača na tržištu 2020. prema zastupljenosti sorti i s obzirom na kategorizaciju proizvoda (izvor: HAPIH, 2021.)

TABLE 2.3. *Wines of Croatian producers on the market in 2020 according to the representation of varieties and With regard to product categorization (source: HAPIH, 2021)*

SORTA VARIETY	VINO BEZ ZOI (hl) WINE WITHOUT PDO (hl)	VINO SA ZOI (hl) WINE WITH PDO (hl)	UKUPNO (hl) TOTAL (hl)
GRAŠEVINA	25.908,7	160.632,1	186.540,7
MALVAZIJA ISTARSKA	6.512,4	30.141,2	36.653,6
PLAVAC MALI CRNI	5.373,3	19.893,2	25.266,6
ŽLAHTINA	5.238,0	5.043,7	10.281,7
MERLOT	585,6	9.277,8	9.863,5
POŠIP	1.275,0	8.554,3	9.829,3
CABERNET SAUVIGNON	855,7	9.410,9	9.410,9
CHARDONNAY	1.007,2	7.232,6	8.239,9
RAJNSKI RIZLING	421,7	4.006,8	4.428,4
ŠKRLET	77,9	1.220,2	1.298,1
OSTALI	83.426,5	104.634,1	188.916,2
UKUPNO / TOTAL	130.682,0	360.046,9	490.728,9



GRAFIKON 2.3. Količina vina (hl) na tržištu u kojima je sortna zastupljenost minimalno 85% Škrlet po godini stavljanja proizvoda na tržište (izvor: HAPIH, 2021.)

GRAPH 2.3. *Quantity of Wine (hL) on the market containing a minimum of 85% Škrlet by year of placement on the market*

dovesti do povećane sadnje ili će za to biti potrebne i poticajne mjere lokalne vlasti i države.

2.6. DANAŠNJA PROIZVODNJA VINA U HRVATSKOJ I ŠKRLET

Da je Hrvatska zemlja iznimnog vinskog potencijala govori činjenica o velikoj sortnoj zastupljenosti na relativno malom arealu. U Tablici 2.3 prikazane su najzastupljenije sorte hrvatskih proizvođača čija su vina stavljena na tržište tijekom 2020. Udio Graševine u hrvatskim vinima na tržištu te godine bio je veći od 38 % (ne uzimajući u obzir pjenušava, gazirana, biser i specijalna vina).

U zadnjih sedam godina na tržište je stavljeno ukupno 6.893 hl proizvoda čiji udio sortimenta čini minimalno 85 % sorta Škrlet te se primjećuje pozitivan trend povećanja količina na tržištu koji je dosegao vrhunac 2019. godine,

The average plot size is 0.17 ha and each holding owns an average of 0.24 ha of the variety Škrlet planted on 1.4 plots. A total of 4.36 ha are planted in Zagreb County, particularly in the Ivanić Grad-Voloder wine-growing region, which administratively falls within Zagreb County, but geographically is a part of Moslavina. A total of 2.3 ha are planted on 22 plots in Bjelovar-Bilogora County. In other counties, the surfaces under Škrlet are very small, and these are mostly individual producers and a few unexpected vineyards. The southernmost vineyard with 400 vines of Škrlet is found near the town of Sinj, in Split-Dalmatia County.

From the above, it is evident that the variety Škrlet is planted on a very small surface and is primarily held on small holdings, mostly in the Moslavina region. A declining trend is evident of the total area, despite the high demand for Škrlet wine. It remains to be seen whether the growing demand for Škrlet wines will lead to

TABLICA 2.4. Količina (hl) vina u kojima je sortna zastupljenost minimalno 85 % Škrlet po godini stavljanja proizvoda na tržište s obzirom na ZOI i tradicionalni izraz (izvor: HAPIH, 2021.)

TABLE 2.4. *Quantity (hL) of Wines containing a minimum of 85% Škrlet by year of placement on the market and by PDO and traditional designation (source: HAPIH, 2021)*

TRADICIONALNI IZRAZ TRADITIONAL DESIGNATION	ZOI PDO	2015.	2016.	2017.	2018.	2019.	2020.	2021.	UKUPNO TOTAL
KVALITETNO VINO KZP QUALITY WINE CGO	MOSLAVINA	257,0	623,6	399,4	1.068,0	956,3	1.188,8	686,9	5.180,0
	POKUPLJE	10,0	9,8	24,1	25,9	46,8	26,8	19,5	162,9
	PRIGORJE-BILOGORA						4,6	7,5	12,1
VRHUNSKO VINO KZP PREMIUM WINE CGO	MOSLAVINA	46,0	84,5		5,0				135,5
UKUPNO / TOTAL		**313,0**	**717,9**	**423,5**	**1.098,9**	**1.003,1**	**1.220,2**	**713,9**	**5.490,5**

prije pandemije koronavirusa (Grafikon 2.3). Iste godine stavljene su na tržište 33 različite etikete Škrleta u količini od 1520 hl, što je iznosilo 0,23 % hrvatskih vina u prometu te godine. Za lakše razumijevanje udjela vina Škrlet na hrvatskom tržištu – on je jednak godišnjem udjelu hrvatskih vina u svjetskoj proizvodnji.

Gotovo 97 % Škrleta označenog zaštićenom oznakom izvornosti (ZOI) proizvodi se u ZOI Moslavina, a od 2020. godine na tržištu možemo naći i Škrlet iz ZOI Prigorje-Bilogora (Tablica 2.4). Prema podacima HAPIH-a od 2015. do 2021. godine na tržište je stavljeno ukupno 111 vina Škrlet s oznakom ZOI Moslavina (5 vrhunskih vina KZP i 106 kvalitenih vina KZP) i 14 vina Škrlet označenih sa ZOI Pokuplje (kvaliteno vino KZP) te 1 vino Škrlet s oznakom ZOI Prigorje-Bilogora (kvaliteno vino KZP). U istom razdoblju proizvedeno je samo 135,5 hl vrhunskog vina Škrlet čija se cjelokupna proizvodnja nalazi na području Moslavine.

increased planting, or whether this will require incentives by the local authorities and the state.

2.6. CURRENT WINE PRODUCTION IN CROATIA AND ŠKRLET

The fact that Croatia is a country of exceptional wine potential is seen in the large number of varieties present in a relatively small area. Table 2.3 shows the most common varieties of Croatian producers whose wines were marketed during 2020. The ratio of Graševina in Croatian wines on the market in that year was higher than 38% (not taking into account sparkling wine, carbonated wine, semi-sparkling wine and special wines).

In the last seven years, a total of 6893 hectolitres of wine containing a minimum of 85% of the variety Škrlet in the ratio of varieties has been placed on the market, and a positive trend

Kvalitetu sorte Škrlet i njezin potencijal svake godine sve više prepoznaju zahtjevniji ljubitelji vina zbog čega je 2021. godine prvi put na tržište stavljeno vrhunsko pjenušavo vino Škrlet, iako u vrlo maloj količini, tek 2,3 hl.

Analize vina Škrlet u postupku stavljanja na tržište

Hrvatska agencija za poljoprivredu i hranu, odnosno njezina ustrojstvena jedinica Centar za vinogradarstvo, vinarstvo i uljarstvo (HAPIH/CVVU) provodi upravni postupak stavljanja vina i drugih proizvoda od grožđa i vina te voćnih vina na tržište. Svi proizvođači vina koji svoj proizvod žele staviti na tržište podnose zahtjev HAPIH/CVVU-u koji nakon provedene administrativne kontrole te fizikalno-kemijskog i organoleptičnog ispitivanja izdaje rješenje za stavljanje proizvoda na tržište. U nastavku se iznose statistički analizirani fizikalno-kemijski i organoleptični rezultati vina Škrleta (n=177) koji su bili u postupku stavljanja na tržište posljednjih sedam godina (2015. – 2021.).

Nakon obrade podataka možemo zaključiti da prosječno vino proizvedeno od sorte Škrlet nosi oznaku ZOI i tradicionalni izraz kvalitetno vino KZP. S obzirom na prosječni sadržaj šećera ono je suho vino koje ima stvarnu alkoholnu jakost 11,9 % vol., ukupnu kiselost 6,2 gL^{-1} te sadrži po litri 27 mg slobodnog i 115 mg ukupnog sumpornog dioksida, a organoleptično je ocijenjeno sa 78 bodova (Tablica 2.5).

S obzirom na kategorizaciju Škrleta (vino bez oznake ZOI, kvalitetno vino KZP i vrhunsko vino KZP) najveća razlika vidljiva je u profilu organskih kiselina. Škrlet vrhunsko vino KZP prosječno ima niže vrijednosti vinske i jabučne kiseline, a više vrijednosti mliječne kiseline od Škrleta koji su deklarirani kao kvalitetno vino KZP ili vino bez oznake ZOI (Grafikon 2.4).

can be observed of an increase of quantities on the market. The peak was achieved in 2019, prior to the COVID-19 pandemic (Graph 2.3). In that year, 33 different labels of Škrlet were placed on the market, in a total quantity of 1520 hectolitres, accounting for 0.23% of all Croatian wines on the market in that year. To put this into perspective, the share of Škrlet wines on the Croatian market is approximately equal to the annual share of Croatian wines on the global wine market.

Nearly 97% of Škrlet wines marked with the protected designation of origin (PDO) were produced in the Moslavina PDO, and since 2020, Škrlet from the Prigorje-Bilogora PDO has also been available on the market (Table 2.4). According to the data of the Croatian Agency for Agriculture and Food (HAPIH), from 2015 to 2021 there were 111 Škrlet wines with the designation of the Moslavina PDO on the market (5 premium wines of controlled geographical origin – CGO, and 106 quality wines with CGO) and 14 Škrlet wines with the designation of the Pokuplje PDO (quality wine with CGO) and 1 Škrlet wine with the designation of the Prigorje-Bilogora PDO (quality wine with CGO). In the same period, only 135.5 hL of premium Škrlet wine was produced, and this entire production was found in the Moslavina region.

The quality of the variety Škrlet and its potential are becoming more and more recognised among wine lovers, and in 2021, premium Škrlet sparkling wine was placed on the market for the first time, though only in a very small quantity, just 2.3 hL.

TABLICA 2.5. Kvantificirane vrijednosti kvalitete vina Škrlet sa zaštićenom oznakom izvornosti na tržištu (2015. – 2021.) (Izvor: HAPIH, 2021.)

TABLE 2.5. *Quantification of the quality values of Škrlet Wine With protected designation of origin on the market (2015–2021) (Source: HAPIH, 2021)*

SVOJSTVO CHARACTERISTICS	n	SREDNJA VRIJEDNOST MEAN VALUE	MIN MIN	MAKS MAX
Relativna gustoća / Relative density	127	0,9928	0,9898	0,9993
Stvarni alkohol (% vol.) / Alcoholic strength (% vol.)	127	11,94	9,82	13,14
Stvarni alkohol (gL^{-1}) / Alcoholic strength (gL^{-1})	127	94,19	77,5	103,7
Smjesa glukoza/fruktoza / Glucose and fructose mixture	123	2,85	0,02	17,59
Reducirajući šećer (gL^{-11}) / Reducing sugars (gL^{-11})	127	3,59	0	17
Pepeo (gL^{-1}) / Ash (gL^{-1})	127	1,92	1,4	3,5
pH / pH	127	3,20	2,941	3,599
Ukupna kis. (gL^{-1}) / Total acidity (expressed as tartaric acid) (gL^{-1})	127	6,20	4,491	8,418
Hlapiva kis. (gL^{-1}) / Volatile acidity (expressed as acetic acid) (gL^{-1})	127	0,29	0,102	0,896
Limunska kis. (gL^{-1}) / Citric acid (gL^{-1})	123	0,30	0,136	0,4876
Vinska kis. (gL^{-1}) / Tartaric acid (gL^{-1})	123	2,68	1,06	4,12
Jabučna kis. (gL^{-1}) / Malic acid (gL^{-1})	123	1,55	0,37	3,8
Mliječna kis. (gL^{-1}) / Lactic acid (gL^{-1})	123	0,25	0	1,11
Glicerol (gL^{-1}) / Glycerol (gL^{-1})	123	6,31	4,55	10,48
Fruktoza (gL^{-1}) / Fructose (gL^{-1})	100	2,72	0,03	16,48
Glukoza (gL^{-1}) / Glucose (gL^{-1})	100	0,57	0	4,14
Slobodni SO_2 (mgL^{-1}) / Free SO_2	127	27	3	50
Ukupni SO_2 (mgL^{-1}) / Total SO_2	127	115	27	210
Organoleptična ocjena / Sensory evaluation	127	77,95	72	83

Ovi podaci pokazuju pozitivne efekte označavanja vina zaštićenom oznakom izvornosti koja čini dodanu vrijednost proizvodu iako iziskuje veća ulaganja proizvođača, ali u konačnici jamči veću dobit (zbog postizanja više cjenovne kategorije proizvoda) od proizvodnje vina bez oznake ZOI.

Većina vina Škrlet označena je na tržištu kao kvalitetno vino KZP, ali zbog njegova potencijala u bliskoj budućnosti možemo očekivati veće količine zanimljivih i intrigantnih vrhunskih vina što već neko vrijeme dokazuju moslavački proizvođači. Najbolje ocjenjena vina Škrlet tijekom stavljanja vina na tržište u posljednjih sedam godina su dva vina kasne berbe (berba 2015. i 2017.) i dva vina redovite berbe (berba 2014. i 2015.) koja su ocijenjena sa 83, odnosno 82 boda. Sva četiri vina su proizvedena u Moslavini i nose tradicionalan naziv vrhunsko vino KZP (Izvor: HAPIH, 2021.).

Konačno, možemo zaključiti da je sorta Škrlet dovoljno plastična i ima velik potencijal za proizvodnju različitih tipova vina uz primjenu svih poznatih tehnologija proizvodnje koje se koriste u uzgoju sorte.

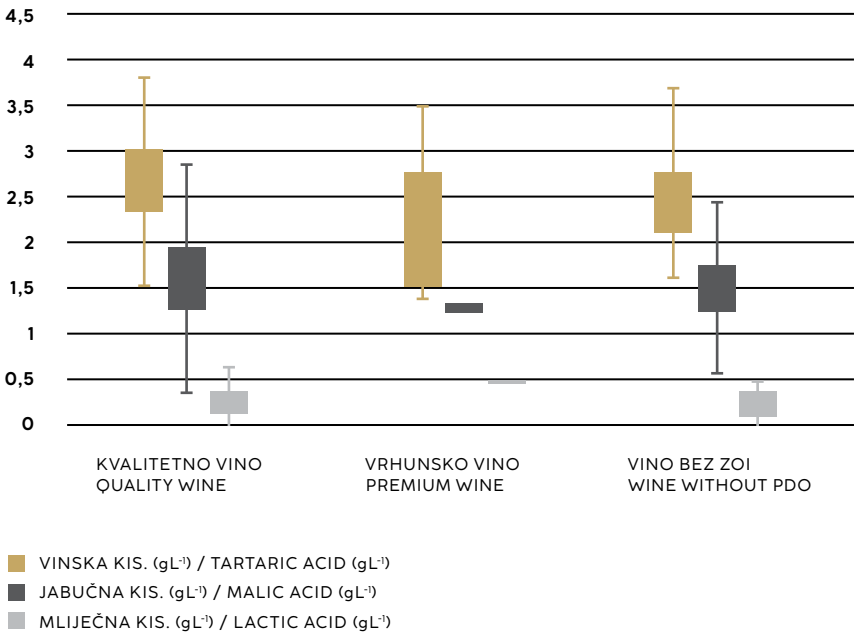
Škrlet wine analyses in the process of being placed on the market

The Croatian Agency for Agriculture and Food and its organisational unit the Centre for Viticulture, Enology and Edible Oils Analysis (HAPIH/CVVU) conducts the administrative procedure surrounding the placement of wine and other grape and wine products and fruit wines on the market. All wine producers wanting to market their products are required to file an application with HAPIH/CVVU. Following the administrative control and the physicochemical and organoleptic testing, this body issues the decision allowing the product to be marketed. Below is an outline of the statistical analysis of the physicochemical and organoleptic results of all wines of Škrlet (n=177) which were in the marketing procedure during the past seven-year period (2015–2021).

After processing the data, it can be concluded that the average wine produced from the variety Škrlet bears the PDO designation and the traditional designation of quality wine with CGO. In terms of the average sugar content, this is considered a dry wine with a true alcohol content of 11.9% vol., total acidity of 6.2 gL^{-1} and a total of 27 mg free and 115 mg total sulphuric dioxide per litre. The organoleptic assessment was on average 78 points (Table 2.5).

The categorisation of Škrlet (wine without PDO label, quality wine with CGO, and premium wine with CGO) is mostly based on the difference in the organic acid profile. Premium Škrlet wine with CGO has on average lower levels of tartaric and malic acid, and higher levels of lactic acid than Škrlet wines categorised as quality wine with CGO or wines without the PDO designation (Graph 2.4).

These data show the positive effects of labelling wine with the protected designation of



GRAFIKON 2.4. Prosječne vrijednosti organskih kiselina (vinske, jabučne i mliječne kiseline) u gL^{-1} vina Škrlet koja su bila u postupku stavljanja vina na tržište 2015. – 2021. godine (n=168) s obzirom na deklariranje tradicionalnih izraza (kvalitetno i vrhunsko vino KZP) za vina s oznakom ZOI u odnosu na vino bez nje.

GRAPH 2.4. *Average values of organic acids (tartaric, malic and lactic acid) in g L^{-1} in Škrlet Wines that Were in the marketing procedure in the period from 2015–2021 (n=168) With regard to the traditional declaration (quality and premium Wine With CGO) for Wines With the PDO designation and Wines Without this designation.*

origin, which gives the product added value, despite requiring higher investments from the producer. Ultimately, this guarantees a greater profit (due to achieving the higher price category of the product) than the production of wines without the PDO designation.

The majority of Škrlet wines were labelled for the market as quality wines with CGO, though due to its potential, in the near future we can expect a greater quantity of interesting and intriguing premium wines, as we have already been seeing from the Moslavina producers in recent years. The best assessed Škrlet wines in the marketing procedure in the past seven-year period were two late harvest wines (vintage 2015 and 2017) and two regular harvest wines (vintage 2014 and 2015) that were assessed with 83 and 82 points. All four of these wines were produced in Moslavina and bear the traditional label of premium quality with CGO (Source: HAPIH, 2021).

Iz usmenih izvora saznajemo da je početkom 20. stoljeća Moslavina vrlo siromašan poljoprivredni kraj. Žitelji Moslavine idu za nadnice raditi u vinograde velikih seljačkih obitelji. Ovi relativno veliki posjedi najčešće su u vlasništvu Posavaca koji su ih otkupljivali od bivših vlastelina. Posavci su u vinograde dolazili preko Lonjskog polja konjskim zapregama, a kad je polje bilo poplavljeno, čamcima. U vinogradima su imali drvene klijeti u kojima bi za vrijeme intenzivnih radova boravili i više dana. Radne snage je bilo napretek. Prema usmenoj predaji jednog moslavačkog vinogradara, još prije 100 godina u vinogradima njegova djeda u kopanje vinograda dolazila je skupina djevojaka Talijanki koje su radile pjevajući. Objed im se sastojao od komada kukuruznog kruha i glavice luka, pa je špek i vino koje im je djed nudio bio razlog dodatnog veselja. Odlazili su Moslavci i u nadnicu u Posavinu gdje su brali kukuruz za košaru kukuruza dnevno.

From personal communications, we learned that at the turn of the 20th century, Moslavina was a very impoverished agricultural area. The inhabitant of Moslavina would work for daily wages in the vineyards of the large rural families. These relatively large estates were most often owned by people from Posavina, who had purchased them from the former landowners. The people of Posavina came to these vineyards via the Lonjsko Polje field, on their horse-drawn carriages, and when the field was flooded, they came by boat. They had wooden wine huts in the vineyards where they could spend several days during periods of intensive work in the vineyard. The labour force was abundant. According to the recollections of a Moslavina wine-grower, even 100 years ago, groups of young Italian girls would come to work in the vineyards, singing as they worked. Their meal would consist of a piece of cornbread and an onion, and the bacon and wine that grandfather would offer them would be reason for additional joy. They would come to Moslavina, and for day wages they would go to Posavina, where they picked corn for a basket of corn per day.

Finally, it could be concluded that the variety Škrlet is sufficiently plastic and has sufficient potential to produce different types of wine, with the application of all known production technology used in growing this variety.

03. PREGLED ZNANSTVENIH I STRUČNIH ISTRAŽIVANJA ŠKRLETA

A REVIEW OF THE SCIENTIFIC AND EXPERT RESEARCH ON ŠKRLET

PREGLED ZNANSTVENIH I STRUČNIH ISTRAŽIVANJA ŠKRLETA

U ovom poglavlju donosimo pregled rezultata najvažnijih znanstvenih i stručnih istraživanja provedenih na Škrletu kao glavnom predmetu istraživanja ili u kojima je Škrlet bio jedna od sorti uključenih u istraživanje. Dajemo osvrt na dobivene rezultate i moguće koristi za unapređenje proizvodnje grožđa i vina ili za promociju Škrleta kao sorte. Uz rezultate se navode i autori i institucije u kojima su provedena istraživanja, pa i ovo može biti od koristi budućim istraživačima i proizvođačima.

Kao što je već spomenuto, uvrštavanje Škrleta u suvremenu stručnu literaturu počelo je sa njegovom stručnom valorizacijom kao sorte (Miklaužić, 1962., 1972.; Licul i sur., 1980.), ali prvo temeljito i višegodišnje znanstveno istraživanje proveo je prof. Nikola Mirošević u sklopu svoje doktorske disertacije od 1980. do 1982. godine na području Volodera. Zahvaljujući tom istraživanju vinogradarska struka dobila je potpuni ampelografski opis Škrleta i prve objektivne informacije o njegovoj gospodarskoj vrijednosti kao vinske sorte. Ovdje navodimo samo nekoliko vrijednih zaključaka iz tog istraživanja.

Prvo, temeljem analize povijesnih izvora i provedenih filometrijskih i uvometrijskih istraživanja, Mirošević Škrlet smatra autohtonom sortom s najvjerojatnijim podrijetlom iz područja Pokuplja te navodi veći broj sinonima. Nadalje se kroz eksperimentalni rad utvrđuju

A REVIEW OF THE SCIENTIFIC AND EXPERT RESEARCH ON ŠKRLET

In this chapter, we provide an overview of the results of the most important scientific and expert research conducted on Škrlet, either as the main subject of the research, or of research in which Škrlet was one of the included varieties. Here we give an overview of the results obtained and possible benefits for improving the production of grapes and wine or for the promotion of Škrlet as a variety. With the results, the authors and institutions where the research was conducted are listed, and this can therefore be of use to future researchers and producers.

As already stated, the inclusion of Škrlet in the contemporary expert literature began with the standard ampelographic descriptions and expert valorisation as a variety (Miklaužić, 1962, 1972; Licul et al., 1980), as well as the first comprehensive and multi-year scientific research conducted by Professor Nikola Mirošević as part of his doctoral dissertation from 1980 to 1982 in the Voloder area. Thanks to this research, the viticulture profession received a complete ampelographic description of Škrlet and the first objective information about its commercial value as a wine variety. Here we outline just a few of the valuable conclusions of that research.

First, pursuant to the analysis of the historical sources and the conducted research on grapevine leaves and berries, Mirošević considered

iscrpne morfološke i agrobiološke karakteristike bitne za pouzdanu identifikaciju Škrleta, ali i za potrebe uzgoja. Iscrpno se opisuju i gospodarsko-tehnološke osobine te rezultati istraživanja s opterećenjem trsa rodnim pupovima, pokazateljima rodnosti i kvalitete kao smjernice za praktični uzgoj i vinifikaciju. S obzirom na poznatu manu Škrleta da u pojedinim godinama odbaci dosta cvjetova i ima nepotpunu oplodnju, provedeno je istraživanje s pinciranjem (prikraćivanje rodnih mladica) i folijarnim prihranjivanjem s utjecajem na rodnost i kvalitetu mošta. Dobiveni rezultati dokazali su da je primjenom ampelotehničkih i agrotehničkih mjera moguće značajno upravljati rodnošću i kvalitetom uroda. Zaključno, Škrlet je potvrđen kao kvalitetna vinska sorta s relativnom otpornošću na gljivične bolesti, dobre gospodarske vrijednosti te nenametljivom sortno-specifičnom aromom. Mirošević (1986.) također naglašava potrebu daljnjih tehnoloških istraživanja i ističe potrebu provedbe klonske selekcije.

3.1. AUTOHTONOST I IDENTIFIKACIJA

Novija istraživanja najprije su se bavila provjerom sinonimije, utvrđivanjem autohtonosti i potencijalnog srodstva Škrleta s drugim sortama. Prvi put krajem 20. stoljeća Škrlet je u skupini od pretpostavljeno 30 hrvatskih autohtonih sorti primjenom markera DNA (SSR) uspoređen s najvažnijim europskim sortama (Maletić i sur., 1999.). Tom prilikom među više od 200 europskih sorti, uključujući i one iz Austrije i Njemačke koje su u nedavnoj povijesti uvedene na naše prostore, nijedna nije pokazala genetičku istovjetnost sa Škrletom. Ovaj set sorti ispitivan je na više načina, s posebnim

Škrlet to be an indigenous variety, with a likely origin from the Pokuplje area, and he also lists a large number of synonyms. Further, through experimental work, he determines the comprehensive morphological and agro-biological characteristics that are important for a reliable identification of Škrlet, and for growing purposes. A detailed description was given of the agronomic and technological properties, and the results of research with vine load by fertile buds, indicators of yield and quality as a guideline for the practical growing and vinification. Considering the well-known flaw of Škrlet that it loses a large number of flowers in certain years resulting in incomplete fertilisation, research was conducted on the effects of pinching back (cutting off shoot tips) and application of foliar nutrition on yield and must quality. The obtained results showed that the application of ampelo-technical and agro-technical measures could significantly manage both yield and quality of the harvest. In conclusion, Škrlet was confirmed as a quality wine variety with relatively high tolerance to fungal disease, good agronomic value and a subtle variety-specific aroma. Mirošević (1986) also stressed the need for further technological research and emphasised the need to conduct clonal selection.

3.1. INDIGENOUS STATUS AND IDENTIFICATION

More recent research has focused above all on verification of synonyms, and establishing the indigenous status and potential relations of Škrlet with other varieties. For the first time in the late 20th century, Škrlet was included in the group of 30 Croatian varieties assumed to be indigenous to be compared using DNA markers

osvrtom na moguće utjecaje germplazme iz Grčke, kao i srodnost sa sortimentom susjednih zemalja. Rezultati istraživanja pokazali su evidentnu genetičku posebnost hrvatskih autohtonih sorti, a među kojima je bio i Škrlet (Sefc i sur., 2000.).

Nekoliko godina kasnije, kao rezultat sudjelovanja i velikom europskom projektu „GrapeGen06" (https://www1.montpellier.inra.fr/grapegen06/accueil.php) u istraživanje genetičkog srodstva i izrade genetičkih profila za potrebe jedinstvene europske baze svih sorti vinove loze uključili smo više od 100 pretpostavljeno hrvatskih autohtonih sorti, a one su skupno analizirane primjenom markera SSR-a s više od 4000 drugih europskih sorti (Lacombe i sur. 2011.). Kao rezultat ove analize u Hrvatskoj nije identificiran nijedan slučaj istovjetnosti genetičkog profila sa Škrletom, ali je otkriven jedan s mađarskom primkom naziva Czeiger (vidi poglavlje 2). U mađarskoj literaturi Czeiger se navodi kao rijetka autohtona sorta Karpatskog bazena

(SSR) with the most important European varieties (Maletić et al., 1999). In this research, more than 200 European varieties, including those from Austria and Germany which had been introduced to Croatian soils in recent history, were compared with the Croatian samples, and none of them were genetically identical with Škrlet. This set of varieties was tested in multiple ways, with special focus on the possible influence of germplasm from Greece, and of relationships with the varieties of neighbouring countries. The results of the research showed the evident genetic specificity of the Croatian indigenous varieties, among them Škrlet (Sefc et al., 2000).

Several years later, the Europe-wide project "GrapeGen06" (https://www1.montpellier.inra.fr/grapegen06/accueil.php) was launched to examine the genetic relationships and to define the genetic profiles to build a single European database of all grapevine varieties. More than 100 assumed Croatian indigenous varieties were included in the analysis, and they were jointly analysed using SSR markers against more than 4000 other European varieties (Lacombe et al. 2011). In this analysis, not a single case of an identical genetic profile was found to overlap with Škrlet, though one case of overlap was discovered with a Hungarian sample called Czeiger (see Chapter 2). In the Hungarian literature, Czeiger is denoted to be a rare, indigenous variety of the Carpathian basin and has a detailed ampelographic description (Nemeth, 1966). Czeiger and Škrlet share an identical SSR profile at 9 microsatellite loci. The tissue sample for the SSR-analysis was taken from the collection of grapevine varieties at the University of Pécs, and it is listed under code HUN045 in the International Catalogue of Grapevine Varieties (VIVC – www.vivc.de). The genetic profile of 115 Hungarian varieties, of which the majority

i detaljno je opisana ampelografski (Nemeth, 1966.). Czeiger sa Škrletom dijeli identičan profil SSR-a na 9 mikrosatelitskih lokusa. Uzorak tkiva za SSR-analizu uzet je iz kolekcije sorti vinove loze Sveučilišta u Pečuhu, a u Međunarodnom katalogu sorti vinove loze (VIVC – www.vivc.de) vodi se pod šifrom HUN045. Genetičke profile 115 mađarskih sorti, od kojih većinu, njih 88, čine one podrijetlom iz Karpatskog bazena, objavili su Galbacs i sur. (2009.). Pretraživanjem literature kroz znanstvene i stručne baze podataka nije moguće pronaći više informacija o Czeigeru iz kojih bi se saznalo više o njegovoj povijesti i gospodarskoj važnosti, a čini se da u Mađarskoj danas nije u uzgoju.

U kasnijem istraživanju u sklopu projekta „Preservation and establishment of true-to-type and virus free material of endangered grapevine cultivars in Croatia and Montenegro", kojim su bile obuhvaćene i vrlo rijetke i neopisane sorte vinove loze na prostoru Moslavine i Pokuplja, otkriveno je nekoliko sorti i nepoznatih genotipova za koje nije bilo prethodne spoznaje da bi se u prošlosti uzgajale na ovom prostoru, ali nijedna od njih nije pokazivala izravnu srodnost sa Škrletom (Žulj Mihaljević i sur., 2015.). Detaljnu analizu svih poznatih hrvatskih autohtonih sorti vinove loze na 20 SSR-lokusa, s posebnim naglaskom na otkrivanje sinonima i mogućih srodstvenih (*pedigree*) veza, provela je u sklopu svoje doktorske disertacije Žulj Mihaljević (2020.) i nije utvrdila novih sinonima ni bliskih genetičkih srodnika Škrleta, čime je neizravno učvrstila status Škrleta kao autohtone hrvatske sorte.

(88) originate from the Carpathian Basin, was published by Galbacs et al. (2009). A literature search of the scientific and expert databases did not retrieve any further information about Czeiger that would allow for further knowledge about its history and commercial importance, and it appears that it is no longer grown in Hungary.

Later research as part of the project entitled "Preservation and establishment of true-to-type and virus free material of endangered grapevine cultivars in Croatia and Montenegro" included very rare and undescribed varieties of grapevine in the area of Moslavina and Pokuplje. The results revealed several varieties and unknown genotypes for which there was no prior knowledge that they had been grown in this region, but none of these showed any direct relationship with Škrlet (Žulj Mihaljević et al., 2015). A detailed analysis of all known Croatian indigenous varieties of grapevine on 20 SSR-loci, with special emphasis on revealing synonyms and possible pedigree relationships, was conducted by Žulj Mihaljević (2020) as part of her doctoral dissertation, and her results did not reveal any new synonyms or close genetic relatives of Škrlet, which further directly solidified the status of Škrlet as an indigenous Croatian variety.

3.2. INTRA-VARIETAL VARIABILITY AND CLONAL SELECTION

In comparison with research on the ampelographic properties and the genetic specificity (identity) of Škrlet, the issue of phenotypic variability arose, as different forms of Škrlet appearing in vineyards. Contemporary viticulture is primarily based on the use of traditional grapevine varieties, while populations originate from

3.2. UNUTARSORTNA VARIJABILNOST I KLONSKA SELEKCIJA

Uspredno s istraživanjima ampelografskih karakteristika i genetičke posebnosti (identiteta) Škrleta pojavio se i problem fenotipske varijabilnosti, tj. različitih pojavnih varijanti Škrleta u vinogradima. Suvremeno vinogradarstvo pretežno se zasniva na upotrebi tradicionalnih sorti vinove loze, a čije populacije vuku podrijetlo od jedne početne biljke koja je nakon što ju je čovjek odabrao bila sukcesivno vegetativno razmnožavana (klonirana). Zbog toga su svi trsovi neke sorte u teoriji genetički identični prvom matičnom trsu. Međutim, nakon mnogo ciklusa sukcesivnog razmnožavanja moguće je unutar populacije sorte opaziti jedinke čiji fenotip odstupa od prosjeka sorte. Ova fenotipska varijabilnost može biti izazvana patogenima kojima je trs zaražen (npr. virusima), utjecajem okolišnih čimbenika, ali i genskim razlikama. Genetička unutarsortna varijabilnost temelji se na pretpostavci da s vremenom dolazi do pojave spontanih mutacija u genomu sorte koje zbog vegetativnog načina razmnožavanja ostaju fiksirane u daljnjim ciklusima razmnožavanja. Klonskom selekcijom kroz niz godina odabiru se, evaluiraju i certificiraju trsovi čije su karakteristike bolje od prosjeka sorte. Međutim, dokazivanje posebnosti klona i njegova pouzdana naknadna identifikacija u proizvodnim nasadima gotovo je nemoguća.

U sklopu projekta klonske selekcije u terenskim istraživanjima otkriveni su brojni trsovi posebnog fenotipa (tzv. elitni trsovi) u raznim vinogradima Škrleta koji su potom vegetativno razmnoženi u potomstva (klonske linije) koja su posađena u posebno dizajnirane poljske pokuse na više lokacija radi eliminacije (ili barem

a single original plant which after selection was successively propagated vegetatively (cloned). For that reason, all the vines of a variety are, in theory, genetically identical to the mother vine. However, after many cycles of successive propagation, it is possible to see individuals within the population whose phenotypes differ from the variety population average. This phenotypic variability can by caused by pathogens infecting the vine (e.g., viruses), the effects of environmental factors, and genetic differences. The genetic intra-varietal variability is based on the assumption that spontaneous mutations arrive in the genome of the variety over time that due to the vegetative method of reproduction remain fixed in future reproductive cycles.

Over the years, through the clonal selection vines that show properties above the variety average are selected, evaluated and eventually certified. However, proving the specificities of a clone and its reliable subsequent identification in production plantations is nearly impossible.

As part of the project of clonal selection in field research, numerous vines with a specific phenotype (called elite vines) were revealed in a number of Škrlet vineyards that were later vegetatively reproduced into progeny (clonal lines). These were then planted in specially designed field experiments at multiple locations for the purpose of elimination (or at least reduction) of the influence of environmental factors and proving mutant status. Therefore, during clonal selection a number of different tests were conducted to verify the agronomic value of clonal progenies. This experimental plantation also served for the selection and verification of different laboratory methods to prove the existence of genetic differences between individual clonal progenies (intra-varietal genetic variability). Many scientists believe that molecular

redukcije) utjecaja okolišnih čimbenika i dokazivanja statusa mutanata. Stoga su tijekom klonske selekcije provođena različita istraživanja usmjerena na provjeru gospodarske vrijednosti klonskih potomstava. Ovi pokusni nasadi poslužili su i za izbor i provjeru različitih laboratorijskih metoda kojima se može dokazati postojanje genetičkih razlika između pojedinih klonskih potomstava (unutarsortna genetička varijabilnost). Vezano uz problem pouzdane identifikacije klona u rasadničarstvu i proizvodnim nasadima mnogi znanstvenici smatraju da bi molekularni markeri mogli biti alat koji će olakšati i ubrzati klonsku selekciju te omogućiti pouzdanu determinaciju klonova.

Istraživanja postojanja i razine unutarsortne genetičke varijabilnosti počeli smo kod nekoliko sorti među kojima i Škrleta, najprije primjenom markera AFLP (*Amplified Fragment Length Polymprphism*) i ISSR (*Inter Simple Sequence Repeats*) (Vokurka, 2003.).

U tom istraživanju ispitivane su razlike između 17 klonskih potomaka Škrleta u ranoj fazi klonske selekcije primjenom ampelografskih, ampelometrijskih i molekularnih metoda. Utvrđeno je da je razina izmjerenog polimorfizma morfoloških svojstava i molekularnih markera dovoljno velika da bi omogućila pronalaženje divergentnih klonova u populaciji sorte. Međutim, ustanovljeno je da razdvajanja i grupiranja pojedinih klonskih potomstava pomoću klasičnih i molekularnih metoda nisu u korelaciji. Markeri AFLP-a pokazali su se informativnijima u odnosu na markere ISSR-a i preporučeni su za buduća istraživanja. Zanimljiv zaključak iz ovog istraživanja je i da je procijenjena razina genetičke varijabilnosti molekularnim markerima u skupini klonova Škrleta bila značajno veća nego u sličnoj skupini klonova Plavca malog unatoč činjenici da je veličina populacije,

DNA markers could be the tool to facilitate and accelerate clonal selection, and enable reliable determination of clones, to resolve the issue of reliable clone identification in nurseries and production plantations.

Research was also conducted to determine the presence of and degree of intra-varietal genetic variability in several varieties, including Škrlet, using the AFLP (Amplified Fragment Length Polymprphism) and ISSR (Inter Simple Sequence Repeats) markers (Vokurka, 2003). That study tested the differences between 17 clonal progeny of Škrlet in the early phase of clonal selection using ampelographic, ampelometric and molecular methods. A moderate degree of polymorphism in the morphological properties and molecular markers was determined, and this was large enough to enable finding divergent clones in the population of the variety. However, it was found that the separation and clustering of individual clonal progeny using classical and molecular methods were not correlated. The AFLP markers proved to be more informative than the ISSR markers, and were recommended for future research. An interesting conclusion of this research was also that the assessed level of genetic variability by the molecular markers in the group of Škrlet clones was more significant than in a similar group of Plavac mali clones, despite the fact that the population size and therefore the level of phenotypical variability of the variety Plavac mali is significantly larger.

In the period from 2004 to 2007, a suite of different properties (yield per vine, number of bunches per vine, sugar content, total acidity and pH) was analysed in 44 clonal candidates at two locations (Repušnica and Popovača), and a large effect of year and location on these values was found (Šimon et al., 2008). No significant

pa i razina fenotipske varijabilnosti sorte Plavac mali, značajno veća.

U periodu od 2004. do 2007. analiziran je prinos po trsu, broj grozdova po trsu, sadržaj šećera, ukupne kiseline i pH-vrijednost kod 44 klonska kandidata na dvije lokacije (Repušnica i Popovača) te je ustanovljen velik utjecaj godine i lokacije na vrijednosti ispitivanih svojstava (Šimon i sur., 2008.). Između većine pretpostavljenih mutanata nisu ustanovljene značajne razlike u analiziranim svojstvima, a što indirektno ukazuje da većina odabranih elitnih trsova svoj različit fenotip primarno duguje okolišnim čimbenicima. Ipak, u ovom, a i u kasnijim istraživanjima, više klonskih kandidata pokazalo je stabilnu i nasljednu različitost.

U istraživanjima provođenim u sklopu doktorske disertacije Šimon (2012.) je tijekom 2008. i 2009. godine istraživao odnos fenotipske varijabilnosti unutar i između klonskih potomstava kod 60 potomstava Plavca malog i 59 potomstava Škrleta, i pri tome je analizirao više fenoloških, morfoloških i proizvodnih svojstava. Ustanovio je očekivano veću varijabilnost između nego unutar pojedinih klonskih potomstava kod obje sorte, što potvrđuje postojanje klonova koji značajno odstupaju od prosjeka populacije sorte. Kod više svojstava, posebno onih vezanih uz fenologiju i svojstva kvalitete mošta, nisu utvrđene značajne razlike između klonova, ali jesu za glavna svojstva poput rodnosti, veličine grozda i broja grozdova po trsu. Prema ovim svojstvima svi klonovi kod obje sorte grupirani su u kontrastne biotipove (skupine međusobno sličnih klonova) i potom dodatno analizirani s nekoliko tipova molekularnih markera (AFLP, S-SAP i REMAP). Svaka od ovih metoda bila je uspješna u jasnom razdvajanju sorti, ali u razdvajanju i identifikaciji pojedinih klonova samo su markeri AFLP-a

differences were found in the analysed properties between most of the assumed mutants, indirectly suggesting that most of the elected elite vines have their own phenotype, primarily due to environmental factors. However, in this study and in later research, multiple clonal candidates proved to be stable and have heritable diversity.

In the research conducted as part of his doctoral dissertation, Šimon (2012) examined the relationship of phenotypic variability within and between clonal progenies in 60 progenies of Plavac mali and 59 progenies of Škrleta during 2008 and 2009. This study also examined multiple phenological, morphological and production properties. He found an expected greater variability between than within individual clone progeny in both varieties, confirming that there are clones that significantly derogate from the average of the variety population. For many properties, especially those associated with phenology and properties of quality of the must, no significant differences were found between clones, though significant differences were found for the main properties such as yield, bunch size and number of bunches per vine. According to these properties, all clones in both varieties clustered into contrast biotypes (groups of mutually similar clones) and were then further analysed with several types of molecular markers (AFLP, S-SAP and REMAP). Each of these methods was successful in clearly differentiating the variety, though for the isolation and identification of individual clones, only the markers AFLP and S-SAP were able to differentiate clones, and only to a certain extent. It was concluded that the test methods did not have sufficient resolution to be directly used as a tool that could accelerate and improve classical methods of clonal selection, though in combination, their use increases the capacity to

i S-SAP-a do određene mjere bili u stanju razlikovati klonove. Zaključeno je da ispitivane metode nisu dovoljno rezolutne da bi se izravno koristile kao alat koji bi mogao ubrzati i poboljšati klasičnu metodu klonske selekcije, ali njihovim zajedničkim korištenjem povećava se kapacitet detekcije unutarsortne varijabilnosti i pouzdanost dokazivanja statusa mutanata.

Ivana Vladimira Petric u sklopu svoje doktorske disertacije provodi evaluaciju klonskih kandidata Škrleta temeljem pokazatelja rodnosti i kvalitete grožđa (Petric, 2013.). Istraživanje uključuje trogodišnje analize pokazatelja rodnosti i kvalitete mošta (2006. – 2008.) za 10 klonskih kandidata na dvije lokacije primjenom standardnih ampelografskih i fizikalno-kemijskih metoda za analizu mošta. U kontekstu analize kvalitete mošta klonskih kandidata Škrleta prvi se put analizira sadržaj D-glukoze i D-fruktoze kao i kompozicija ukupnih kiselina (sadržaj i omjer vinske, jabučne i limunske kiseline). Konačno, u laboratoriju Sveučilišta u Ljubljani pod mentorstvom prof. Tatjane Košmerl uzorci klonskih kandidata Škrleta prolaze detaljnu analizu spojeva odgovornih za primarne arome primjenom plinske kromatografije uz masenu spektrometriju (GC-MS).

Istraživanjem su dokazane značajne razlike između klonova u pokazateljima rodnosti i kakvoće grožđa i da su te razlike nasljednoga karaktera. Nadalje je utvrđeno značajno variranje klonova u sadržaju glukoze i fruktoze te je multivarijatnom analizom utvrđeno da bi praćenje sadržaja glukoze umjesto sadržaja suhe tvari bilo informativnije i učinkovitije u diskriminaciji klonskih kandidata. Rezultati istraživanja kiselinskog profila klonova usporedbom variranja sadržaja ukupnih kiselina i njihova odnosa sa sadržajem vinske, limunske i jabučne kiseline pokazali su da pojedini klo-

detect intra-varietal variability and to reliably prove the status of mutants.

In her doctoral dissertation, Ivana Vladimira Petric performed an evaluation of clonal candidates of Škrlet based on yield and grape quality indicators (Petric, 2013). The research included a three-year analysis (2006 – 2008) of indicators of yield and must quality for 10 clonal candidates at two locations, using standard ampelographic and physicochemical methods for the analysis of must. In the context of analysing the quality of must of the Škrlet clonal candidates, the content of D-glucose and D-fructose were analysed for the first time, together with the composition of total acids (content and ratios of tartaric, malic and citric acid). Finally, in the laboratory of the University of Ljubljana under the mentorship of Professor Tatjana Košmerl, the samples of Škrlet clonal candidates were subjected to detailed analysis of the compounds responsible for the primary aromas, using gas chromatography with mass spectrometry (GC-MS).

This research showed that there were significant differences between the clones in the indicators of yield and grape quality, and that these differences were heritable. Further, multivariate analysis indicated a significant variation of clones in the content of glucose and fructose and that monitoring the content of glucose instead of the content of dry matter was more informative and effective in the discrimination of clonal candidates. The results of the research on the acid profile of clones by comparing the variations in total acid contents and their ratios with the contents of tartaric, citric and malic acid, showed that certain clones could have nearly identical contents of total acids, while still significantly differing in the content of tartaric or malic acid.

novi mogu imati približno istovjetan sadržaj ukupnih kiselina dok se istovremeno značajno razlikuju u sadržaju vinske ili jabučne kiseline.

Petric i sur. (2016.) su analizom terpenskih spojeva (u slobodnom obliku) odgovornih za primarne arome sorte Škrlet bijeli, detektirali spojeve odgovorne za mirisni opis sorte (linalol, β-damascenon, terpinolen), ali razlike u relativnoj površini pika ovih spojeva nisu bile statistički značajne između klonova te su oni u udjelu ovih spojeva međusobno vrlo slični. Međutim, utvrđeni su drugi aromatski spojevi (trans-ocimene, 2-methyl-1-butanol, myrcene, α-phelandrene, cis-ocimene i 3-methyl-1-butanol) koji znatno manje sudjeluju u ukupnom opisu mirisa, ali su ipak sa svojim vrijednostima omogućili značajnu diskriminaciju klonskih kandidata s obzirom na razinu pojedinih spojeva, ali samo unutar pojedine lokacije. Temeljem ovih rezultata zaključeno je da utjecaj lokacije (tlo, klima, gnojidba) dominira nad genetičkim potencijalom klona kada se on nađe u drugim uvjetima sredine. Međutim, unutar jedne lokacije klonski kandidati su kroz tri vrlo različite godine zadržali svoje međusobne odnose u sintezi aromatskih spojeva i bilo ih je moguće razlikovati. Zahvaljujući ovom istraživanju predložene su preporuke za unapređenje klonske selekcije.

3.3. ISTRAŽIVANJA VEZANA UZ POVEĆANJE RODNOSTI I KVALITETE VINA

Jagatić Korenika i sur. (2018.) istraživali su utjecaj hladne maceracije na aromatski i fenolni profil u proizvodnji vina Škrleta i Pošipa. Pojedini fenolni spojevi utvrđivani su primjenom sustava tekućinske kromatografije visoke djelotvornsoti (HPLC) dok su ukupni fenoli i

Petric et al. (2016) analysed the terpene compounds (free form) responsible for the primary aromas of the variety Škrlet bijeli, and detected compounds that were responsible for the fragrance description of the variety (linalool, β-damascenone, terpinolene), though differences in the relative surface of peaks of these compounds were not statistically significantly different between clones and were very similar in the ratios of these compounds. However, other aromatic compounds were detected (trans-ocimene, 2-methyl-1-butanol, myrcene, α-phelandrene, cis-ocimene and 3-methyl-1-butanol) which had a substantially smaller contribution to the overall fragrance description, though their values enabled significant discrimination of clonal candidates with regard to the level of individual compounds, though only within certain locations. Pursuant to these results, it was concluded that the influence of location (soil, climate, fertilisation) dominated over the genetic potential of clones when they are found in other environmental conditions. However, within a single location, the clone candidates retained their mutual relationships in the synthesis of aromatic compounds through three very different years, and they could be differentiated. Thanks to this research, recommendations were given to improve clonal selection.

3.3. RESEARCH FOCUSED ON IMPROVING YIELD AND WINE QUALITY

Jagatić Korenika et al. (2018) studied the effects of cold maceration on the aromatic and phenol profiles in the production of the wines Škrlet and Pošip. Individual phenolic compounds were

flavan-3-oli u vinu mjereni spektrofotometrijskom metodom. Komponente aroma mjerene su primjenom plinske kromatografije.

U slučaju Škrleta, hladna maceracija imala je značajan utjecaj na sadržaj ukupnih fenola i kompoziciju flavan-3-ola. Primjena hladne maceracije značajno je utjecala na komponente primarnih aroma (terpena). Aromatski profil vina u ovom istraživanju praćen je preko 24 specifična spoja grupirana u osam aromatskih serija, a koje su utjecale na miris vina. Utvrđeno je da je primjena hladne maceracije u proizvodnji vina Škrleta značajno povećala pet aromatskih serija, a samo tri kod Pošipa.

Trdenić i sur. (2020.) istraživali su tijekom 2012., 2013. i 2014. godine utjecaj mineralne gnojidbe uz dodatke kalija (K) i bora (B) putem folijarne gnojidbe na komponente aroma u moštu Škrleta – klon 29, uz praćenje prosječne godišnje temperature zraka. Klon 29 odlikuje se visokom rodnošću s velikim brojem grozdova po trsu, međutim s najmanjom prosječnom masom grozda i prosječnom kvalitetom grožđa, pa se pokusnom gnojidbom željelo unaprijediti njegove proizvodne karakteristike. Primijenjena su 4 gnojidbena tretmana. Aromatski spojevi u moštu određivani su primjenom plinske kromatografije s masenom detekcijom (GC/MS). Istraživanjem nisu utvrđeni značajni učinci gnojidbenih tretmana na sadržaj primarnih aroma u moštu, ali je utvrđen statistički značajan utjecaj prosječne temperature zraka u vegetaciji. Godine (2013. i 2014.) s nižom prosječnom temperaturom zraka tijekom vegetacije imale su više vrijednosti aromatskih spojeva, osim za *β*-damaskenone čije su vrijednosti bile znatno veće u godini s višom prosječnom temperaturom tijekom vegetacije (2012.).

Lukić i sur. (2020.) istraživali su mogućnosti razlikovanja bijelih vina od pet autohtonih

established using the High-Performance Liquid Chromatography (HPLC) system, while total phenols and flavan-3-ols in wine were measured using spectroscopy. The aroma components were measured using gas chromatography.

For Škrlet, cold maceration had a significant influence on the content of total phenols and the flavan-3-ol composition. Cold maceration significantly influenced the primary aroma components (terpenes). The aromatic profile of the wine in this study examined more than 24 specific compounds, grouped into eight aromatic series, that affected the fragrance of wine. It was established that the use of cold maceration in the production of Škrlet wine significantly improved five aromatic series, as opposed to only three series in the production of Pošip.

Trdenić et al. (2020) conducted research in 2012, 2013 and 2014 on the influence of mineral fertilisers with the addition of potassium (K) and boron (B) via foliar application on the aroma components in the must of Škrlet – clone 29, while also tracking the average annual air temperature. Clone 29 features high yield with a large number of bunches on the vine, though with a smaller average bunch weight and average grape quality; therefore, experimental fertilisation was aimed at improving its production characteristics. Four different fertilisation treatments were applied. The aromatic compounds in the must were determined using gas chromatography with mass spectrometry (GC/MS). The study did not find any significant effects of fertilisation treatments on the content of primary aromas in the must, though a statistically significant difference was found in the effect of average air temperature during the vegetation season. Two years (2013 and 2014) with a lower average air temperature during the vegetation season had higher values

sorti preko njihovih aromatskih profila. U istraživanju su koristili monosortna vina Malvazije istarske, Pošipa, Škrleta, Maraštine i Kraljevine. U determinaciji hlapljivih spojeva primijenili su dvodimenzionalu plinsku kromatografiju sa spektrometrijom mase vremena leta (GCxGC-TOF-MS) i konvencionalnim jednodimenzionalnim GC/MS-om. Dobiveni podaci analizirani su uni- i multivarijatnom statističkom analizom. Kao najbolji diferencijatori sortnih vina navedenih sorti pokazali su se monoterpenski spojevi, osobito alfa-terpineol, limonen i linalool. Općenito, vino Škrleta sadržavalo je najviše monoterpena, malvazija istarska bila je dominantna u smislu koncentracije fermentacijskih etera, dok je Pošip sadržavao najviše razine pojedinih C-13-norisoprenoida, benzenoida, acetata i spojeva koji sadrže sumpor. Vino Kraljevine je karakterizirala najveća koncentracija uvjetno identificiranih terpenskih gama-dehidro-ar-himahalena, dok vino Maraštine nije imalo specifične nedvosmislene markere. Autori smatraju da bi se njihov pristup u analizi aromatskih profila mogao praktično primijeniti za napredno definiranje i upravljanje sortnom specifičnosti vina pojedinih sorti.

3.4. BOLESTI VINOVE LOZE

Istodobno s projektima klonske selekcije hrvatskih autohtonih sorti vinove loze pokrenuta su i sustavna istraživanja njihova zdravstvenog stanja, primarno stanja zaraženosti virusima koji izazivaju sistemične bolesti koje se prenose vegetativnim razmnožavanjem. Prve rezultate istraživanja prisutnosti četiri gospodarski najštetnija virusa, i to dva nepovirusa (virus lepezastog lista vinove loze - GFLV i virus mozaika gušarke - ArMV) i dva klosterovirusa (uvijenosti lista vinove loze

of aromatic compounds, with the exception of *β*-damascenone, which was significantly higher in the year (2012) with a higher average air temperature during vegetation.

Lukić et al. (2020) examined the possibilities of differentiating white wine of five different indigenous varieties based on their aromatic profiles. The study included varietal wines of the varieties Malvazija istarska, Pošip, Škrlet, Maraština and Kraljevina. In the determination of volatile compounds, they used two-dimensional gas chromatography with time-of-flight mass spectrometry (GCxGC-TOF-MS) and conventional one-dimensional GC/MS. The results were then analysed using univariate and multivariate statistical analysis. The best compounds for differentiating these wine varieties were the monoterpene compounds, particularly alfa-terpineol, limonene and linalool. In general, Škrlet wine contained the most monoterpenes, Malvazija istarska was dominant in the concentration of fermentation ethers, while Pošip contained the highest level of individual C-13-norisoprenoids, benzenoids, acetates and sulphur-containing compounds. The wine Kraljevina was characterised by the highest concentration of conditionally identified terpene gamma-dehydro-ar-himachalenes, while the wine Maraština did not have any specific and unambiguous markers. The authors stated that this approach to analysing aromatic profiles could be practically applicable for defining and managing the variety specificities of wines of specific varieties.

3.4. GRAPEVINE DISEASES

Simultaneous with the clonal selection projects for Croatian indigenous varieties of grapevine,

pridružene viruse 1 i 3, GLRaV-1 i GLRaV-3) pomoću metode ELISA (Enzyme-Linked Immunosorbent Assay), a koji uključuju i Škrlet, objavljuju Karoglan Kontić i sur. (2009.). Prema tom istraživanju u proizvodnim nasadima autohtonih sorti u Hrvatskoj utvrđena je velika prisutnost četiri štetna virusa kojih prema sustavu certifikacije ne smije biti u sadnom materijalu.

Prisutnost ovih virusa u različitim vinogorjima Hrvatske je vrlo visoka, a udio nezaraženih trsova vrlo mali. Ustanovljena je mnogo veća zaraženost u obalnom području, a nešto manja u kontinentalnom dijelu Hrvatske. U mnogim slučajevima otkrivena je istovremena zaraza s više različitih virusa. U Dalmaciji je bio najrašireniji GLRaV-3 (približno 80 % svih analiziranih trsova), a u kontinentalnom dijelu GLRaV-1 (oko 50 %). Općenito, klosterovirusi su bili značajno zastupljeniji od nepovirusa. Ukupna zaraženost u populaciji Škrleta bila je veća od 90 %, a dominantni virus bio je GLRaV-1.

Čak i u pokusnim kolekcijskim nasadima za čije je zasnivanje korišten materijal s vizualno zdravih trsova, utvrđena je visoka incidencija navedenih i još četiri dodatna virusa (Vončina i sur., 2011.). Kasnijim istraživanjima provedenima na Agronomskom fakultetu u Zagrebu u suradnji sa znanstvenicima s kalifornijskih sveučilišta Berkeley i Davis utvrđena je prisutnost i brojnih drugih virusa u našim autohtonim sortama (Vončina i sur. 2017.; Vončina i sur. 2019.), pogotovo u priobalnom području te je otkriven i jedan novi virus nazvan badnavirus vinove loze 1 (Vončina i Almeida, 2018.). Kako je zdravstveno stanje sadnog materijala od esencijalne važnosti za podizanje kvalitetnih nasada, više informacija i sam postupak zdravstvene selekcije detaljnije se opisuje u poglavlju o klonskoj selekciji.

systematic research was initiated to examine their health condition, primarily the state of infestation with viruses that cause systematic disease that can be transmitted by vegetative propagation. The first results of the research showed the presence of the four most economically damaging viruses detected using the Enzyme-Linked Immunosorbent Assay (ELISA); two nepoviruses (grapevine fanleaf virus – GFLV, and Arabis mosaic virus – arMV) and two closteroviruses (grapevine leafroll associated virus-1 and grapevine leafroll associated virus-3 - GLRaV-1 i GLRaV-3), including on Škrlet (Karoglan Kontić et al., 2009). According to that study a strong presence of all four viruses was confirmed in the production plantations of indigenous varieties in Croatia, though according to the certification system, the planting material should be virus free.

The presence of these viruses in different wine-growing regions in Croatia is very high, and the share of uninfected vines is very low. A much higher infestation rate was confirmed in the coastal zone, and somewhat less in the continental part of Croatia. In many cases, simultaneous infestations with different viruses were detected. In Dalmatia, the most widespread pathogen was GLRaV-3 (detected in almost 80% of all analysed vines), and GLRaV-1 (about 50%) was most widespread in the continental region. In general, closteroviruses were more abundant than nepoviruses. The total infestation of the Škrlet population was greater than 90%, and the dominant pathogen was GLRaV-1.

Even in the experimental collection plantations, founded using material with visually healthy vines, a high incidence of these viruses and four others was confirmed (Vončina et al., 2011). Later research conducted at the Faculty

Primjenom metoda PCR-a i RFLP-a Škorić i sur. (2011.) istraživali su geografsku distribuciju i diverzitet zlatne žutice vinove loze, sve prisutnije destruktivne bolesti u hrvatskim vinogradima, i potvrdili zaraženost sorte Škrlet, i to uzorka s područja Volodera. Ovo istraživanje ukazuje na veliku potrebu nadzora i kontrole ove vrlo destruktivne bolesti.

U ovom poglavlju vrijedno je spomenuti još jedno istraživanje, a u kojemu je objekt istraživanja bio Škrlet. Kaliterna i sur. (2012.) istraživali su sastav populacije gljiva poznatijih kao uzročnici bolesti drva vinove loze. Tom je prilikom kod sorte Škrlet s područja Popovače i Kutine utvrđena prisutnost gljiva iz porodice *Diaporthaceae*, te dosta visoka osjetljivost sorte na crnu pjegavost (*Phomopsis viticola*), a umjerena na ostale istraživane uzročnike bolesti drva.

Osim ovdje predstavljenih znanstvena istraživanja objavljeno je više stručnih radova i izrađen veći broj diplomskih radova na Sveučilištu u Zagrebu, a koji se preko ključne riječi „Škrlet" jednostavno mogu naći pretraživanjem akademskih baza podataka ili raznih internetskih tražilica.

of Agriculture, University of Zagreb, in cooperation with scientists from University of California, Berkley and University of California, Davis confirmed the presence of other numerous viruses in indigenous Croatian varieties (Vončina et al. 2017, 2019), particularly in the coastal zone, with the discovery of a new virus called the grapevine badnavirus-1 (Vončina and Almeida, 2018). Since the health condition of propagation material is of the utmost importance for raising good quality plantations, more information and the health selection procedures are described in detail in the chapter on clonal selection.

The methods PCR and RFLP were used to determine the geographic distribution and diversity of grapevine flavescence dorée, an increasingly present and destructive pathogen in Croatian vineyards (Škorić et al., 2011). Infestation of the variety Škrlet was confirmed on a sample from the Voloder area. This research indicates the great need for monitoring and control of this highly destructive disease.

In this chapter, it is worthwhile mentioning another study on Škrlet. Kaliterna et al. (2012) examined the composition of the fungal population known as a cause of disease in grapevine. The results indicated the presence of fungi from the family *Diaporthaceae* in Škrlet from the areas of Popovača and Kutina, and a high vulnerability of the variety to phomopsis cane and leaf spot (*Phomopsis viticola*), and moderate susceptibility to the other causative agents of disease to grapevine wood.

In addition to the scientific research presented here, numerous professional studies and a large number of graduate theses have been prepared at the University of Zagreb, and using a search of the key word "Škrlet" can be easily searched using academic databases or different internet search engines.

04. AMPELOGRAFSKE I GOSPODARSKE KARAKTERISTIKE ŠKRLETA

AMPELOGRAPHIC AND AGRONOMIC CHARACTERISTICS OF ŠKRLET

AMPELOGRAFSKE I GOSPODARSKE KARAKTERISTIKE ŠKRLETA

Škrlet je stara, autohtona hrvatska sorta, koja po svojim ampelografskim i gospodarskim obilježjima već duže izaziva stručnu i znanstvenu pozornost. Unatoč dugom uzgoju i nesumnjivoj važnosti sorta je ampelografski obrađena i gospodarski evaluirana tek u novije vrijeme. Kako to i s drugim starim, zanemarenim i gotovo nestalim sortama biva, dugo je postojala samo u ekstenzivnim nasadima mješovitog sortimenta, a opstanak joj je ovisio o entuzijazmu lokalnih zaljubljenika i njihovoj spremnosti da je razmnože i u pravilu zajedno s drugim sortama održavaju. Međutim, krajem 70-ih i početkom 80-ih godina 20. stoljeća dolazi do pojačanog zanimanja javnosti i struke za vina upravo tih, zaboravljenih sorti, pa je i Škrlet postao predmet stručnih radova. Tome su pogodovali rezultati prvih sortnih vinifikacija. Tako je širi uzgoj Škrleta doveo do njegove revitalizacije, a to je potaknulo znanstvena i stručna istraživanja. Nekadašnja velika tvrtka Moslavačko vinogorje podigla je osamdesetih godina 20. stoljeća nekoliko vinograda Škrleta i počela ga odvojeno vinificirati. Odmah je postao traženo vino, pored razvikanih svjetskih sorti koje su, kao i danas, prevladavale u moslavačkim vinogradima. Uslijedili su stručni projekti, ali i prva potpuna ampelografska obrada ove sorte u doktorskoj disertaciji prof. dr. Nikole Miroševića. Potom su pokrenuti drugi projekti i druga istraživanja,

AMPELOGRAPHIC AND AGRONOMIC CHARACTERISTICS OF ŠKRLET

Škrlet is an old, indigenous Croatian variety, that in terms of its ampelographic and agronomic characteristics has long attracted the attention of expert and scientific circles. Despite the long tradition of growing this grape, and its unquestionable significance, the variety was only quite recently ampelographically described and agronomically evaluated. As is the case with other old, neglected and nearly lost varieties, it was long present only in extensive vineyards with a mixed composition of varieties, and its survival depended entirely on the enthusiasm of local supporters of this grape and their willingness to propagate it to keep it, as a rule together with other varieties. Towards the end of the 1970s and in the early 1980s, there was a new interest among the public and the wine experts for these nearly forgotten varieties, and Škrlet became the subject of research and expert analysis. This was also spurred by the results of the first attempts at vinification of the variety. This led to a revitalisation and an expansion of growing Škrlet, and encouraged scientific and expert study on this variety. In the 1980s, the former large company Moslavačko Vinogorje raised several vineyards of Škrlet and began its vinification on its own as a variety. It immediately became a sought after wine, alongside the renowned global varieties that then, as now, dominated the vineyards in the Moslavina region. This was followed by

Tipični izgled grozda i lista Škrleta
Typical appearance of Škrlet's bunch and leaf

pa danas o Škrletu znamo mnogo više nego o drugim hrvatskim sortama.

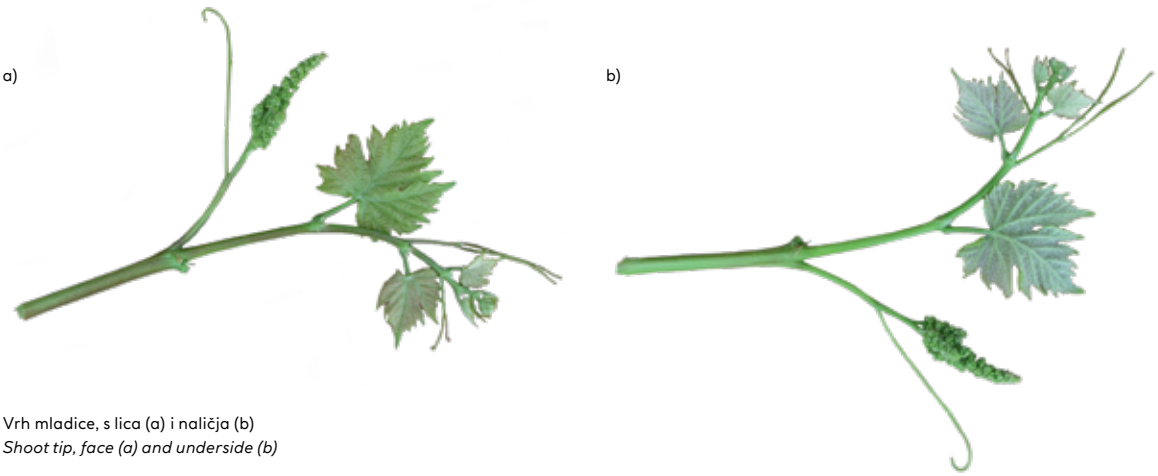
S godinama je popularnost Škrleta rasla i danas je jedna od najpopularnijih autohtonih hrvatskih sorti i jedno od najtraženijih hrvatskih vina. Po mnogo čemu je poseban, kako u vinogradu, tako i u podrumu, zahvaljujući ponajprije svojim karakteristikama. U nastavku su prikazana njegova glavna ampelografska i gospodarska obilježja utvrđena tijekom spomenutih projekata.

expert projects and the first comprehensive ampelographic description of this variety in the doctoral dissertation of Professor Dr. Nikola Mirošević. Later, other projects and research were initiated, and today we know much more about Škrlet than about many other Croatian varieties.

Over time, the popularity of Škrlet has grown, and today it is one of the most popular indigenous Croatian varieties, and one of the most sought after Croatian wines. It is special for many reasons, both in the vineyard and in the cellar, thanks to its distinctive characteristics. Below we give an overview of its main ampelographic and agronomic properties established in these projects.

Botanički opis

ZIMSKI PUP: dobro razvijen, konusan, ljuskice su tamnokestenjaste boje, pri bazi tamnije. Pri otvaranju izražene pepeljaste vunaste dlačice, iz kojih se naziru žutozelenkasti mladi listići s crvenkastim obodom.



Vrh mladice, s lica (a) i naličja (b)
Shoot tip, face (a) and underside (b)

MLADICA: Vrh mladice je otvoren, blago povijen, svjetložućkastozelenkast s blago izraženim antocijanskim obojenjem po rubu. Slabo je dlakav. Mladi listići su žljebasti (prvi na mladici), zelenkastobakrenocrvene boje, obrasli paučinastim dlakama, srednjeg intenziteta u međužilnom prostoru kao i na žilama naličja. Izraženi su vršni zupci, zelene su boje. Treći i četvrti listići su potpuno otvoreni, naborani, zelenkasti s bakrenastom nijansom, slabije izraženom nego kod najmlađih listića. Lice rijetko, a naličje srednje obraslo paučinastim dlakama, s istaknutim žilama. Zupci izraženi, oštri, posebice završeci glavnih nerava.

JEDNOGODIŠNJA ZRELA MLADICA: Rozgva je bujna, srednje debela do debela, kestenjastosmeđa, srednje dugih internodija. Uz nodije je boja intenzivnija, dobiva crvenkastoljubičastu

Botanical description

WINTER BUD: well developed, conical, scales dark chestnut colour, darker at the base. Upon opening, pronounced ash-grey woolly hairs, showing yellowish-green young leaves with a reddish edge.

SHOOT: Shoot tip is open, slightly bent, pale yellowish-green, with a slightly pronounced anthocyanin colouration along the edge. Sparsely hairy. Young leaves are ribbed (first on the shoot), greenish-copper red in colour, covered in fine webby hairs, with moderate intensity between veins and on the veins on the underside. Pronounced apical teeth, green in colour. The third and fourth leaves completely open, wrinkled, greenish with a coppery sheen, less pronounced than in the youngest leaves. Face sparsely and underside moderately covered with fine webby hairs, veins pronounced. Teeth prominent, sharp, particularly the tips of the main lobes.

ONE-YEAR SHOOTS: Cane vigorous, moderately thick to thick, chestnut brown, moderately long internode. Colour more intensive at the

a)

b)

List Škrleta s lica (a) i naličja (b)
Leaf of Škrlet, upper (a) and lower leaf surface (b)

nijansu. Posuta je sitnim točkicama. U presjeku je eliptična, dosta široke srži koja može utjecati na slabiji afinitet pri cijepljenju na podloge (srašćivanje – tvorbu kalusa između podloge i plemke).

LIST: Odrasli list je srednje velik do velik, pentagonalnog oblika i najčešće peterodijelan. Postrani gornji sinusi lista slabo su preklopljeni ili otvoreni, u obliku lire, srednje duboki i bez prisutnosti zubaca. Donji sinusi su plitki, malo otvoreni ili preklopljeni. Sinus peteljke je slabo otvoren, pri bazi u obliku slova V. Lice lista je tamnozelene boje, golo, blago mjehurasto naborano, a na naličju lista nalazimo vrlo malo paučinastih dlaka u međužilnom području. Na naličju nalazimo izražene oštre čekinjaste dlačice na glavnim žilama lista, koje mogu biti rumeno nijansirane. Peteljka lista je srednje duga ili duga, u pravilu svjetlozelena, ponekad s crvenkastom nijansom na osunčanim listovima, pri bazi zadebljala i oštro povijena.

VITICE: Jake, račvaste, uobičajenog rasporeda za vinovu lozu (00020202, odnosno dva nodija s viticama pa jedan bez itd.).

nodes, taking on a reddish-purple tone. Spattered with tiny spots. Cross-section elliptical, wide pith that may influence the weaker affinity for grafting onto substrate (callusing – tissue formed between the rootstock and the scion).

LEAVES: Adult leaf is moderately large to large, pentagonal in shape and most often with five lobes. Lateral upper lobes of the leaf slightly curled or open, lyre shaped, moderately deep and untoothed. Lower lobes shallow, somewhat open or curled. Petiolar sinus slightly open, V-shaped at the base. Leaf upper surface dark green, bare, slightly crimped. Leaf lower surface with some webby hairs between the veins. Underside with short, sharp hairs along the main leaf veins, hairs may be reddish. Petiole moderately long to long, light green as a rule, occasionally with a reddish hue on the sunny side, thickened and sharply bent at the base.

TENDRILS: Strong, branching, with typical distribution for grapevine (00020202, two nodes with tendrils and one without, etc.).

CVIJET I CVAT: Morfološki i funkcionalno dvospolan, pet prašnika koji su viši od tučka. Otvaranje cvijeta i odbacivanje cvjetne kapice je uobičajeno za *Vitis viniferu*. Cvat je srednje veličine, najčešće krilat, oblik se može razlikovati između klonova.

GROZD: Zreo grozd je srednje veličine (dužine oko 15 cm, nešto manje širok, mase oko 150 g), rastresit i konusan, s jednim do dva krilca. Rijetko je valjkast, bez krilaca (utvrđeno samo kod nekih klonskih kandidata). Peteljka grozda je najčešće srednje duljine, odrvenjela do koljenca, čvrste građe. Kod nekih genotipova je uočena i duga peteljka grozda. Kako je Škrlet osjetljiv na nepovoljne vremenske prilike u doba cvatnje i oplodnje, može biti i vrlo rastresit, ponekad i s malim, besjemenim bobicama, nastalim bez oplodnje.

FLOWER AND INFLORESCENCE: Morphological and functional hermaphrodite, five stamens longer than the pistil. Flower opening and loss of the calyptra is typical for *Vitis viniferu*. Inflorescence of medium size, usually winged, shape may differ between clones.

BUNCH: The mature bunch is of medium size (about 15 cm in length, somewhat less wide, mass about 150 g), loose and conical, with one to two wings. Rarely cylindrical, wingless (found only in some clonal candidates). Bunch peduncle most often medium length, woody to the first branch, strong. Some genotypes with a long peduncle. Since Škrlet is sensitive to unfavourable weather conditions during blooming and fertilisation, it can be very loose, occasionally with small, seedless berries, formed without fertilisation.

Grozd (a) i peteljka grozda (b)
Bunch (a) and peduncle (b)

Bobice Škrleta
Škrlet berries

BOBICE: Zrele bobice su srednje veličine (oko 15 mm u promjeru), okrugle, u pravilu zelenožute boje. Kožica je srednje debljine, a meso mekano i sočno, ukusno, svježe i voćno, vrlo diskretne sortne arome. Bobice su često posute točkicama te pjegama na osunčanoj strani, koje se stapaju u veće grimizne pjege koje mogu ponekad dati prevladavajuću boju grozdu, što se često dovodi u vezu s podrijetlom imena Škrlet. Bobice se nalaze na dugoj peteljčici, lako se otkidaju.

SJEMENKE: Kruškolike, uobičajenog izgleda kod sorti plemenite loze, najčešće kratkog, uskog i zaobljenog kljuna, srednje veličine.

BERRIES: Mature berries medium sized (about 15 mm diameter), round, as a rule greenish-yellow. Skin of moderate thickness, flesh soft and juicy, tasty, fresh and fruity, with a very discrete varietal aroma. Berries often spotted on the sunny side, spots joining to form purple blushes that can occasionally give the predominant berry colour, which is often associated with the origin of the name Škrlet (scarlet). Berries on a long pedicel, easily broken off.

SEEDS: Pear-shaped, typical shape of *V. vinifera* varieties, often with a short, narrow and rounded beak, medium sized.

Biološka i gospodarska svojstva

FENOLOŠKE KARAKTERISTIKE: Vegetacija počinje srednje rano, u uvjetima Moslavine pupovi se obično otvaraju u drugoj polovici travnja. Tople zime posljednjih godina ubrzavaju početak vegetacije, što povećava opasnost i moguće štete od kasnih proljetnih mrazova. S cvatnjom počinje uobičajeno u prvoj polovici lipnja, u toplijim godinama krajem svibnja. Ovisno o temperaturi, cvatnja završava nakon dva tjedna. Prema uobičajenoj klasifikaciji sorti s obzirom na vrijeme dozrijevanja grožđa Škrlet se ubraja u treće razdoblje (prema Pulliatu), što je nekoć bilo znatno kasnije. Tako se Škrlet gotovo bez iznimke brao u listopadu, dok se danas nerijetko pobere već početkom rujna. U nekim ekstremno toplim godinama, primjerice 2003., čak i krajem kolovoza.

Zbog globalnog zatopljenja sve se fenofaze odvijaju ranije od uobičajenih datuma, a najviše je to očito u dozrijevanju grožđa. Tako šara (početak dozrijevanja, kada bobica dostigne punu veličinu i počne mijenjati boju) u toplim godinama nastupa već početkom kolovoza, a puna (najčešće i tehnološka) zrelost u prvoj polovici rujna. Prema Miroševiću (1986.) vegetacija Škrleta traje u prosjeku 200 dana (razdoblje od pupanja do opadanja lišća).

BUJNOST: Škrlet je bujan do vrlo bujan, debelih mladica snažnog rasta u dužinu. S obzirom na bujnost valja pripaziti na izbor podloge te na gnojidbu, posebice dušikom. Bujnost će uvelike utjecati i na izbor sustava uzgoja.

OSJETLJIVOST PREMA BIOTSKIM I ABIOTSKIM ČIMBENICIMA: Škrlet je srednje osjetljiv prema bolestima i štetnicima, u prosjeku je s drugim sortama. Ne kreće prerano u proljeće,

Biological and agronomic properties

PHENOLOGICAL CHARACTERISTICS: Vegetation begins moderately early, in the conditions in Moslavina, buds usually begin to open in second half of April. Warm winters in recent years have moved up the start of vegetation, increasing the threat of potential damage caused by late spring frosts. Depending on temperature, blooming is complete after two weeks. According to the typical classification of the variety, concerning the berry maturation time, Škrlet is categorised as a third-period variety (according to Pulliat), though it was once much later. As such, Škrlet was nearly without exception harvested in October, while today it is often harvested in early September. In certain extremely hot years, such as in 2003, the harvest is in late August.

Due to global warming, all the phenophases are unfolding earlier than the usual dates, and this is most evident in berry maturation. In warmer years, the veraison (start of maturation, when the berry achieves its full size and starts to change colour) already appears in early August, and full maturation (most often technological as well) is complete in the first half of September. According to Mirošević (1986), vegetation in Škrlet lasts about 200 days on average (period from bud burst until leaf fall).

VIGOUR: Škrlet is vigorous to very vigorous, with thick shoots that are strong along the entire length. Considering the vigour of the plant, care should be taken when selecting the rootstock and with fertilisation, especially with nitrogen. Vigour will largely influence the selection of training system.

međutim visoke temperature zimi mogu izazvati suzenje i pupanje, što ga u pojedinim godinama čini osjetljivim prema kasnim proljetnim mrazovima.

S oplodnjom može imati problema i često dolazi do osipanja. Razlog za to su loše vremenske prilike u vrijeme cvatnje i oplodnje (hladno i vrlo vlažno vrijeme) te visoka bujnost, a valja pripaziti i na gnojidbu, koja u velikim količinama može dovesti do štete. Grozdovi mogu ostati rehuljavi ili s velikim udjelom sitnih, besjemenih bobica (nastalih bez oplodnje). Često se u uzgoju Škrleta primjenjuje folijarna prihrana mikroelementima pred cvatnju, ali u slučaju lošeg vremena u periodu cvatnje ni to ne pomaže. Osim na peronosporu i pepelnicu, ne pokazuje ni visoku osjetljivost prema *Botrytisu*, što može zahvaliti rehuljavom grozdu, a što je posebice važno u često vlažnim uvjetima u vrijeme dozrijevanja grožđa u Moslavini i Pokuplju.

RODNOST: U slučaju dobre oplodnje rodnost je velika, u suprotnom je osrednja, u ekstremnim slučajevima i mala. U nekim godinama na rodnost može utjecati i visok postotak nekrenulih (abortiranih) pupova. Prema Miroševiću (1986.) u pojedinim godinama i više od trećine pupova ne krene u proljeće.

KAKVOĆA: Postiže obično srednju razinu šećera u grožđu i srednju do višu razinu ukupne kiselosti. Uzgojem na prikladnim položajima i u meteorološki povoljnim godinama te uz primjenu odgovarajućeg opterećenja postiže visoku i cijenjenu kvalitetu grožđa. Obično nakuplja 17 – 18 °B, te je ukupna kiselost 7 – 8 gL^{-1}. Grožđe je ukusno, naglašene kiselosti, uz nježnu, ali zamjetnu sortnu aromu.

Ukratko, prema svojim morfološkim i fiziološkim karakteristikama sorta Škrlet pripada

SUSCEPTIBILITY TO BIOTIC AND ABIOTIC FACTORS: Škrlet is moderately susceptible to disease and pests, similar on average to other varieties. It does not start too early in spring; however, excessively high winter temperatures can cause sap flow (tiers appearance on the spur or cane cut) and bud burst, which in certain years can make it vulnerable to late spring frosts.

It may have issues with fertilisation and often results in flower loss (abscission). This is due to the poor weather conditions during blooming and fertilisation (cold and very wet weather) and the high plant fullness, and special care should be given to fertiliser application as excessive amounts can cause damages. Bunches can remain loose or with a large share of small, seedless berries (formed without fertilisation). In growing Škrlet, foliar application of microelement nutrition is often applied prior to blooming, though in the case of poor weather during the blooming period, this does not have an effect. With the exception of phylloxera and powdery mildew, it is not highly susceptible to *Botrytis*, thanks to the looseness of the bunch, as this is particularly important in the often wet conditions during grape maturation in the Moslavina and Pokuplje regions.

YIELD: When fertilisation is good, the yield is high, if it is not the yield is moderate, while in extreme conditions, the yield is low. In some years, the yield can also be affected by a high proportion of aborted buds. According to Mirošević (1986), in some years more than a third of buds do not burst in spring.

QUALITY: Usually achieves a moderate level of sugar in the berry and a moderate to high level of overall acidity. When grown in suitable positions and in favourable weather years, and

ekološko-geografskoj grupi *proles pontica*, *subproles balcanica* (klasifikacija prema ekološko-geografskom podrijetlu, Negrulj 1938.), kao i većina hrvatskih autohtonih sorti.

ENOLOŠKE KARAKTERISTIKE: Vina Škrleta su obično srednje jaka (11 – 12 vol. % alk.), srednje punog do punog tijela, naglašene svježine (6-7 gL^{-1} ukupne kiselosti izražene kao vinska kiselina). Gotovo redovito su suha, rijetko se Škrlet vinificira s ostatkom šećera. Boja je obično živa, svjetložuta s naglašenim i cijenjenim zelenkastim odsjajem. Ukupna kiselost može ponekad imati i više vrijednosti, a da to bitno ne utječe na njegove senzorne karakteristike (primjerice uravnoteženost glavnih sastojaka), što se dovodi u vezu s dobrim odnosom glavnih kiselina grožđa. Svježina je, uz naglašenu voćnost, glavna odlika vina Škrleta, pa se često ocjenjuju kao lepršava, cvjetno-voćna, lagana do srednje puna vina, diskretne, ali prisutne cvjetno-voćne sortne arome koja najviše podsjeća na citruse i jabuku, na zeleno i svježe.

Sumirajući navedeno, vina Škrleta osvajaju svojom svježinom i voćnošću, nenametljivošću te uravnoteženim odnosom glavnih sastojaka – jačine (alkohola), svježine (kiselina), punoće

with the appropriate load, it can achieve a high quality and prized grape. Usually accumulates 17–18°B, and a total acidity of 7–8 gL^{-1}. The berry is tasty with a pronounced acidity, but with a subtle though notable varietal aroma.

In summary, according to its morphological and physiological properties, the variety Škrlet belongs to the ecological geographic group *proles pontica*, *subproles balcanica* (classification based on ecological and geographic origin, Negrulj 1938), like most other Croatian indigenous varieties.

ENOLOGICAL CHARACTERISTICS: Škrlet wine is typically moderately strong (11–12 vol. % alc.), medium to full bodied, with pronounced freshness (6–7 gL^{-1} total acidity expressed as tartaric acid). It is nearly always dry, rarely is Škrlet vinified with the residual sugar. Colour is usually lively, light yellow with a pronounced and prized greenish tone. Total acidity can occasionally be higher, without significantly affecting its sensory characteristics (due to the balance of the main components), which is related to the good ratio of the main acids in the berry. Freshness, with a pronounced fruitiness, is the main characteristic of the Škrlet wine, and it is

(ekstrakta, minerala) i mirisa. Aromatski su kompleksna, srednjeg intenziteta, ali ugodna mirisa, od kojih su najčešći cvjetni (terpeni) i voćni mirisi (esteri, terpeni, norisoprenoidi) te mirisi na zeleno i svježe (C6 alkoholi). Svježina i aromatske karakteristike znatno doprinose pitkosti i atraktivnosti vina Škrleta, pa je to i njegovo glavno obilježje. U okusu također dominira svježina, pa unatoč analitički višim vrijednostima kiselosti vina u pravilu nisu neskladna. Završetak je voćni i ugodan, kratak do srednje dug, ali jasan i čist. Nisu u pravilu za dugo čuvanje, ali neke posebne berbe mogu u kontroliranim uvjetima zadržati izvrsna svojstva godinama.

Od Škrleta se mogu raditi dobri pjenušci, kao sortni ili u kombinaciji s drugim sortama. Tome doprinose lijepe i izražene kiseline i nenametljiva

often appraised as a fresh, floral-fruity, light to moderately full wine, discrete but with a present floral-fruity varietal aroma that is most reminiscent of citrus fruits and apple, green and fresh.

In summary, Škrlet wine is noted for its freshness and fruitiness, subtleness and balanced relationships of the main components – strength (alcohol content), freshness (acid), fullness (extracts, minerals) and aroma. The aromas are complex with a moderate intensity, but pleasant fragrance, most often floral (terpenes) and fruity (esters, terpenes, norisoprenoids) fragrances, and the fragrance of greenness and freshness (C6 alcohols). The freshness and aromatic characteristics strongly contribute to the smooth flavour and attractiveness of Škrlet wine, making this is main characteristic. The flavour is also dominated by freshness, and

aroma, a rade se uglavnom tradicionalnom metodom (*méthode champenoise*, sekundarna fermentacija u boci), a zasigurno bi dobre rezultate postigao i s jednostavnijom i jeftinijom metodom, drugim vrenjem u tanku (*Charmat*). U posljednje vrijeme neki se proizvođači odlučuju na tzv. pet-nat (*pétillant naturel)* tehnologiju, što podrazumijeva samo jednu fermentaciju, koja se djelomično odvija u tanku, a dijelom u boci.

Škrlet se nije nametnuo kao sorta za predikatna vina, duže čuvanje na trsu ne dovodi do željenih rezultata (koncentracija šećera i kiselosti, razvoj plemenite plijesni). Međutim, možda bi neka druga tehnološka rješenja (npr. prosušivanje u kontroliranim uvjetima) dala zadovoljavajuće rezultate, što nažalost do sada nije dovoljno istraženo. Vina od sličnih sorti i iz sličnih ekoloških uvjeta (npr. Vin Santo iz

despite the analytically higher values of acidity, in the wine these are, as a rule, not unbalanced. The finish is fruity and pleasant, short to medium long, but clear and clean. They are generally not to be kept for long, though certain special vintages may, under controlled conditions, retain their excellent qualities for years.

Škrlet can also be used to make good sparkling wines, as a varietal wine or in a blend with other varieties. This is thanks to its lovely and pronounced acidity and subtle aroma. These sparkling wines are typically made using the traditional method (*méthode champenoise*, secondary fermentation in the bottle), and good results would certainly also be achieved using the simpler and less expensive method of a long fermentation in the tank (*Charmat*). In recent years, producers have also opted for the pet-nat (*pétillant naturel)* technology, which requires only one fermentation that is performed partly in the tank and partly in the bottle.

Škrlet has not shown an affinity to be a predicate wine; keeping it on the vine longer has not given the desired results (concentrations of sugar and acidity, development of noble rot). However, it is possible that other technological solutions (such as drying under controlled conditions) could give satisfactory results, though this has not yet been sufficiently researched. Wines of similar varieties and from similar ecological conditions (e.g., Vin Santo from Tuscany, and some of our *passito* (*prošek*) wines) could be a model towards creating a suitable dessert wine made from Škrlet, and therefore it could be represented in all categories on the market.

THREATS TO THE POPULATION AND PROTECTION MEASURES: According to the criteria for determining the endangerment of grape

Toscane, ali dijelom i naši prošeci) mogli bi biti model na putu do odgovarajućeg desertnog vina od Škrleta, pa bi na taj način na tržištu bile zastupljene sve kategorije.

UGROŽENOST POPULACIJE I MJERE ZAŠTITE: prema kriterijima za određivanje ugroženosti sorata vinove loze (Maletić i sur., 2015.), a sukladno kategorizaciji IUCN-a (International Union for Conservation of Nature, Međunarodna unija za očuvanje prirode) Škrlet više nije ugrožena sorta, nisu potrebne mjere zaštite. Populacija je u porastu, sorta se sve više sadi i pojava klonskog sadnog materijala dodatno joj jamči stabilnu budućnost.

varieties (Maletić et al., 2015), and in accordance with the categorization of the International Union for Conservation of Nature (IUCN), Škrlet is no longer an endangered variety, and does not require any protection measures. The population is growing the variety is being increasingly planted, and the appearance of clonal propagation materials further guarantees it a stable future.

05. PODRUČJE UZGOJA I OKOLINSKI UVJETI
GROWING AREA AND ENVIRONMENTAL CONDITIONS

PODRUČJE UZGOJA I OKOLINSKI UVJETI

Sva zemljopisna područja na kojima se uzgaja vinova loza karakteriziraju određene klimatske i geomorfološke prilike. Svaka manja ili veća cjelina s obzirom na svoja klimatska obilježja (temperaturu, oborine, kretanje vjetra itd.) i geomorfološka svojstva (sastav tla, nagib terena itd.) u kombinaciji sa sortom uvjetuje specifičnu kakvoću grožđa, a time i kakvoću te stil budućega vina. Pored prirodnih uvjeta za kvalitetu grožđa bitan je i utjecaj čovjeka – tehnološki postupci, tradicija nekog područja i sl., što se skupno označava imenom *terroir*.

Kako bi se svi ti faktori koji utječu na uspješan uzgoj vinove loze što bolje objedinili za neko vinorodno područje, provedena je u svim zemljama svijeta regionalizacija vinogradarske proizvodnje.

U Republici Hrvatskoj vinogradarska područja podijeljena su na vinogradarske regije, podregije i vinogorja te vinogradarske (klimatske) zone proizvodnje. To je definirano Pravilnikom o zemljopisnim područjima uzgoja vinove loze (NN 76/2019) donesenima temeljem članka 7. Zakona o vinu (NN 32/2019). Njime su definirani i ovi pojmovi, a pri podjeli su se, osim okolišnih čimbenika, uvažavale i administrativne granice gradova i općina (vidljivo u sustavu ARKOD).

Hrvatska je podijeljena na četiri regije (Slavoniju i Hrvatsko Podunavlje, Hrvatsku Istru

GROWING AREA AND ENVIRONMENTAL CONDITIONS

All geographical locations where grapevine is grown are characterised by specific climatic and geomorphological conditions. In any region, large or small, these specific climatic characteristics (temperature, rainfall, wind, etc.) and geomorphological features (soil composition, slope, etc.) in combination with the variety will give rise to a specific grape quality, which in turn affects the quality and style of the future wine. In addition to natural conditions, human impacts are also relevant for grape quality, including technological procedures, regional traditions and more. All this, collectively, is known as the *terroir*.

In order to consolidate all the factors that impact the success of viticulture at a particular wine-growing location, countries around the world have embarked on the process of regionalisation of wine production.

In the Republic of Croatia, wine-growing areas are classified into wine regions, subregions, and wine-growing hills, as well as wine-growing (climatic) production zones. This is regulated in the Ordinance on geographical locations for grapevine cultivation (Official Gazette 76/19), which was adopted pursuant to Article 7 of the Wine Act (Official Gazette 32/19). The Ordinance also defines these terms, and the classification was developed based both on environmental factors and the administrative borders

i Kvarner, Dalmaciju te Središnju bregovitu Hrvatsku) i 12 podregija, koje se dalje dijele na vinogorja. Smisao ove podjele je u činjenici da različita područja neke zemlje imaju i različite okolišne uvjete za uzgoj vinove loze, pa se sukladno tome preporučuju sorte koje će i ostvariti najveći dio svojega gospodarskog potencijala na određenom području. Škrlet se uzgaja u vinogradarskoj regiji Središnja bregovita Hrvatska, preporučena je sorta za podregije Moslavina, Pokuplje i Prigorje – Bilogora. Možemo ga pronaći i u susjednim područjima, ali u znatno manjoj mjeri.

Okolišni uvjeti (ponajprije klimatski i pedološki) u najvećoj mjeri određuju pogodnost nekog područja za uzgoj određene sorte. U uskoj vezi s tim je i reljef, posebice u kontinentalnim vinogorjima, pa ovim čimbenicima i pridajemo najveću važnost jer u pravilu najviše utječu na kvalitetu grožđa i vina.

5.1. PODREGIJA MOSLAVINA

Vinogradi ove podregije navezani su ponajprije na Moslavačku goru, koja se pruža središnjim dijelom u smjeru sjeverozapad–jugoistok i koja je najzaslužnija za reljef podregije. Moslavačka gora relativno je niska (najviši vrh Humka je na 489 m n/m), sastavljena od eruptivnih i metamorfnih stijena (granit, dijabaz, pegmatit, gnajs...). Njezino prigorje čine taložni sedimenti prapora, pijeska, šljunka i gline. Reljef je prilično heterogen, a vinogradi se nalaze na blago položenim jugoistočnim i jugozapadnim padinama, na nadmorskim visinama od 120 do 200 m, što je svojevrsni specifikum s obzirom na to da se većina vinograda u regiji Središnja bregovita Hrvatska nalazi iznad 200 m nadmorske visine.

of towns and municipalities (according to the Land Parcel Identification System (ARKOD)).

Croatia is divided into four wine regions (Slavonia and Hrvatsko Podunavlje, Croatian Istria and Kvarner, Dalmatia, and Central Hilly Croatia) and 12 subregions, which are further divided into wine-growing hills. The idea behind this classification is that different locations in a country also have different environmental conditions for grapevine cultivation, and accordingly different varieties that are able to achieve their maximum economic potential are recommended in that particular area. Škrlet is grown in the wine region of Central Hilly Croatia and it is the recommended variety for the subregions of Moslavina, Pokuplje, and Prigorje–Bilogora. It is also found in neighbouring locations, but to a significantly lesser extent.

The environmental conditions (primarily climatic and pedological) will primarily determine whether a particular location is suitable for growing a particular variety. Relief is also very important in this regard, especially in continental wine-growing areas. This is the reason why we attribute the greatest importance to these factors, as they generally have the greatest impact on the quality of grapes and future wine.

5.1. MOSLAVINA SUBREGION

Vineyards in this subregion are primarily linked to the Moslavačka Gora hills, extending centrally through this subregion, with a northwest-southeast orientation as the primary relief feature in this subregion. The Moslavačka Gora hills are relatively low hills (the highest peak Humka is at an elevation of 489 m), composed of igneous and metamorphic rocks (granite, diabase, pegmatite, gneiss...). The foothills are

Moslavački vinogradi

Moslavina vineyards

Obronci Moslavačke gore po sastavu su taložine nastale trošenjem kristalnih stijena iz trupine Moslavačke i Dilj gore. Prevladavaju različiti pijesci i gline nastali erozijom i taloženjem za vrijeme povlačenja Panonskog mora. Zbog vrlo povoljnog odnosa pijeska i gline u njihovu sastavu, tla karakteriziraju vrlo uravnoteženi vodozračni odnosi. Od tipova tala pojavljuje ih se tek nekoliko – najčešći su lesivirano tlo na lesu i lesivirano pseudoglejno, koja se svrstavaju u klasu umjereno pogodnih tala za uzgoj loze, te pseudoglejno tlo (srednje duboko i duboko) koje spada u klasu ograničeno pogodnih tala.

Podregiju čine dva vinogorja: Voloder – Ivanić-Grad i Čazma.

Glavnina vinograda se pruža od ivanićgradskih gorica na zapadu preko Popovače, Volodera, Kutine i Ilove do Novske na istoku, a

composed of sediments of loess, sand, gravel, and clay. The relief is rather heterogeneous, while vineyards are located on the gentle slopes facing southeast or southwest, at elevations from 120 m to 200 m. This is quite specific since most of the vineyards in the Central Hilly Croatia region are located at elevations over 200 m.

The slopes of the Moslavačka Gora hills are sedimentary deposits formed by the wearing of crystalline rock from the body of the Moslavačka Gora and Dilj Gora hills. Various types of sands and clays are prevalent, formed by erosion and deposition at the time of the retraction of the Pannonian Sea. Due to the highly favourable ratio of sand to clay, these soils are characterised by an excellent water-to-air balance. In terms of soil types, there are only a few, the most common are loessified soil on loess and

Vinogradi u okolici Popovače

Vineyards in the vicinity of Popovača

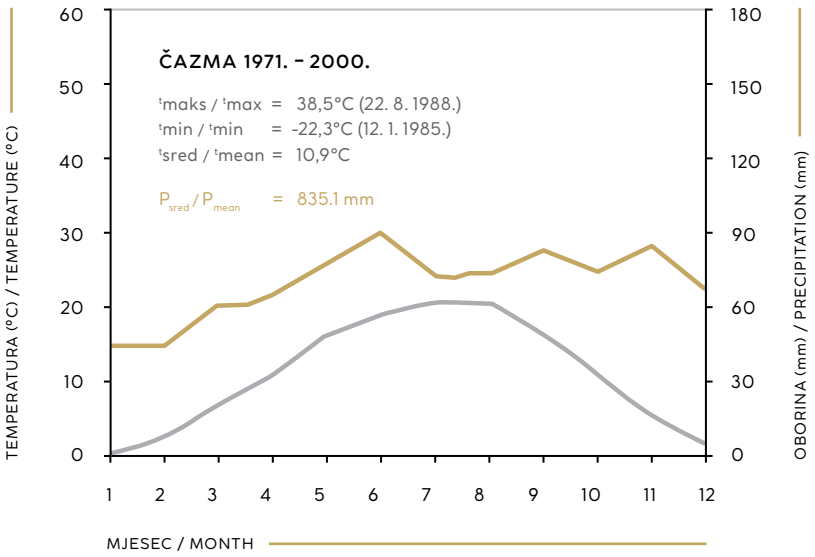
najpoznatiji položaji su Kloštar Ivanić, Grabersko Brdo, Ruškovačka kosa, Voloder, Gračenica, Jelenska, Repušnica i Gojlo. Sjeverni dio podregije čine Čazma i Garešnica, s položajima Korčani, Sv. Vid, Štefanjski breg, Jandrija, Veltlinska, Pobjenik, Sukaja, Dišnik, Bršljanica, Trnovitica i Gornja Garešnica (Mirošević i sur., 2009.).

Opći klimatski pokazatelji relevantnih postaja ne izdvajaju ovo područje od ostalog dijela sjeverozapadne Hrvatske, a specifičnost položajima daje ekspozicija i nadmorska visina. Srednja godišnja temperatura iznosi 11,5 °C, srednja vegetacijska (IV. - IX. mj.) 17,9 °C, uz 1.917 sati sijanja sunca. Godišnje oborine su 807 mm, od toga u vegetaciji padne više od polovice, 455 mm.

loessified pseudogley soil, that are included in the class of soils with moderate suitability for viticulture, and pseudogley soil (medium deep and deep) in the class of soils with limited suitability for viticulture.

The subregion consists of two wine-growing hills: Voloder/Ivanić-Grad and Čazma.

Most vineyards extend from the Ivanić-Grad hills in the west across Popovača, Voloder, Kutina and Ilova to Novska in the east. The best known sites are Kloštar Ivanić, Grabersko Brdo, Ruškovačka Kosa, Voloder, Gračenica, Jelenska, Repušnica, and Gojlo. The northern part of the subregion is formed by Čazma and Garešnica with wine-growing positions at Korčani, Sv. Vid, Štefanjski Breg, Jandrija, Veltlinska, Pobjenik,



GRAFIKON 5.1. Osnovni klimatski pokazatelji izmjereni na meteorološkoj postaji Čazma za referentni niz godina (1971. – 2000.)

GRAPH 5.1. *Main climatic indicators measured at the Čazma weather station for the reference series of years (1971 – 2000)*

5.2. PODREGIJA POKUPLJE

Reljef podregije Pokuplje vrlo je razveden, pretežito brežuljkasto-brdovit, a karakteriziraju ga obronci Vukomeričkih gorica, Zrinske i Petrove gore te dolina rijeke Kupe i njezinih pritoka koji se protežu cijelim područjem. Vinogradarstvo ovoga područja nije osobito razvijeno, najmanje je vinograda u odnosu na druge podregije. Međutim, područje obiluje brojnim padinama, brežuljcima, brdima različitih nagiba i ekspozicija, što ga čini potencijalno vrlo zanimljivim za proizvodnju grožđa i vina.

Uzgoj vinove loze nije u značajnoj mjeri ni tradicija područja. Međutim, na nekim položajima u okolici Karlovca i Draganića, Novigrada, Duge Rese i Barilovića njeguje se uzgoj vinove loze, a u posljednje vrijeme javlja se povećan interes za sadnjom. Vinograde nalazimo i na obroncima Vukomeričkih gorica te u okolici Petrinje. Vinogradi se nalaze na nadmorskim visinama od 170 do 400 m, pretežito 180 – 220 m. Što se tala tiče, klasu pogodnih čine

Sukaja, Dišnik, Bršljanica, Trnovitica, and Gornja Garešnica (Mirošević et al., 2009).

The general climatic indicators at the relevant stations indicate that these sites do not vary significantly from the rest of northwest Croatia, though these sites are specific due to their exposition and elevation. The mean annual temperature is 11.5°C, mean temperature during the growing season (April–September) is 17.9°C, with 1917 hours of sunlight. The annual precipitation is 807 mm, with more than half falling during the growing season (455 mm).

5.2. POKUPLJE SUBREGION

The relief in this subregion is quite indented, mostly hilly, characterised by the slopes of the Vukomeričke Gorice, Zrinska Gora, and Petrova Gora hills, and the valley of the Kupa River and its tributaries flowing throughout the subregion. Viticulture is not particularly developed in the subregion, with fewer vineyards here

vrlo male površine lesiviranoga tla na laporu. U umjereno ograničena tla spadaju lesivirana pseudoglejna tla, eutrično smeđa tla i rendzine. U ograničeno pogodna tla spadaju distrično smeđa tla, pseudogleji obronačni te lesivirana tla na vapnencima. Ograničenja u uzgoju kod nižih kategorija lošiji su vodozračni odnosi u tlu, niži pH, te iskoristiva dubina tla i nagibi terena (Mirošević i sur., 2009).

Podregiju čine tri vinogorja: Karlovačko i Petrinjsko te vinogorje Vukomeričke gorice.

Srednja godišnja temperatura kreće se oko 11 °C. U tijeku vegetacije nakupi se suma efektivnih temperatura od 1.300 – 1.400 °C. Zime su vrlo hladne te se temperatura može spustiti i do -26 °C. Tijekom ljetnih mjeseci dovoljno je sunca i topline, a temperature katkad dosežu i 39 °C.

Godišnja količina oborina kreće se oko 900 – 1.000 mm, a zbog razmjerno ravnomjernog rasporeda (oko polovice ukupne količine padne u vrijeme vegetacije) loza ima na raspolaganju dovoljno vlage za rast i razvoj. U nekim su godinama jeseni izrazito kišne, što može donekle poremetiti tijek dozrijevanja i intenzivirati napad gljivičnih bolesti.

Iz najvažnijih meteoroloških podataka vidljivo je da su ove dvije podregije pogodne za uzgoj

than in other subregions. However, the area has numerous slopes, hillocks, hills with various degrees of steepness and exposition, making it potentially interesting for the production of grapes and wine.

Grapevine cultivation is not a significant tradition here. However, at some position around Karlovac and Draganić, Novigrad, Duga Resa, and Barilović, viticulture is a cherished custom, with increased interest for new planting in recent years. Vineyards are also found on the hillsides of the Vukomeričke Gorice hills and in the vicinity of Petrinja. Vineyards are found at elevations from 170–400 m, and usually from 180–220 m. In terms of the soil and its suitability for viticulture, there are small patches of leossified soil on marl that can be considered suitable for viticulture. Soils with moderately limited suitability include leossified pseudogley soil, eutric brown soil, and rendzina. Soils with limited suitability are dystric brown soil, pseudogley on slope, and leossified soil on limestone. Limitations in viticulture in the case of lower categories are a poorer soil water-air balance, lower pH, usable soil depth and terrain slope (Mirošević et al., 2009).

The subregion consists of three wine-growing hills: Karlovac, Petrinja, and the Vukomeričke Gorice hills.

The mean annual temperature is around 11°C. During the growing season, the effective temperature sum is from 1300–1400°C. Winters are very cold and temperatures can drop to -26°C. During the summer months, there is enough sunshine and heat and temperatures sometimes reach 39°C.

Annual precipitation ranges from 900–1000 mm and in view of the relatively uniform distribution (around half falling during the vegetation season), grapevine receives sufficient moisture for growth and development. In some

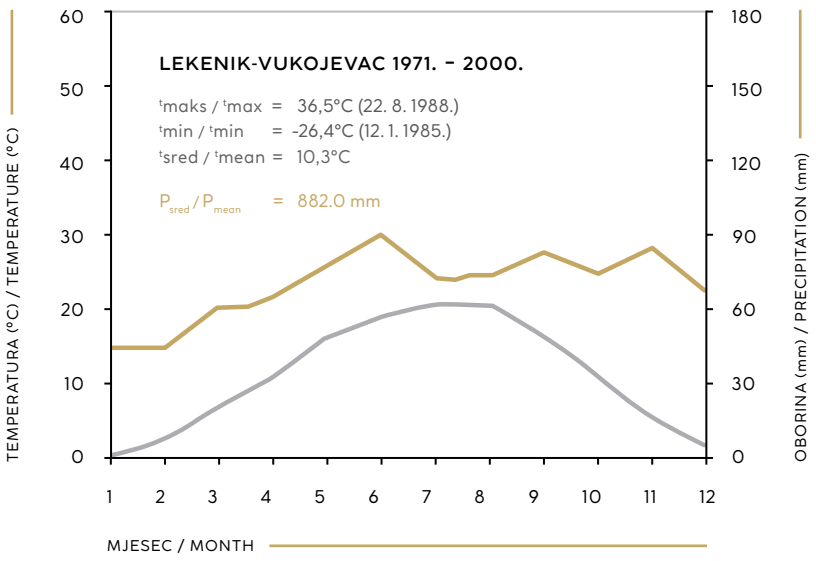
Vinogradi u Pokuplju (Vivodina)

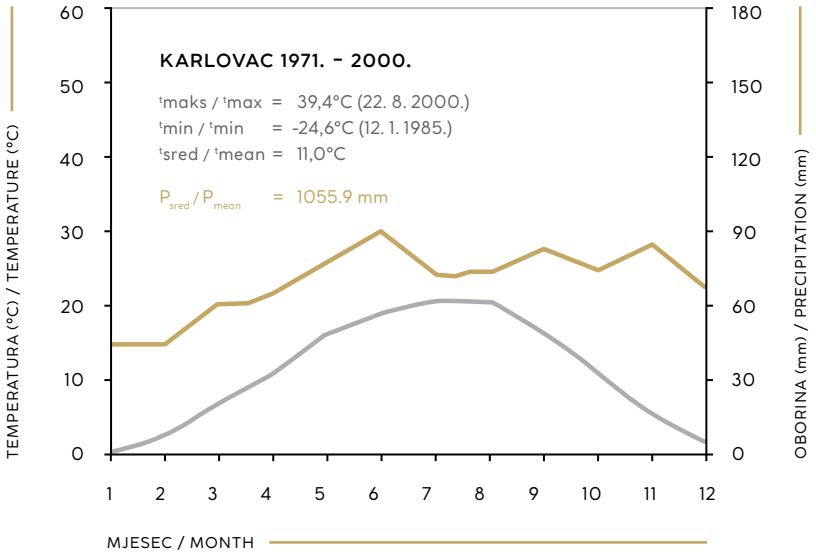
Vineyards in Pokuplje (Vivodina)

vinove loze. Prevladavaju tipični kontinentalni uvjeti, što s jedne strane znači da se vinova loza uzgaja pretežito na toplim južnim i jugozapadnim položajima na obroncima spomenutih planina. Umjerena kontinentalna klima, koja ponajprije podrazumijeva tople dane i svježe noći, dovoljno vlage i u vegetacijskom razdoblju, vrlo povoljno utječe na karakteristike nekih bijelih sorti, a Škrlet je nesumnjivo među njima. Očito je interakcija sorte i okoline u ovom slučaju za Škrlet vrlo povoljna, što pokazuje kvaliteta njegovih vina.

years, there can be pronounced rainfall in autumn, which can affect the course of maturation and intensify attacks by fungal diseases to a certain degree.

It is evident from the most relevant weather data that these two subregions are suitable for viticulture. They are characterised by typical continental conditions, which on the one hand means that grapevine is primarily grown on the warmer south and southwest facing slopes of these hills. The temperate continental climate, which implies warm days and cool nights, and sufficient moisture during the vegetation season, has a particularly favourable impact on the characteristics of certain white varieties, and Škrlet is certainly among them. There is an evident interaction between the variety and its environment which here is highly favourable for Škrlet, as seen in the quality of its wines.





GRAFIKON 5.2. Klimatski pokazatelji s nekih postaja podregije
GRAPH 5.2. *Climatic indicators from two stations in the subregion*

06. KLONSKA SELEKCIJA
CLONAL SELECTION

KLONSKA SELEKCIJA

Iako se sorte vinove loze u praksi održavaju i razmnožavaju vegetativnom reprodukcijom (kloniranjem), što pretpostavlja genetičku istovjetnost potomaka, u vinogradima se mogu uočiti pojedinačni trsovi koji po nekim karakteristikama grozda ili lista manje ili više odstupaju od uobičajenih sortnih karakteristika. Iz toga proizlazi da i grozdovi i bobice različitog oblika i dozrelosti dovode do heterogenosti kvalitete mošta i vina. Vinova loza je vrlo prilagodljiva vrsta, pa pojedini trsovi (ili skupine trsova) mogu, ovisno o variranju uzgojnih uvjeta, promijeniti izgled i fiziološka svojstva. Iz brojnih istraživanja i iskustava poznato je da dva genetički identična trsa u različitim agroekološkim uvjetima mogu poprimiti značajno različit izgled i dati mošt različite kvalitete. Na konačnu vrijednost fenotipa nekog trsa (izvedbu genotipa u određenoj okolini) ponajprije utječe genotip (genetička konstitucija), ali i okolina, tj. dostupnost vode, svjetla, topline, hranjiva, kao i zaraženost uzročnicima bolesti te različita podloga ili starost trsa. Ukratko, iako bi svi trsovi jedne sorte u vinogradu u teoriji trebali imati jednak izgled i fiziološke procese, u stvarnosti je prisutna i uočljiva stanovita fenotipska varijabilnost. U vinogradu je relativno jednostavno uočiti morfološke i fiziološke posebnosti (odstupanja) pojedinih trsova u odnosu na prosječni fenotip populacije, ali nije jednostavno otkriti njihove uzroke. Najčešći uzroci unutarsortne varijabilnosti u vinogradu

CLONAL SELECTION

Although in practice grapevine varieties are maintained and propagated by vegetative reproduction (cloning), which implies genetically identical descendants, in vineyards it is possible to observe individual vines that differ more or less from the usual varietal characteristics in terms of a property of the bunch or of the leaf. It follows from this that bunches and berries of different form and levels of ripeness lead to heterogeneity in the quality of both the must and the wine. Grapevine is a highly adaptable species and depending on the variations in cultivation conditions, individual vines (or groups of vines) of the same variety may exhibit changes in appearance and physiological properties. Numerous studies and a broad range of experience have shown that two genetically identical vines, cultivated under different growing conditions, may develop differing appearances and produce must of differing quality. The final phenotype value of a given vine (the performance of a genotype in a given environment) is impacted primarily by the genotype (genetic constitution), but also by the environment, i.e., access to water, light, warmth, and nutrients, the degree of disease infestation, differences in rootstock, or the age of the vine. In short, although all vines of a given variety in a vineyard should in theory exhibit the same appearance and physiological processes, in reality there is

su nehomogeni uzgojni uvjeti (heterogenost tla, različit položaj ili starost pojedinih trsova), zaraženost virusima te mutacije pojedinih trsova.

Promjene fenotipa zbog okolinskih čimbenika nisu nasljedne i prestankom stresnog ili iznimno povoljnog djelovanja nekog čimbenika on se vraća u osnovno stanje. Isto tako, potomstvo iz razmnožavanja biljaka čija je fenotipska promjena uvjetovana okolinskim čimbenicima neće zadržati promijenjen izgled. Izuzetak su sistemične bolesti poput viroza čiji se uzročnici (virusi) razmnožavanjem prenose na vegetativno razmnožene potomke i u njima nastavljaju svoje djelovanje. Međutim, ako je promjena fenotipa posljedica mutacije gena, ona se u pravilu trajno zadržava i prenosi razmnožavanjem na iduća potomstva.

Učinak mutacija na vrijednost fenotipa može biti i pozitivan i negativan. Iz iskustva znamo da mutirana biljka (mutant) najčešće poprima lošija svojstva od prosjeka populacije sorte, ali ponekad je riječ o poboljšanju u odnosu na izvorni genotip. Posljedično se tijekom više generacija razmnožavanja starih autohtonih sorti u populacijama (vinogradima) i zbog velikog broja razmnoženih jedinki u populaciji sorte postupno nakupljaju mutanti te sorta prestaje biti genetički uniformna. Stoga mnogi trsovi u vinogradu, iako na oko vrlo sličnog izgleda, nemaju više identičan genotip, a posljedica variranja genotipa u populaciji sorte je unutarsortna genetička varijabilnost.

Smisao klonske selekcije jest u populaciji sorte otkriti i razmnožiti pozitivne mutante te njihovim daljnjim kontroliranim razmnožavanjem stvoriti sadni materijal za podizanje novih nasada čija će proizvodna vrijednost biti veća od originalne populacije sorte. Potomstvo pozitivnog mutanta izdvojenog iz neke sorte čija je vrijednost potvrđena u postupku individualne

an observable degree of phenotypic variability. Observing morphological and physiological specificities (deviation) of individual vines in relation to the average phenotype population is relatively easy in the vineyard; discovering the causes, however, is not simple. The most frequent causes of intravarietal variability in vineyards are non-homogeneous cultivation conditions (soil heterogeneity, differences in the position or age of individual vines), viral infection, and mutation in individual vines.

Phenotypic changes induced by environmental factors are not inheritable and, with the cessation of the stressful or very favourable action of a given factor, the base condition of a phenotype is restored. Likewise, descendants from the propagation of plants in which a phenotypic change has been induced by environmental factors will not retain the altered appearance. The exceptions are systemic diseases such as viral infection, the causative agents (viruses) of which are transmitted through propagation to vegetatively propagated descendants in which they persist. If, however, the phenotypic change is the result of gene mutation, this, as a rule, is permanently retained and is transmitted by propagation to the next generation.

The impact of a mutation on phenotypic value may be either positive or negative. We know from experience that a mutated plant (mutant) usually acquires properties poorer than the average of the varietal population, though at times there may be an improvement in relation to the original genotype. Consequently, over the course of multiple generations of the propagation of old indigenous varieties in populations (vineyards), and on account of the great number of propagated specimens in a varietal population, a variety will gradually accumulate mutants, and the variety ceases to

klonske selekcije u rasadničarstvu nazivamo klonom.

Proizvodnja loznog sadnog materijala u Hrvatskoj do prije 10-15 godina, a posebno autohtonih sorti, u pravilu je pretpostavljala samo vrlo površnu (vizualnu) genetičku i zdravstvenu selekciju. U najvećem broju slučajeva za autohtone sorte nisu uopće postojali zasebni matičnjaci, već su se pupovi za razmnožavanje uzimali iz proizvodnih nasada. Zbog takve prakse loši proizvodni rezultati nekih autohtonih sorti, u usporedbi sa stranima, čiji su nasadi podignuti s kvalitetnim, u pravilu certificiranim sadnim materijalom iz uvoza, najvećim su dijelom proizlazili iz lošeg zdravstvenog stanja i genetičke heterogenosti nasada, a ne zbog niskog potencijala same sorte. Stoga je postalo jasno da je jedino ispravno rješenje koje može dovesti do kvalitetnog (genetički ujednačenog i dovoljno zdravog) sadnog materijala Škrleta (ali i drugih autohtonih sorti) provedba individualne klonske selekcije.

Metoda individualne klonske selekcije postupak je genetičkog i zdravstvenog poboljšanja postojećih sorti koje se razmnožavaju vegetativnim putem. Riječ je o dugotrajnom i skupom postupku koji čini nekoliko usporednih ili vremenski odvojenih faza: (1) odabir elitnih trsova, (2) zdravstvena (fitosanitarna) selekcija, (3) selekcija potomstava elitnih trsova (klonskih kandidata), (4) zaključno ispitivanje i priznavanje (homologacija). Prije konačnog cilja – dobivanja cjepova klona – potrebno je uspostaviti i održavati matične nasade.

U nekoliko idućih cjelina iznosimo temeljna znanja, stručne postupke, metode i propise u provedbi klonske selekcije te cjelovit niz radnji provedenih u projektu klonske selekcije Škrleta od 2000. do 2015.

be genetically uniform. Thus, many vines in a vineyard, although of very similar appearance, are no longer of an identical genotype, and the consequence of genotypic variation in a varietal population is intravarietal genetic variability.

The purpose of clonal selection is to detect and propagate positive mutants in a population and to employ controlled propagation to create propagating material with which to raise new plantations, in which the productive value will be greater than the original varietal population. The term clone refers to the descendants of a positive mutant isolated from a variety whose value is confirmed in the process of individual clonal selection in a nursery.

Up to ten to fifteen years ago the production of propagating material in Croatia in particular for indigenous varieties involved, as a rule, only very superficial (visual) genetic and sanitary selection. In most cases there were no separate mother blocks for indigenous varieties; propagation buds were taken, rather, from productive plantations. In comparison with foreign varieties, for which most plantations were raised with high-quality and, as a rule, imported and certified propagating material, the poor production of some indigenous varieties was due largely to the poor health and genetic heterogeneity in the plantations, and not due to any low potential of the variety itself. It was thus evident that the only proper solution that could lead to high quality (genetically uniform and sufficiently healthy) propagating material of Škrlet (and other indigenous varieties) was to implement individual clonal selection.

The individual clonal selection is a method of genetic and sanitary improvement of existing varieties that are vegetatively propagated. This is a lengthy and costly process that comprises a number of parallel or separate phases:

6.1. POSTUPAK INDIVIDUALNE KLONSKE SELEKCIJE

Individualna klonska selekcija ima za cilj izdvajanje klonova unutar pojedine sorte koji se u odnosu na standard sorte ili u odnosu na postojeće klonove u pozitivnom smislu razlikuju prema pojedinim gospodarski važnim svojstvima. Od početnog izdvajanja matičnih trsova u proizvodnim nasadima do završnoga kruga selekcije nastoji se izdvojiti najbolje klonske kandidate i jasno definirati sva njihova svojstva. Navedenim postupkom utvrđuje se je li riječ o stabilnim promjenama (mutacijama) ili modifikacijama koje su nastale pod utjecajem okoline. Kao što je već navedeno, riječ je o dugotrajnom postupku koji prethodi izdvajanju najboljih klonskih kandidata. Međutim, u kontekstu kvantitativnih svojstava koja se najčešće istražuju riječ je o relativno kratkom periodu njihova ispitivanja i stoga se ne mogu do kraja precizno utvrditi predmetna svojstva u odnosu na sve uvjete u kojima će se isti klonovi u budućnosti uzgajati. Zbog niza interakcija u kasnijem uzgoju izdvojenoga klona (genotipa), tj. djelovanja različitih biotskih i abiotskih čimbenika koje nije moguće uključiti u postupak selekcije, podaci o svojstvima klonova moraju se promatrati u kontekstu uvjeta u kojima se ona provodi (npr. lokacija, korištena podloga, sustav uzgoja, ampelotehnika, gnojidba i sl.). Unatoč relativno dugotrajnom postupku istraživani klonovi možda uopće neće biti izloženi pojedinim ekstremnim okolinskim uvjetima koji bi dali uvid u neke od njihovih karakteristika. Najbolji je primjer osjetljivost na sivu plijesan koja se može utvrditi samo u slučaju ako su u vrijeme selekcije bili izuzetno vlažni uvjeti u fazi dozrijevanja grožđa. S druge strane, istraživanjima u sklopu selekcije moguće je

(1) selection of elite vines, (2) sanitary selection, (3) selection of descendants of elite vines (candidate clones), (4) final testing and certification (homologation). Mother block plantations must be established and maintained before the final objective is achieved: the production of clone grafts.

Below we present the fundamental know-how, expert processes, methods and regulations in the implementation of clonal selection, and a comprehensive series of operations performed in the Škrlet clonal selection project from 2000 to 2015.

6.1. INDIVIDUAL CLONAL SELECTION PROCEDURE

The objective of individual clonal selection is to select clones from a particular variety that exhibits positive differentiation of certain agronomically important trait in relation to the varietal standard, or in relation to existing clones. From the initial isolation of mother vines in production plantations to the final round of selection, efforts are made to single out the best candidate clones and to clearly define all their properties. This procedure determines whether these are stable changes (mutations) or modifications induced by environmental factors. As noted, this is a lengthy process preceded by the selection of the best candidate clones. However, in terms of the quantitative properties most often analysed, the period of research has been relatively short, and it is still not possible to fully and precisely determined their traits in relation to all the conditions in which these clones will be cultivated in the future. Given the range of interactions that will take place in the subsequent cultivation of an isolated clone

utvrditi pojedina svojstva za koja je poznato da izravno ili neizravno doprinose većoj ili manjoj osjetljivosti na sivu plijesan kao što su zbijenost grozda i debljina kožice.

Za više detalja o ciljevima, mogućnostima i metodama klonske selekcije čitatelji se upućuju na udžbenik *Vinova loza – ampelografija, ekologija i oplemenjivanje* (Maletić i sur., 2008.).

Izbor elitnih trsova Škrleta i ispitivanja njihovih klonskih potomstava

Godine 2000. počela je prva faza projekta individualne klonske selekcije cv. Škrlet bijeli koji je provodio stručni tim zagrebačkog Agronomskog fakulteta uz financijsku potporu i suradnju najprije Udruge vinogradara i voćara „Lujo Miklaužić" iz Kutine, a potom niz godina Sisačko-moslavačke županije. Posao na selekciji počeo je u jesen 2000. obilaskom više starih vinograda (starijih od 40 godina) diljem Moslavine i Pokuplja. Selekcija u širem prostoru i u starim vinogradima, koji nisu podizani s cjepovima već su razmnožavani na stari način (cijepljenjem na mjestu), pretpostavlja veću unutarsortnu genetičku varijabilnosti. Za podizanje mlađih vinograda s gotovim cjepovima pupovi su u pravilu uzimani samo iz ograničenog broja matičnih nasada, što smanjuje vjerojatnost pronalaska različitih i pozitivnih mutanata. Na temelju detaljnog pregleda više stotina trsova unutar jednog vinograda odabrano je tek nekoliko njih koji su se izdvajali od prosjeka populacije temeljem dobre bujnosti, odsutnosti simptoma bolesti te posebno uočenim pozitivnim karakteristikama grozda i bobice. Tijekom ove terenske selekcije pregledano je više od 10.000 trsova Škrleta. Ovi tzv. elitni trsovi odlikovali su se različitom krupnoćom, oblikom i zbijenošću grozda, različitom krupnoćom i obojenošću bobice, kao i različitom ocjenom kvalitete bobice

(genotype), i.e., the impacts of various biotic and abiotic factors that cannot be included in the selection process, the data on clone properties should be considered in the context of the selection conditions (e.g., location, rootstock used, cultivation system, ampelographic technique, fertilisation, etc.). In spite of the relatively lengthy process, the studied clone may not at all be exposed to any extreme environmental conditions that would shed insight into some of their traits. The best example of this is susceptibility to grey mould, which can only be determined if during the selection process the grapes were subject to extremely wet conditions in the ripening phase. On the other hand, selection research can identify individual properties known to contribute, directly or indirectly, to greater or lesser susceptibility to grey mould, such as bunch compactness and skin thickness.

For greater detail on clonal selection objectives, possibilities, and methods, see the textbook *Vinova loza – ampelografija, ekologija i oplemenjivanje* [Grapevine: Ampelography, Ecology and Breeding], Maletić et al., 2008).

Selection of elite Škrlet vines and testing their clonal descendants

The first phase of the individual clonal selection project for the cultivar Škrlet bijeli was launched in 2000 by a specialist team of the Faculty of Agriculture, University of Zagreb. The project was financially and professionally supported initially by the Kutina-based Lujo Miklaužić Wine and Fruit Growers Association, and, later and for a number of years, by Sisak-Moslavina County. Selection work commenced in autumn 2000 with a tour of many old vineyards (40+ years) across the Moslavina and Pokuplje regions. Selection in the broader area and in old vineyards not established using

Podizanje prvih eksperimentalnih nasada s prvorazmnoženim klonskim linijama. Prvi pokusni nasadi podignuti su u Popovači i Repušnici u suradnji s vinarijom Miklaužić i vinarijom Mikša. Cijepljenje tehnikom „zeleno-na-zeleno" obavio je Ivan Gašpar, dipl. ing. agr. Ivan Gašpar provodio je i prve mikrovinifikacije eksperimentalnih klonova iz svog vinograda.

Raising the first experimental plantations with first-propagated clone lines. The first experimental plantations were planted in Popovača and Repušnica in cooperation with the Miklaužić Winery and the Mikša Winery. The „green-to-green" grafting was performed by Ivan Gašpar, B.Sc. ing. agr. Ivan Gašpar also carried out the first micro-vinifications of experimental clones from his vineyard.

(mjerenje sladora refraktometrom i organoleptička ocjena). Sve uočene karakteristike evidentirane su u selekcijske obrasce, a odabrani trsovi propisno su obilježeni kako bi im se tijekom kasnijih dolazaka u iste vinograde brzo pristupilo radi provjere stabilnosti svojstava u idućim godinama i uzimanja pupova za razmnožavanje.

Tijekom 2000. odabrane su i dvije prikladne parcele na koje su posađene ožiljene bezvirusne podloge za buduće selekcijske nasade u kojima će se provoditi individualna klonska selekcija. Na lokaciji Popovača posađene su ožiljene podloge K5BB, a na lokaciji Repušnica podloge SO4, na koje su se od 2001. metodom zeleno-na-zeleno cijepili pupovi uzeti s elitnih trsova odabranih u prethodnoj i kasnijim godinama.

Tijekom nekoliko godina izdvojeno je više od 100 elitnih trsova s područja Moslavine i Pokuplja, a od svakog elitnog trsa uzgojeno je po pet klonskih potomaka u eksperimentalnim nasadima u Popovači i Repušnici. U tim nasadima idućih godina (nakon ulaska u rod) detaljno se

grafted rootstock, but rather propagated using the old method (on-site/field grafting), implies greater intravarietal genetic variability. When raising younger vineyards with prepared grafted rootstock, buds are taken only from a limited number of mother block plantations, as this reduces the likelihood of finding diverse and positive mutants. Based on a detailed examination of several hundred vines within a single vineyard, only a few are selected as standing out from the population average based on good vigour, the absence of disease symptoms, and positive characteristics of the bunch and berries. This field selection included over 10,000 Škrlet vines. "Elite" vines were distinguished by differences in bunch size, shape and compactness, differences in berry size and colouration, and by differing evaluations of the quality of berries (measuring sugar content with a refractometer and organoleptic evaluation). All of the observed characteristics were recorded in the selection forms and the selected vines were

analiziraju klonska potomstva na sljedeća svojstva: vrijeme cvatnje i oplodnje, tip i bujnost rasta, karakteristike lista i mladica, koeficijenti rodnosti, broj grozdova i prinos po trsu te prosječna masa grozda i bobice. Bilježena su i svojstva poput oblika, zbijenosti grozda, pojave i odsutnosti krilaca grozda, pojava simptoma bolesti te sve druge posebnosti koje su uočene na elitnim trsovima. Iz grožđa u berbi pojedinih klonskih kandidata uzimani su prosječni uzorci mošta koji su analizirani na sadržaj šećera i ukupnih kiselina, a u kasnijim godinama za odabrane klonske kandidate provode se i detaljnije analize mošta što uključuje kompoziciju šećera i kiselina te analizu spojeva odgovornih za primarne arome. Sve ovo istovjetno je provođeno u oba selekcijska nasada, a dobiveni podaci analizirani su odgovarajućim statističkim metodama iz čega se postupno otkrivala genetička posebnost pojedinih klonova.

Tijekom 2003., nekoliko godina prije nego što će u Hrvatskoj biti moguće obaviti službenu analizu zdravstvenog stanja i certifikaciju sadnog materijala, uzorci manjeg broja perspektivnih klonskih kandidata Škrleta šalju se u laboratorij prof. dr. Ernsta Rühla, tadašnjeg ravnatelja Instituta za vinovu lozu u Geisenheimu (Njemačka), koji provodi testiranje ELISA na prisutnost štetnih virusa. Već iz prvih rezultata postaje jasno da je stupanj zaraženosti štetnim virusima vrlo visok i da će samo manji broj klonskih kandidata biti zdravstveno prihvatljiv za nastavak selekcije. U ponovljenom i proširenom testiranju tijekom 2004. nalaz se potvrđuje. Do 2006. provedene su planirane analize agronomskih svojstava te su svi klonski kandidati testirani na prisutnost virusa. Od ukupno 105 elitnih trsova izdvojeno je samo 11 (10 %) bezvirusnih klonskih kandidata i još nekoliko njih koji su se odlikovali vrijednim karakteristikama,

properly marked to facilitate rapid access during subsequent visits to vineyards to monitor the stability of properties in following years and to take buds for propagation.

Two suitable plots were selected in 2000 on which virus-free rooted rootstocks were planted for future selection plantations in which individual clonal selection would be performed. K5BB rooted rootstocks were planted at the Popovača location and SO4 rootstock at the Repušnica location; from 2001 the green-grafting method was used to graft buds taken from the elite vines selected in the previous and later years.

Over 100 elite vines were isolated over a number of years from the Moslavina and Pokuplje regions, with five clonal descendants grown from each elite vine at the experimental plantations in Popovača and Repušnica. Over the following years (following first yield), a detailed analysis of clonal descendants was performed at these plantations for the following properties: time of blooming and fertilisation, type and vigour of growth, leaf and shoot characteristics, yield coefficient, the number of bunches and yield per vine, and average bunch and berry weight. Other properties were also recorded, such as bunch shape and compactness, presence or absence of winged bunches, appearance of any disease symptoms, and any other specific trait observed on the elite vines. Average samples of must were taken from grapes harvested from individual candidate clones and analysed for sugar content and total acidity, while in later years a more detailed analysis of must was performed for select candidate clones, including sugar and acid composition, and an analysis of the primary aromatic compounds. All this was performed concurrently at both selection plantations, and the obtained data were analysed using appropriate statistical methods, which

Prof. dr. Ernst Rühl (prvi s lijeva), Hoschschule Geisenheim University, Njemačka i njegov tim, Bettina Lindner (druga s lijeva) i Frank Manty (drugi s desna) bili su savjetnici u projektu klonske selekcije Škrleta. Klonska selekcija kao metoda oplemenjivanja vinove loze prvi put je primijenjena u ovoj ustanovi, osnovanoj davne 1872.

Prof. Dr. Ernst Rühl (first from left), Hoschschule Geisenheim University, Germany and his team, Bettina Lindner (second from left) and Frank Manty (second from right) were advisors in the Škrlet clonal selection project. Clonal selection as a method of grapevine breeding was first applied in this institution, founded in 1872.

ali zbog zaraženosti pojedinim virusima nisu bili spremni za daljnje faze klonske selekcije. Jedan od takvih, klonski kandidat ŠK-57, koji se odlikuje posebno malim grozdom i visokim sladorom, u sklopu znanstvene suradnje upućen je na postupak eliminacije virusa u *Foundation Plant Services* (FPS), kalifornijsko sveučilište Davis, te danas predstavlja sastavni dio njihove svjetski poznate kolekcije sorti vinove loze. Iako je taj trs bio zaražen uvijenosti lista vinove loze pridruženim virusom 1 (GLRaV-1), u međuvremenu je provedena njegova uspješna sanitacija (uklanjanje virusa) te se u skoroj budućnosti može očekivati njegov povratak u bezvirusnom stanju u Hrvatsku.

Kako certificirani klonski sadni materijal mora biti slobodan od gospodarski najštetnijih

gradually revealed the genetic specificities of individual clones.

In 2003, several years before it would be possible to publish an official analysis concerning the sanitary status and to certify propagating material in Croatia, samples of a small number of promising Škrlet candidate clones were submitted to the laboratory of Ernst Ruehl, then director of the Geisenheim Grape Breeding Institute (Germany), to perform serology test ELISA for the presence of economically important (harmful) viruses. It was clear from the initial results that the viral infestation rate was very high and that only a small number of candidate clones would be suitable for further selection based on their health. Repeated and expanded testing in 2004 confirmed these findings. The planned analyses of agronomic properties were performed up to 2006, with all candidate clones tested for the presence of viruses. Of the 105 elite vines, only 11 (10%) virus-free candidate clones were isolated, along with a few exhibiting valuable characteristics, but not ready for the further phases of clonal selection on account of infection with individual viruses. One of these candidate clones, ŠK-57, characterised by a particularly small bunch and high sugar content, was submitted to the Foundation Plant Services of the University in California, Davis (FPS UC Davis) for virus elimination procedures as part of a research collaboration, and it is now an integral part of the organisation's internationally recognised registry of grapevine varieties. Although that vine was infected by grapevine leafroll-associated virus 1 (GLRaV-1), its successful sanitation (virus elimination) has since been performed and we can expect its return to Croatia in virus-free condition in the near future.

As certified clonal propagating material must be free of the economically important viruses,

Posao na provedbi klonske selekcije Škrleta započeo je podizanjem klonskih potomstava na lokacijama Popovača i Repušnica 2000. godine. Vlado Mikša (stariji i mlađi) iz vinarije Mikša i Marko Miklaužić (vinarija Miklaužić) osigurali su eksperimentalne površine unutar svojih vinograda te sudjelovali u berbama i analizama klonskih kandidata.

Work on the implementation of the clonal selection of Škrlet began with the raising of clonal offspring at the locations of Popovača and Repušnica in 2000. Vlado Mikša (senior and junior) from the Mikša winery and Marko Miklaužić (Miklaužić winery) provided experimental fields within their vineyards and participated in the harvesting and analysis of clone candidates.

virusa, u drugu fazu klonske selekcije uključeni su samo klonski kandidati slobodni od njih. Bitan čimbenik vrijednosti klonskog sadnog materijala upravo je njihovo dobro zdravstveno stanje (fitosanitarni status) jer dugovječnost nasada i kvaliteta grožđa u najvećoj mjeri ovise upravo o zdravstvenom stanju trsova. Stoga se

the second phase of clonal selection included only those candidate clones free of these pathogens. Good health (phytosanitary status) is a critical factor in the value of clonal propagating material, because vineyard longevity and grape quality depend primarily on vine health. Consequently, special regulations stipulate the testing

posebnim propisima utvrđuju način ispitivanja te kriteriji fitosanitarnog statusa kojima mora udovoljavati certificirani sadni materijal. Zbog toga je zdravstvena selekcija vrlo važna komponenta klonske selekcije. Međutim, poznavanje simptoma i štete koju uzrokuju virusi i slični vegetativno prenosivi uzročnici bolesti te načina njihove detekcije i sanitacije mogu biti i od šireg interesa. Stoga se u sljedećem poglavlju ukratko opisuju najvažnije vegetativno prenosivi uzročnici bolesti vinove loze, kako one korištene u postupku klonske selekcije Škrleta, tako i neke koje za sada ne ulaze u sustav certifikacije, ali će ih svakako biti nužno uključiti u buduće programe klonske selekcije.

6.2. ZDRAVSTVENA SELEKCIJA I NAJVAŽNIJI VEGETATIVNO PRENOSIVI PATOGENI VINOVE LOZE

Zdravstvena selekcija, odnosno odabir biljaka sukladno njihovoj otpornosti na različite biljne patogene (gljive, bakterije, viruse) te s obzirom na njihovo zdravstveno stanje u pogledu vegetativno prenosivih uzročnika bolesti (virusa i bakterija/fitoplazmi), neizostavan je i važan dio selekcijskog procesa. Pored dobro poznatih pseudogljivičnih i gljivičnih bolesti vinove loze kao što su pepelnica (*Erysiphe necator*), plamenjača (*Plasmopara viticola*), siva plijesan (*Botryotinia fuckeliana*) te crna pjegavost rozgve (*Phomopsis viticola*) u današnje vrijeme posebna pozornost posvećuje se bolestima koje se prenose sadnim materijalom i čija se kontrola ponajprije zasniva na korištenju zdravog, odnosno certificiranog sadnog materijala. Među navedene patogene ubrajaju se virusna oboljenja, odnosno viroze te oboljenja uzrokovana bakterijama, odnosno

methods and the required phytosanitary status criteria that certified propagating material must meet. Selection based on sanitary status, then, is a critical component of clonal selection. Our knowledge of the symptoms and damage caused by viruses or similar vegetatively transmitted diseases and detection and sanitation methods may also, however, be of wider interest. The following chapter gives a briefly overview of the most important vegetatively transmissible grapevine agent of diseases, both in the Škrlet clonal selection process and some not currently included in the certification system, but will certainly need to be included in future clonal selection programmes.

6.2. SANITARY (HEALTH-BASED) SELECTION AND THE MOST SIGNIFICANT VEGETATIVELY TRANSMITTED PATHOGENS OF GRAPEVINE

Sanitary (health-based) selection, i.e., the selection of plants based on their resistance or tolerance to various plant pathogens (fungi, bacteria, viruses) and based on their health in terms of vegetatively transmitted pathogens (viruses and bacteria/phytoplasmas), is an essential and critical part of the selection process. In addition to the well-known pseudofungal and fungal diseases affecting grapevine, such as powdery mildew (*Erysiphe necator*), downy mildew (*Plasmopara viticola*), grey mould (*Botryotinia fuckeliana*), and phomopsis cane and leaf spot (*Phomopsis viticola*), particular attention is now focused on diseases transmitted through propagating material. This is best controlled through the use of healthy, i.e., certified, plating material. These pathogens include both viral and

bakterioze. Vinova loza drvenasta je kultura s najvećim brojem poznatih virusnih oboljenja, čak više od stotinu. Nasreću, samo se njihov manji broj uzima u obzir i preporučuje se da sadni materijal bude slobodan od tih tzv. ekonomski značajnih virusa. Nasuprot tome u novije vrijeme znatno su se proširile bakterijske bolesti koje uzrokuju veliku štetu i u pojedinim su vinogradarskim regijama u vrlo kratkom periodu poprimile epidemijske razmjere, primjerice zlatna žutica vinove loze te crno drvo.

U posljednjih 15-ak godina sa sortom Škrlet napravljen je značajan napredak u pogledu zdravstvenog stanja sadnog materijala. Od velikog broja odabranih elitnih trsova za samo 10 % utvrđeno je da su slobodni od četiri ekonomski najznačajnija virusa, a kao najzastupljeniji pokazao se uvijenosti lista vinove loze pridruženi virus 1 (GLRaV-1), čija je pojavnost iznosila čak 85 %. U kasnijem procesu formiranja matičnjaka Škrleta i praćenju zdravstvenog stanja klonskih kandidata pridružuje se Zavod za fitopatologiju Agronomskog fakulteta u Zagrebu. U ponovljenom testiranju triju registriranih klonova 2018. nisu utvrđeni zaraženi trsovi u matičnim nasadima. Od ukupno 70 analiziranih trsova prisutnost virusa GLRaV-1 (naknadna infekcija) utvrđena je kod samo jednog, podrijetlom iz eksperimentalnog nasada podignutog 2001., što svjedoči da se virusi od osnivanja eksperimentalnih i matičnih nasada nisu značajno proširili.

Danas je zdravstveno stanje kojem mora udovoljavati materijal namijenjen za vegetativno razmnožavanje vinove loze reguliran *Pravilnikom o stavljanju na tržište materijala za vegetativno umnažanje loze* te njegovim izmjenama i dopunama („Narodne novine" br. 133/06, 67/10, 30/11, 77/13, 49/20). Sukladno Pravilniku reprodukcijski materijal mora biti

bacterial diseases. Grapevine is a woody crop with the highest known number of viral diseases over one hundred. Fortunately, only a small number are considered and propagating material should be free of these economically significant viruses. Recently, in contrast, we have seen the significant spread of bacterial diseases that cause massive damage, such as flavescence dorée and bois noir (black wood), that in some wine regions have reached epidemic proportions over a very short span of time.

Over the 15 years, significant progress has been achieved with the health of propagation material of the Škrlet variety. Of the larger number of selected elite vines, only 10% were determined to be free of the four economically most important viruses, and the most prevalent was grapevine leafroll-associated virus 1 (GLRaV-1), present in 85% of vines. The Department of Plant Pathology at the Faculty of Agriculture, University of Zagreb later joined the process of the formation of Škrlet mother blocks and the monitoring of the sanitary status of candidate clones. No infected vines were found in the mother block plantations in a repeated testing of three registered clones in 2018. The GLRaV-1 (a subsequent infection) was found in only one out of 70 analysed vines, originating from an experimental plantation raised in 2001, indicating that viruses have not spread significantly since the establishment of the experimental and mother block plantations.

Current sanitary requirements for material intended for the vegetative propagation of grapevines is regulated under the Ordinance on the marketing of materials for the vegetative propagation of grapevines (and its amendments) (Official Gazette 133/06, 67/10, 30/11, 77/13, 49/20). Pursuant to this Ordinance,

praktički slobodan od štetnih organizama koji smanjuju njegovu korisnost i kvalitetu te mora biti u skladu sa zahtjevima koji se odnose na karantenske štetne organizme i karantenske štetne organizme zaštićenih područja u Europskoj uniji koji su utvrđeni u provedbenim aktima. U uzorkovanju i ispitivanju zdravstvenog stanja reproduktivnog materijala primjenjuju se protokoli Europske i sredozemne organizacije za zaštitu bilja (eng. *European and Mediterranean Plant Protection Organization*, EPPO) ili drugi međunarodno priznati protokoli.

Od reguliranih nekarantenskih štetnih virusa čiju je prisutnost u matičnjacima potrebno utvrditi vizualnim pregledom, a po potrebi i uzorkovanjem i laboratorijskim analizama, ubrajaju se oni iz tri skupine:

I. infektivna degeneracija
   a) virus lepezastog lista vinove loze, akronim GFLV (engl. *grapevine fanleaf virus*)
   b) virus mozaika gušarke, akronim ArMV (engl. *arabis mosaic virus*)
II. kompleks uvijenosti lista vinove loze
   a) uvijenosti lista vinove loze pridruženi virus 1, akronim GLRaV-1 (engl. *grapevine leafroll-associated virus 1*)
   b) uvijenosti lista vinove loze pridruženi virus 3, akronim GLRaV-3 (engl. *grapevine leafroll-associated virus 3*)
III. podloge bilja roda *Vitis* spp. i njihovih križanaca, osim u slučaju europske vinove loze, obavezno je praćenje prisutnosti virusa pjegavosti vinove loze, akronim GFkV (engl. *grapevine fleck virus*).

Iako su problemi zbog ovih virusa daleko izraženiji u priobalnom području Hrvatske, njihova sporadična, a u nekim slučajevima i

propagation material must be free of harmful organisms that reduce its usefulness and quality and must comply with requirements pertaining to quarantine harmful organisms and quarantine harmful organisms in protected areas in the European Union as set out in implementing acts. The protocols of the European and Mediterranean Plant Protection Organization (EPPO) or other internationally recognised protocols, are applied in the sampling and testing of the sanitary status of reproductive material.

There are three groups of regulated non-quarantine harmful viruses whose presence in mother blocks are determined by visual inspection, and, if necessary, by sampling and laboratory analysis:

I. Infectious degeneration
   a) grapevine fanleaf virus (GFLV)
   b) arabis mosaic virus (ArMV)
II. Grapevine leafroll complex
   a) grapevine leafroll-associated virus 1 (GLRaV-1)
   b) grapevine leafroll-associated virus 3 (GLRaV-3)
III. Mandatory monitoring for the presence of grapevine fleck virus (GFkV) in the rootstock of plants of the genus *Vitis* spp. and their hybrids, except in the case of the European grapevine

Although problems associated with these viruses are far more pronounced in Croatia's coastal regions, their sporadic, and in some cases significant occurrence has also been observed in the continental regions, primarily the viruses from the infectious degeneration group, grapevine leafroll-associated virus 1, and grapevine fleck virus. Problems associated with phyto-

značajna pojava zabilježena je i u kontinentalnom području, ponajviše virusa iz skupine infektivne degeneracije, uvijenosti lista vinove loze pridruženog virusa 1 te virusa pjegavosti vinove loze. U posljednjih desetak godina sve je izraženiji i problem vezan uz fitoplazme (zlatna žutica i crno drvo). Stoga će u nastavku biti detaljnije opisane najznačajnije i najučestalije viroze te bolesti uzrokovane fitoplazmama u Hrvatskoj.

INFEKTIVNA DEGENERACIJA. S obzirom na simptome koje uzrokuju na zaraženoj lozi, kod oba virusa iz skupine razlikujemo dva soja: deformirajući i kromogeni.

Deformirajući sojevi virusa na listovima uzrokuju asimetričnost i naboranost te pojačanu nazubljenost ruba lisne plojke, na rozgvi duple nodije, skraćene internodije povremeno praćene neujednačenim odrvenjavanjem, nenormalnim grananjem te cik-cak rastom, smanjen je broj grozdova koji su reducirane veličine, često rehuljavi i s neujednačenim dozrijevanjem bobica unutar grozda.

Kromogeni sojevi uzrokuju promjene u pigmentaciji listova, najčešće je riječ o žućenju u intenzitetu od nekoliko sporadičnih pjega do cijele površine lista. Do promjena u boji rijetko može doći i na mladicama, viticama i cvatovima.

Simptomi su najuočljiviji u proljeće, dok s povišenjem temperature tijekom ljetnih mjeseci postaju manje zamjetni. Osim zaraženim sadnim materijalom, koji je glavni način dolaska, odnosno unosa ovih virusa u nezaraženo područje, širenje unutar istih ili susjednih vinograda odvija se uz pomoć vektora – u slučaju virusa lepezastog lista vinove loze to je američka kopljasta nematoda (*Xiphinema index*), dok je prijenosnik virusa mozaika gušarke europska kopljasta nematodoa (*Xiphinema diversicaudatum*). Zbog

plasmas (flavescence dorée and bois noir) have become increasingly pronounced over the past decade. The most significant and common viral and phytoplasma caused diseases in Croatia will, therefore, be described in more detail below.

INFECTIOUS DEGENERATION. Based on the symptoms they cause on an infected vines, two strains can be distinguished in both viruses from this group: distorting and chromogenic.

Distorting strains of the viruses cause leaf asymmetry and puckering and increased serration at the margin of the leaf blade, double nodes on canes, shortened internodes sometimes accompanied by uneven lignification, abnormal branching, and zig-zag growth, with a reduction in the number and size of bunches that are often loose with irregular ripening of berries in the bunch.

Chromogenic strains cause problems with leaf pigmentation, usually yellowing ranging in intensity from a few sporadic spots to the entire leaf surface. Rarely there can also be discolouration of the shoots, tendrils and blossoms.

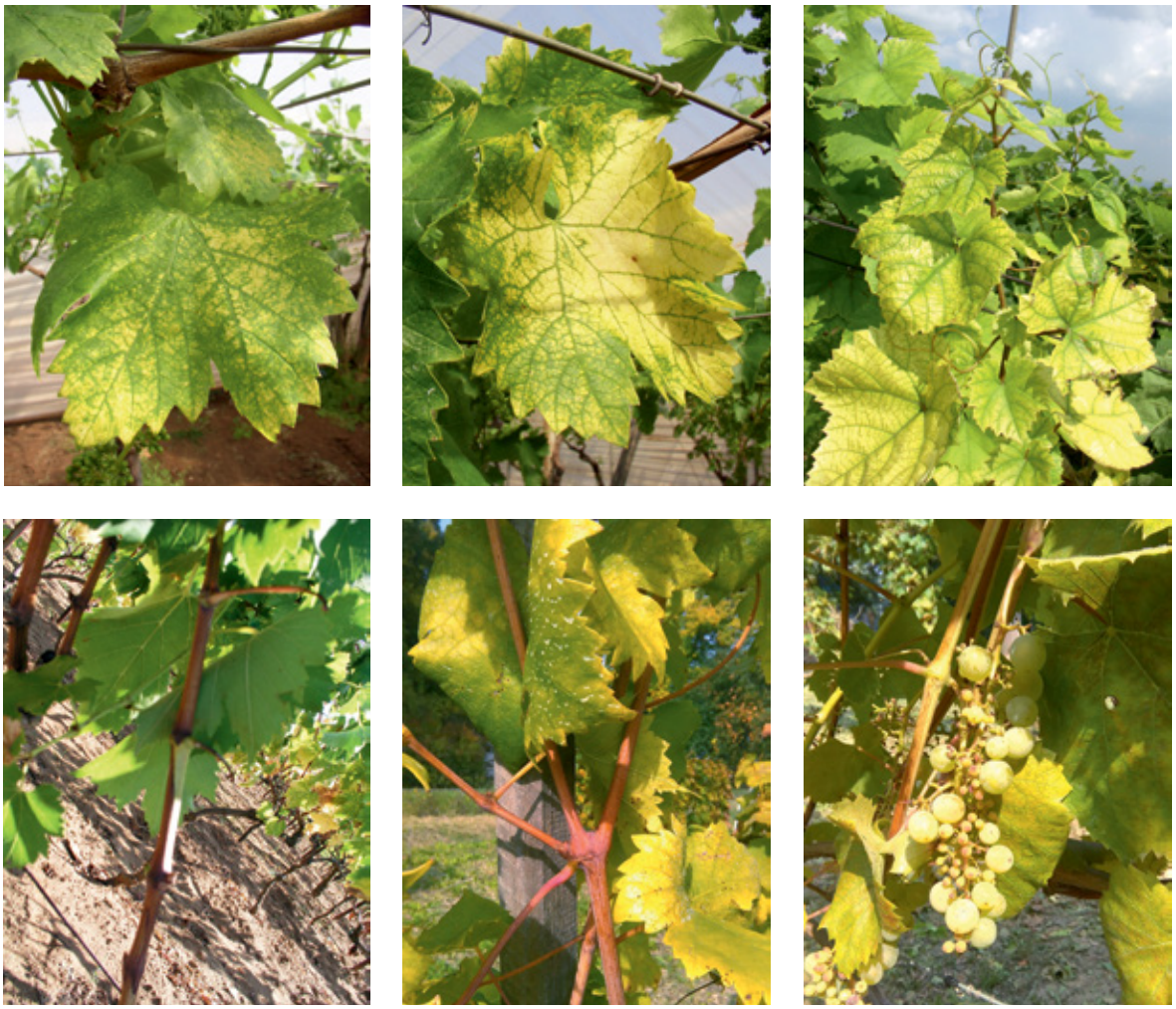
The symptoms are most evident in the spring and become less noticeable in the summer with the increase of the temperature. Along with infected propagating material, the primary way of the arrival, i.e., introduction of these viruses into an uninfected area, spread within a vineyard or to a neighbouring vineyard, occurs via a vector; in the case of the grapevine fanleaf virus this is the Californian dagger nematode (*Xiphinema index*), while the vector of the arabis mosaic virus is the European dagger nematode (*Xiphinema diversicaudatum*). The low mobility of the vectors usually means that infections occur in oases and spread between neighbouring plants.

Studies conducted over the past two decades have found a significant prevalence of this virus

slabije pokretljivosti vektora zaraze se obično javljaju u oazama te se šire između susjednih biljaka.

Istraživanjima provedenim u zadnjih dvadesetak godina utvrđena je značajnija rasprostranjenost virusa ove skupine, ponajprije lepezastog

group, primarily grapevine fanleaf virus, in our coastal regions and on our islands, with sporadic occurrence recorded in continental Croatia. The associated detrimental effect depends primarily on the susceptibility of the variety; all European vine varieties are considered sus-



Simptomi zaraze kromogenim i/ili deformirajućim sojevima virusa iz skupine infektivne degeneracije (virus lepezastog lista vinove loze i virus mozaika gušarke). Simptomi na listu mogu varirati od sporadičnih žutih pjega do požutjelosti cijele lisne plojke ili izboja (gore); neujednačeno odrvenjavanje te nepravilno grananje rozgve (dolje lijevo i sredina), neujednačeno dozrijevanje bobica unutar grozda (dolje desno).

Symptoms of infection with chromogenic and/or distorting strains of viruses from the infectious degeneration complex (grapevine fanleaf virus and arabis mosaic virus). Foliar symptoms may vary from scattered yellow spots to the yellowing of the entire leaf surface or shoot (top); irregular lignification and abnormal branching of the cane (bottom left and middle), non-uniform berry ripening in a bunch (bottom right).

lista vinove loze, u našem priobalnom području i na otocima, dok je njegova sporadična pojava zabilježena i na području kontinentalne Hrvatske. Štetnost prije svega ovisi o osjetljivosti sorte te se smatra da su sve sorte europske loze osjetljive. Iako izravnih podataka o štetnosti ovih virusa kod sorte Škrlet nema, prema istraživanjima provedenima na sortama Chardonnay, Traminac i Muškat bijeli na području Francuske, Italije i Njemačke utvrđen je negativan utjecaj na prinos u rasponu od 23 do 93 %. Također, utvrđeno je smanjeno stvaranje drva kod podloga za 64 %, ukorjenjivanja za 60 % te negativan utjecaj na srašćivanje podloge i plemke i uspješnost cijepljenja od svega 10 do 26 %.

KOMPLEKS UVIJENOSTI LISTA VINOVE LOZE. Iako postoji više virusa iz ove skupine, ekonomski najznačajnijima smatraju se dva: uvijenosti lista vinove loze pridruženi virusi 1 i 3. Za oba je utvrđeno da se pojavljuju širom svijeta i ubrajaju se u najrasprostranjenije i najučestalije viruse vinove loze. Kao što im i naziv sugerira, najuočljiviji simptom zaraze je uvijanje ruba lisne plojke prema dolje uz karakteristično žućenje (odnosno crvenilo kod crnih sorti), pri čemu usko područje oko žila zadržava zelenu boju.

Prve promjene boje počinju najčešće u kasno ljeto, a do kraja ljeta, odnosno početka jeseni čitava površina lista mijenja boju.

Pored unosa u nova područja zaraženim sadnim materijalom za ovu skupinu virusa poznato je da se prenose različitim vrstama štitastih uši od kojih su u našem podneblju najznačajnije lozina štitasta uš (*Pseudococcus ficus*), limunov crvac (*Ps. citri*), ali i brojne druge vrste čija učestalost i sastav po vrstama zavisi od podneblja, ali i programa zaštite koji se primjenjuju u pojedinim vinogradima. Zbog prijenosa velikim brojem različitih štitastih uši preporučuje se

ceptible. Although there is no direct data on the damage caused by these viruses to the Škrlet variety, research conducted on the Chardonnay, Traminer and Muscat blanc varieties in France, Italy and Germany found a negative impact on yields ranging from 23 to 93%. These studies also found reduced lignification in rootstock by 64%, rooting by 60%, a negative impact on the graft take of scion and rootstock, with a grafting success rate of only 10 to 26%.

GRAPEVINE LEAFROLL COMPLEX. Although there are multiple viruses in this group, two are considered to be the most economically important: grapevine leafroll-associated viruses 1 and 3. Both have been found to occur worldwide and are among the most widespread and most frequent grapevine viruses. As their name suggests, the most evident symptom of the infection is the downward curling of the leaf blade with characteristic yellowing (reddening in red-berried varieties) with a narrow band around the veins retaining a green colour. The initial discolouration usually begins in late summer; by the end of summer or the beginning of autumn the entire leaf surface changes colour.

Along with introduction into new areas by the use of propagating material, this group of viruses is known to be transmitted by various species of scale insects, of which the most significant in Croatia are the grapevine mealybug (*Pseudococcus ficus*) and the citrus mealybug (*P. citri*), in addition to numerous other species whose frequency and species composition depend on the local climate and on spraying programmes implemented in individual vineyards. Since transmission occurs by the great number of different scale insects, their monitoring is recommended, with control using the appropriate insecticides registered for this purpose.

Simptomi uzrokovani virusima iz skupine uvijenosti lista vinove loze: uvijanje rubova lisne plojke prema dolje (lijevo), prijevremeno žućenje plojke kod bijelih sorti, pri čemu usko područje oko žila zadržava zelenu boju (desno).

Symptoms caused by viruses from the grapevine leafroll complex: downward curling of the margins of the leaf blade (left), premature yellowing of the leaf blade in white varieties, with a narrow green band around the veins (right).

njihovo praćenje te po potrebi suzbijanje odgovarajućim, za tu namjenu registriranim insekticidima. Zimsko prskanje uljnim sredstvima doprinosi znatnom smanjenju populacije. Rasprostranjenost ovih virusa na području Hrvatske daleko je veća u usporedbi s infektivnom degeneracijom, pri čemu je pojavnost GLRaV-3 mnogo veća u priobalnom području (na pojedinim lokalitetima i kod pojedinih sorti i do 100 %), dok je GLRaV-1 češći u kontinentalnom dijelu Hrvatske (kod pojedinih sorti i do 45 %).

Skraćivanje vegetacije i smanjenje asimilacijske površine ima negativan utjecaj na prinos u pogledu kvalitete (produženo dozrijevanje i utjecaj na aromatski profil mošta) i količine pri čemu se smatra da virus tipa 1 ponajprije utječe na smanjenje količine prinosa, a GLRaV-3

Winter spraying with mineral oils contributes to a significant reduction in population size. The prevalence of these viruses in Croatia is much greater in comparison with infectious degeneration, with a much higher incidence of GLRaV-3 in coastal regions (up to 100% in some localities and in some varieties), while GLRaV-1 is more frequent in continental Croatia (up to 45% in some varieties).

The shortening of the vegetation period and the reduction in assimilation area has a negative impact on yield in terms of quality (prolonged ripening and impact on the aromatic profile of the must) and quantity, with the type 1 virus considered to primarily reduce yield, while GLRaV-3 primarily reduces sugar content. The two viruses may also appear in mixed infection

na smanjenje sadržaja šećera. Ponekad ova dva virusa dolaze u zajedničkim, mješovitim zarazama pri čemu njihov sinergijski odnos povećava štetnost. Iako ne postoje egzaktna istraživanja štetnog utjecaja na sorti Škrlet, rezultati istraživanja provedenih u drugim zemljama (Australija, Francuska, SAD, Italija, Španjolska) ukazuju na smanjenje prinosa od 5 do 70 %, smanjenje sadržaja šećera do 2,5 °Brixa te povećanje sadržaja kiselina do 1,5 gL^{-1}.

VIRUS PJEGAVOSTI VINOVE LOZE. Riječ je o virusu čija je rasprostranjenost utvrđena u svim uzgojnim područjima vinove loze. Nisu poznati drugi domaćini osim europskih i američkih vrsta roda *Vitis.* Iako postoji zakonska obaveza da se na ovaj virus testiraju samo podloge, to nije znanstveno opravdano budući da ukoliko se na podlogu slobodnu od virusa nacijepi zaražena plemka, virus će prijeći i na podlogu. Kod europske loze, većine podloga i hibrida virus ne uzrokuje golim okom vidljive simptome pa govorimo o latentnoj zarazi. Međutim, simptomi zaraze najuočljiviji su kod vrste *Vitis rupestris* St. George kod koje dolazi do prosvjetljavanja žila trećeg i četvrtog reda i razvoja lokalnih providnih pjega, listovi se deformiraju i postaju naborani, a ponekad dolazi do njihova uvijanja prema gore. Kod pojedinih sojeva virusa zabilježeno je značajno zaostajanje u rastu.

Glavnim načinom prijenosa virusa smatra se korištenje zaraženog sadnog materijala. Iako drugi način prijenosa nije znanstveno potvrđen, opažanja iz Japana, Grčke, Južne Afrike i Italije ukazuju na mogućnost prijenosa i nekim vektorom.

Najveće štetno djelovanje virusa očituje se u proizvodnji podloga. Kod podloge *V. rupestris* St. George zaraženi matični trsovi daju slabiju kvalitetu drva, reznice pokazuju smanjenu

in which their synergistic relationship increases the extent of the damage. While there are no exact studies on detrimental effects on the Škrlet variety, the results of studies conducted in other countries (Australia, France, USA, Italy, Spain) indicated a reduction in yield ranging from 5 up to 70%, a reduction in sugar content of up to 2.5°Brix, and increased acid content of up to 1.5 gL^{-1}.

GRAPEVINE FLECK VIRUS. This virus has been found in all areas in which grapevine is cultivated. European and American species of the genus *Vitis* are the only known hosts. Although the legal requirement is to test only rootstock for the presence of this virus, this is not scientifically supported since the virus could be transmitted to the rootstock if an infected scion is grafted to virus-free rootstock. In the case of European grapevine, most rootstock, and hybrids is latent, since virus does not cause visible symptoms. The symptoms of infection, however, are most evident on species *Vitis rupestris* 'St. George', where we see clearing of the veins of the third and fourth order and the development of localised translucent spots, the leaves are distorted and become wrinkled, and may curl upward. Some strains of the virus also induce significant stunting.

The use of infected propagating material is considered to be the primary method of the transmission of the virus. Although there is no scientific confirmation of other means of transmission, observations made in Japan, Greece, South Africa, and Italy indicate that transmission may occur via a vector.

The greatest detrimental effect done by this virus is manifested in the production of rootstocks. In *V. rupestris* 'St. George' rootstock, infected mother vines yield lower quality wood,

sposobnost ukorjenjivanja te lošije sraščivanje podloge i plemke. Štetno djelovanje zabilježeno je i kod drugih podloga (Kober 5BB, 420 A), dok se Teleki 5A pokazao tolerantnim.

Iako nije obuhvaćen zakonskom regulativom za sadni materijal vinove loze, u novije vrijeme na području Hrvatske sve je učestalija pojava virusa Pinota sivog (engl. *grapevine Pinot gris virus*, akronim GPGV). Iako su simptomi zaraze prvi put uočeni na području sjeverne Italije 2003. na sorti Pinot sivi, uzročnik promjena otkriven je gotovo deset godina kasnije – 2012. Postoje sojevi virusa koji kod loze uzrokuju simptome najuočljivije početkom vegetacije: išaranost i deformiranost listova, zaostajanje u rastu listova i mladica, skraćeni internodiji, a u pojedinih sorti zabilježen je i kasniji početak vegetacije. Navedene simptome vinogradari često pripisuju napadu grinja šiškarica, oštećenjima nastalima od hladnoće zbog jakih zima te nestručne primjene herbicida iz skupine regulatora razvoja. Nasuprot sojeva s jasno izraženim simptomima, prisutnost virusa potvrđena je i u lozi bez izraženijih simptoma, pa postoje i asimptomatični sojevi virusa. Kao alternativni domaćini virusa potvrđeni su bijela loboda (*Chenopodium album*) i bijeli golesak (*Silene latifolia*). Njihova potencijalna uloga u zarazi vinove loze nije poznata. Ulazak virusa u nove vinograde uglavnom je povezan sa zaraženim sadnim materijalom, međutim dokazano je da je lozina grinja šiškarica (*Colomerus vitis*, sinonim *Eriophyes vitis*) također prijenosnik virusa. Istovremena pojava simptoma virusa i grinja šiškarica razlog je da se simptomi često pripisuju grinjama šiškaricama te se problema nastoji riješiti primjenom akaricida. U većim populacijama grinja se može očekivati u vinogradima u kojima se koristi sumpor za suzbijanje pepelnice budući da njegova primjena neizravno djeluje i na korisne,

cuttings exhibit reduced rooting capacity and poorer graft take between the rootstock and scion. Harmful effects have also been observed among other rootstocks (Kober 5BB, 420 A), while Teleki 5A has been shown to be tolerant.

Although not included in the legislation covering grapevine propagating material, the incidence of the grapevine Pinot gris virus (GPGV) has been increasing in Croatia in recent years. Although the symptoms of the infection were first observed in northern Italy in 2003 in the Pinot gris variety, the causative pathogen was only discovered almost a decade later, in 2012. There are virus strains that cause symptoms on vines that are most evident during early vegetation: leaf mottling and deformation, stunting of the leaves and shoots, shortened internodes and in some varieties, the late start of vegetation (delayed budburst). Wine-growers often attribute these symptoms to eriophyid mites, damage during very cold winters, and the improper use of growth-regulator herbicides. In contrast to strains with clearly expressed symptoms, the presence of the virus has also been confirmed in vines not exhibiting pronounced symptoms, such that there are also asymptomatic viral strains. The fat hen (*Chenopodium album*) and the white campion (*Silene latifolia*) have been confirmed as the alternative hosts. Their potential role in grapevine infection is not known. The introduction of the virus in new vineyards is primarily associated with the use of infected propagating material, however, it has been shown that the grape erineum mite (*Colomerus vitis*, synonym *Eriophyes vitis*) is also a vector of the virus. The concurrent appearance of virus symptoms and of the mites is the reason that symptoms are often attributed to grape erineum mites, and the problem tend to be solved with the use of acaricides. High mite

predatorske grinje koje reguliraju populaciju lozine grinje šiškarice. Prema rezultatima stranih istraživanja na osjetljivim sortama zabilježen je smanjen broj, težina i kvaliteta grozdova uz povećan sadržaj ukupnih kiselina, što u konačnici može rezultirati smanjenjem prinosa i do 80 %. Utjecaj simptomatičnih sojeva virusa na sortu Škrlet tek treba istražiti.

populations may be expected in vineyards in which sulphur is used to suppress grape powdery mildew, since its use has an indirect effect on beneficial, predatory mites that regulate the population of grape erineum mites. The results of foreign studies on susceptible varieties show a reduction in the number, weight, and quality of bunches, with increased total acid content,

Različiti tipovi simptoma zaraze virusom Pinota sivog. Zaostajanje u rastu i išaranost listova (gore lijevo); sitni listovi te nejednolično tjeranje pupova (gore desno); različit intenzitet deformacije i išaranosti listova ovisno o soju virusa (dolje).

Different types of symptoms caused by grapevine Pinot gris virus. Stunting and leaf mottling (top left); undersized leaves and irregular budding (top right); different intensities of deformation and leaf mottling depending on the virus strain (bottom).

Pojava i usporavanje širenja svih virusa vinove loze zasniva se na preventivnim mjerama – ponajprije na korištenju certificiranog (bezvirusnog) sadnog materijala te kontroli i pravovremenom suzbijanju vektora (štitaste uši, nematode, grinje). Prije podizanja vinograda preporučuje se analizirati tlo na moguću prisutnost nematoda, vektora virusa iz skupine infektivne degeneracije. Poželjni su i redoviti pregledi vinograda, ali zbog mogućih infekcija bez vidljivih simptoma te zamjene s drugim čimbenicima (nedostatak mikro- ili makrohranjiva, šteta od pojedinih štetnika, oštećenja zbog neodgovarajuće primjene agrotehnike ili herbicida itd.) zarazu je potrebno potvrditi u za to opremljenim laboratorijima. Pri manjem intenzitetu zaraze preporuka je ukloniti zaražene trsove prije nego što se zaraza proširi (posebno virusi iz skupine uvijenosti lista), a pri većem intenzitetu zaraze, pogotovo ako ga prati smanjenje prinosa, poželjno je ukloniti cijeli vinograd. Značajan napredak postignut je u stvaranju rezistentnih podloga i plemki klasičnim selekcijskim metodama i genetičkim inženjerstvom.

U posljednjih desetak godina na području Hrvatske zabilježeno je značajno širenje fitoplazmi vinove loze. Nažalost, ni glavna uzgojna područja Škrleta nisu pošteđena, pa velik broj lokaliteta u Sisačko-moslavačkoj županiji spada u zaražena, odnosno sigurnosna područja. Iako postoji više vrsta fitoplazmi koje mogu zaraziti vinovu lozu, ekonomski najznačajnijima i najrasprostranjenijima smatraju se bolest pod nazivom zlatna žutica vinove loze tzv. *flavescence dorée* - FD (od franc. riječi 'flavescence' što znači žućenje te 'dorée' zlatno), čiji je uzročnik *Candidatus* Phytoplasma vitis te bolest crno drvo, odnosno *bois noir* - BN (od franc. riječi 'bois' sto znači drvo te 'noir' crno), čiji je uzročnik *Candidatus* Phytoplasma solani.

which may ultimately result in a reduction in yield of up to 80%. The impact of symptomatic strains of the virus on the Škrlet variety has yet to be investigated.

The appearance and slowing down the spread of all grapevine viruses are based on preventative measures primarily on the use of certified (virus-free) propagating material, and the control and timely suppression of vectors (scale insects, nematodes, mites). Soil analysis is recommended ahead of the establishment of a vineyard in order to identify the possible presence of nematodes, vectors of viruses from the infectious degeneration complex. Regular inspections of vineyards are desirable, but the fact is that there may be infections without visible symptoms, and the possibility of confusion with other factors (micro- or macronutrient deficiencies, pest damage, damage caused by the improper use of agricultural practices, herbicides, etc.), means that infections should be confirmed in appropriately equipped laboratories. In cases of low intensity infection, the recommendation is to eliminate the infected vines before the infection spreads (especially with regard to viruses from the leafroll complex), while in the case of high intensity infection especially if accompanied by reduced yield the elimination of the entire vineyard could be advised. Significant progress has been made in creating resistant rootstocks and scions by applying classical selection methods and genetic engineering.

Over the past decade, Croatia has evidenced a significant spread of grapevine phytoplasmas. The main Škrlet cultivation areas, unfortunately, have not been spared, with a great number of localities in Sisak-Moslavina County falling within the infected areas. Although there are multiple phytoplasmas that may infect grapevine, the most economically significant and

Kako bi se spriječilo njihovo širenje, u Hrvatskoj se svi posjednici vinograda, odnosno proizvođači sadnog materijala moraju pridržavati pravila definiranih *Naredbom o poduzimanju mjera za sprječavanje širenja i suzbijanje zlatne žutice vinove loze* (NN 48/18 i 63/19), dok je sprječavanje negativnog utjecaja te širenje crnog drva definirano *Pravilnikom o stavljanju na tržište materijala za vegetativno umnažanje loze* te njegovim izmjenama i dopunama. Prema Pravilniku uzročnik crnog drva svrstava se u kategoriju reguliranog nekarantenskog štetnog organizma, pri čemu se za matične nasade i proriština vizualnim pregledom, odnosno po potrebi laboratorijskim analizama, mora utvrditi da su slobodni od crnog drva.

ZLATNA ŽUTICA VINOVE LOZE (*flavescence dorée,* FD) ubraja se u najopasnije uzročnike bolesti vinove loze. Utvrđeno je značajno širenje u Europi pa tako i u Hrvatskoj. Prisutna je u gotovo svim vinogradarskim regijama kontinentalne Hrvatske i Istre. Patogen je ograničen na floem zaraženih biljaka, gdje zbog poremećaja u prijenosu produkata fotosinteze od lista prema korijenu nastaju promjene koje mogu biti vidljive na različitim biljnim organima.

Tijekom pregleda vinograda proizvođači bi se trebali usredotočiti na nekoliko detalja premda je za potvrdu patogena, zbog sličnosti simptoma s nekim drugim uzrocima (druge fitoplazme, viroze, nedostatak biljnih hranjiva, neadekvatna primjena herbicida, oštećenja nastala uzgojnim mjerama itd.), potrebna laboratorijska analiza.

Iako se simptomi zaraze često javljaju na cijelom trsu, nisu rijetki slučajevi da su prisutni samo na pojedinim dijelovima/krakovima trsa. Osjetljivima se smatraju skoro sve sorte europske loze, dok američke podloge (*V. rupestris, V. riparia, V. berlandieri*) i njihovi križanci mogu

prevalent are the diseases known as *flavescence dorée* (FD, from the French *flavescence*, meaning yellowing, and *dorée*, meaning golden), the causal agent of which is '*Candidatus* Phytoplasma vitis', and the *bois noir* (BN) disease (from the French *bois*, meaning wood, and *noir*, meaning black), the causal agent of which is '*Candidatus* Phytoplasma solani'. In order to prevent the spread of these diseases, all vineyard owners in Croatia and producers of propagating material are required to comply with the rules laid out in the Order on measures to control and prevent the spread of flavescence dorée (OG 48/18, 63/19), while the prevention of the negative impact of bois noir is covered by the Ordinance on the marketing of materials for the vegetative propagation of grapevine (and its amendments). According to the Ordinance, the causative pathogen of bois noir is classified in the category of regulated non-quarantine harmful organisms, with a requirement of visual inspection of mother block plantations and nurseries and if necessary laboratory analyses to determine that they are free of bois noir.

FLAVESCENCE DORÉE (FD) is considered causal agent of one of the most dangerous grapevine diseases. Significant expansion has been identified in Europe, including Croatia. It is present in almost all the viticulture regions of continental Croatia and the Istrian peninsula. The pathogen is restricted to the phloem of infected plants, where due to the disruption of the transport of photosynthesis products from leaves to roots, induce changes that may be visible on different plant organs.

During the vineyard inspection, producers should concentrate on several details, though confirmation of the pathogen requires laboratory analysis, due to the similarity of symptoms

biti zaraženi i poslužiti kao izvor infekcije, ali su obično bez vidljivih znakova zaraze. Obično su simptomi u godini zaraze neprimjetni ili slabije zamjetni, a postaju izraženi u sljedećoj vegetacijskoj sezoni. Najuočljiviji su tijekom ljeta, i to kroz uvijanje rubova lisne plojke prema dolje pri čemu listovi postaju krhki (drobe se u ruci). Uz promjenu oblika dolazi i do žućenja/crvenila lišća koje često prelazi u nekrozu. Plojke simptomatičnih listova obično otpadaju same pri čemu peteljka lista ostaje još neko vrijeme na mladici. Promjene na mladicama u obliku neujednačenog odrvenjavanja pri čemu se izmjenjuju smeđe i zelene zone, često sa cik-cak rastom i skraćenim internodijima. Promjene mladicama često daju gumastu konzistenciju te čitav trs poprima obješen izgled. Ponekad se na bazalnom dijelu mladica javljaju crne točke. Simptomi na grozdovima variraju od sušenja cvatova i rehuljavih grozdova do posmeđivanja kasnije u vegetaciji i sušenja/smežuravanja bobica koje vrlo lako otpadaju. Navedene promjene rezultiraju znatnim smanjenje prinosa i po količini, i po kvaliteti. Iako su zabilježeni slučajevi oporavka, simptomi se obično vraćaju, pa u većini slučajeva zaraza završava potpunim sušenjem u 2-3 godine nakon infekcije.

U prijenosu zlatne žutice važnu ulogu imaju izvori zaraze (zaraženi sadni materijal, zaraženi matični nasadi podloga i plemki, zaraženi komercijalni vinogradi i napušteni vinogradi, brajde na okućnicama), ali i američki cvrčak (*Scaphoideus titanus*) koji hraneći se na zaraženoj lozi usvaja fitoplazmu i prenosi je unutar istog ili susjednih vinograda. Iako je uzročnik pronađen i u nekih drugih domaćina (crna joha – *Anus glutinosa*, pavitina – *Clematis vitalba* itd.), vrste roda *Vitis* smatraju se glavnim izvorom fitoplazme. Širenje na veće udaljenosti odvija se putem zaraženog sadnog materijala koji se

with those of other causative agents (other phytoplasmas, viral infections, nutrient deficiency, inadequate use of herbicides, damage caused by cultivation measures, etc.).

Although symptoms of infection often appear on the entire vine, it is not rare for them to appear only on certain parts/arms of the vine. Almost all European vine varieties are considered susceptible, while American rootstocks (*V. rupestris, V. riparia, V. berlandieri*) and their hybrids may be infected and serve as a source of the infection but are usually without visible signs of infection. In the first year of infection, symptoms are usually less evident, becoming more pronounced in the following growing season. They are most evident in the summer, notably by the downward curling of the margin of the leaf blade and brittle leaves (that crumble in the hand). The change in shape is accompanied by yellowing/reddening of the leaves, which often followed by necrosis. Symptomatic leaves usually fall off, with the stem remaining on the shoot for some time. Changes on shoots take the form of irregular lignification, with alternating brown and green zones, often exhibiting zig-zag growth and shortened internodes. Changes on shoots often include a rubbery consistency, with the entire vine acquiring a weeping posture. Black spots may appear at the basal part of the shoot. Symptoms on bunches vary from the withering of blossoms and loose bunches, to browning later in vegetation and the drying/shrivelling of berries, which fall off easily. These changes result in a significant reduction in yield, both in terms of quantity and quality. Although cases of recovery have been observed, the symptoms usually return, and in most cases, infection ends with complete withering of the vine two to three years from the initial infection.

dobiva korištenjem pupova (plemki) odnosno reznica (podloge) sa zaraženih matičnih biljaka.

Američki cvrčak, podrijetlom iz Sjeverne Amerike, smatra se ampelofagnom vrstom, odnosno vrstom čiji je glavni domaćin vinova loza. Ima jednu generaciju godišnje te prezimljuje u obliku jaja odloženih pod koru. Ličinke izlaze obično u travnju ili svibnju, što ovisi o klimatskim prilikama, a do odraslog oblika prolaze

Sources of infection (infected propagating material, infected mother block plantations of rootstocks and scions, infected commercial and abandoned vineyards, grape arbours around private houses), and the American grapevine leafhopper (*Scaphoideus titanus*), which acquires the phytoplasma while feeding on infected vines and transmits it within the same or to a neighbouring vineyard, play a key role in the

Obješeni izgled trsa zaraženog zlatnom žuticom vinove loze te detalj žućenja i uvijanja ruba lisne plojke prema dolje (gore), crne pjege na bazalnom dijelu mladica (dolje lijevo), djelomično ili potpuno sušenje grozdova te isušivanje bobica (dolje desno).

The weeping posture of vine infected with flavescence dorée and a detail of the yellowing and downward curling of the margins of the leaf blade (top), black spots at the basal part of the shoot (bottom left), partial or complete withering of bunches, and withering of berries (bottom right).

kroz pet stadija. Ishranom na zaraženim biljkama ličinke usvajaju fitoplazmu i nakon otprilike četiri tjedna latencije sposobne su prenositi je (obično ličinke završnih razvojnih stadija). Jednom zaražen insekt sposoban je prenositi fitoplazmu cijelog života. Također, potvrđene su različite preferencije vektora prema različitim sortama.

Zbog velike štetnosti zlatne žutice i složene epidemiologije za uspješnu kontrolu potrebno je sveobuhvatno provoditi mjere koje se temelje na tri načela: sprječavanju širenja zaraženim sadnim materijalom, uklanjanju zaraženih biljaka te praćenju i suzbijanju američkog cvrčka. Zaraženi sadni materijal glavni je razlog prodiranja u nezaražena područja te prijenosa na velike udaljenosti. Zbog toga je vođenje brige o zdravstvenom stanju matičnjaka osnovna preventivna mjera kontrole. Zaražene i simptomatične biljke ne smiju se koristiti kao izvor plemki/podloga te ih treba ukloniti. Posebnu pažnju treba posvetiti matičnjacima podloga s obzirom na to da su američke vrste roda *Vitis* te njihovi križanci obično asimptomatični ili s vrlo blagim simptomima. Također, ne treba zanemariti ni činjenicu da sadni materijal može poslužiti i za prijenos američkog cvrčka, odnosno njegovih jaja odloženih pod koru. Uzročnik zlatne žutice može se iz dormantnog drva eliminirati tretmanom vrućom vodom, i to tako da se materijal koji se namjerava koristiti za proizvodnju cjepova potpuno potopi u vodi zagrijanoj na konstantnu temperaturu od 50 °C u trajanju od 45 minuta.

Uklanjanje zaraženih biljaka u komercijalnim vinogradima temelji se na pojavi simptoma koje je, zbog sličnosti s nekim drugim ranije navedenim čimbenicima, potrebno potvrditi laboratorijskim analizama. Detekcija uzročnika može se odraditi na zaraženoj lozi, ali i na vektoru. Pored seroloških metoda (npr. ELISA) koje se zbog

transmission of flavescence dorée. Although the causative agent has also been found in other hosts (black alder (*Anus glutinosa*), old man's beard (*Clematis vitalba*), etc., species of the genus *Vitis* are considered to be the main source of phytoplasmas. Long distance spread occurs by the use of infected propagating material obtained through the use of buds (scions) and cuttings (rootstock) from infected mother plants.

The American grapevine leafhopper, originating from North America, is considered an ampelophagous species, i.e., a species whose primary host is grapevine. It has one generation per year and overwinters in the form of eggs laid under the bark. The larvae usually emerge in April or May, depending on climatic conditions, and go through five stages to adult form. Larvae acquire phytoplasma by feeding on infected plants and are able to transmit it after about four weeks of latency (usually the larvae of the final developmental stages). Once infected, the insect is capable of transmitting phytoplasma throughout its lifetime. Differences in vector preferences for different varieties have been confirmed.

The great detrimental effect of flavescence dorée and its complex epidemiology means that successful control requires the implementation of comprehensive measures based on three principles: preventing the spread of infected propagating material, eliminating infected plants, and monitoring and controlling the American grapevine leafhopper. Infected propagating material is the main source of arrival into uninfected areas and long-distance transmission. Therefore, the good sanitary status of mother blocks is the main preventive measure in control efforts. Infected and symptomatic plants must not be used as a source of scions/rootstock, and must be eliminated. Particular attention should

jednostavnosti često koriste za testiranja većeg broja uzoraka, danas se zbog povećane osjetljivosti i često nejednolične distribucije patogena unutar zaraženog trsa prednost daje metodama koje se temelje na analizi genoma (konvencionalni PCR i PCR u stvarnom vremenu). Uzorci za analizu uzimaju se na temelju ranije opisanih simptoma koji se mogu javiti početkom ljeta, ali su najizraženiji od sredine ljeta te postaju sve izraženiji do berbe. Simptomatične biljke treba označiti i u slučaju pozitivnih laboratorijskih rezultata odmah ukloniti. Opseg uklanjanja ovisi o situaciji na terenu: u slučaju zaraze ispod 20 % preporučuje se uklanjanje pojedinačnih biljaka, dok se pri zarazi većoj od 20 % preporučuje uklanjanje cijelih vinograda. Za uspješnu kontrolu zlatne žutice simptome je potrebno pratiti ne samo u matičnjacima i komercijalnim vinogradima, nego i u zapuštenim vinogradima, samoniklim vrstama *Vitis* te lozi koja se uzgaja na okućnicama (tzv. pergole ili brajde) budući da mogu biti izvor zaraze (CABI, 2020).

Drugi važan smjer u kontroli zlatne žutice je praćenje i suzbijanje američkog cvrčka. Ovaj vektor prolazi kroz pet razvojnih stadija ličinki, a trajanje svakog prije svega ovisi o klimatskim prilikama. Ličinke se obično zadržavaju na biljci na kojoj su se razvile iz jaja te se hrane sisanjem sokova na donjim etažama lišća, s time da se u povoljnim klimatskim prilikama mogu naći i na gornjim dijelovima trsa. Prvi odrasli oblici javljaju se u lipnju i prisutni su u vinogradu do kraja rujna. I dok se za praćenje pojave i brojnosti ličinki koristi povećalo, za određivanje brojnosti odraslih oblika koriste se žute ljepljive ploče. Odrasli oblici obično se kreću u radijusu od 20 do 30 metara, ali zabilježene su i migracije na veće udaljenosti. Program suzbijanja američkog cvrčka korištenjem registriranih insekticida temelji se na prikupljenim podacima o brojnosti

be given to rootstock mother blocks considering that American species of the genus *Vitis* and their hybrids are usually asymptomatic or exhibit very mild symptoms. The fact that propagating material can also serve for the spread of the American grapevine leafhopper, as its eggs are laid under the bark, should be considered. The causal agent of flavescence dorée may be eliminated from the dormant wood by hot water treatment, in the way that the material used for the production of propagating material is fully immersed in water heated to a constant temperature of 50°C for 45 minutes.

The elimination of infected plants in commercial vineyards is based on the appearance of symptoms that, due to their similarity with some other above-mentioned factors, should be confirmed by laboratory analysis. Detection of the causal agent can be done on the infected vine and on the vector. In addition to serological methods (e.g., ELISA), often used to test large numbers of samples due to their simplicity, preference is now given due to greater sensitivity and the often uneven distribution of pathogens within the infected vine to methods based on genome analysis (conventional PCR and real-time PCR). Sampling is done on the basis of symptoms, which may occur in early summer, but are most pronounced from mid-summer and become increasingly pronounced through to harvest. Symptomatic plants should be marked and, in case of positive laboratory result, eliminated immediately. The extent of elimination depends on the situation in the field: in the case of an infection rate below 20%, the elimination of individual plants is recommended, while for infection rates above 20% the elimination of the entire vineyard is recommended. Successful control of flavescence dorée requires that symptoms are monitored for

populacije, klimatskim prilikama te postotku zaraženih trsova. U ekološkoj proizvodnji dozvoljena su sredstva na osnovi piretrina, ali treba voditi računa o njihovoj nestabilnosti te zadovoljavajućoj učinkovitosti samo na ličinke u prva tri razvojna stadija. Prvo tretiranje obično se provodi 30 dana nakon pojave prvih ličinki. O uspješnosti i pravovremenosti ovog tretiranja ovisi i uspješnost kontrole bolesti. U našim klimatskim prilikama ovaj tretman obično pada u lipnju i usmjeren je na suzbijanje ličinki prvih triju razvojnih stadija budući da one mogu sadržavati fitoplazmu, ali ju ne mogu prenositi (prenose je samo ličinke završnih razvojnih stadija te odrasli oblici). U slučaju potrebe mogu se provesti još dva dodatna tretiranja: početkom srpnja radi suzbijanja novoizišlih ličinki te početkom kolovoza radi suzbijanja odraslih oblika i sprječavanja njihove migracije iz okolnih vinograda ili divljih/samoniklih vrsta *Vitis*.

Više o kontroli zlatne žutice vinove loze može se pronaći u *Naredbi o poduzimanju mjera za sprječavanje širenja i suzbijanje zlatne žutice vinove loze* (NN 48/18) kao i *Akcijskom planu za sprječavanje širenja i suzbijanje zlatne žutice vinove loze za razdoblje od 2018. do 2021.*

CRNO DRVO (*bois noir,* BN). Prema Pravilniku o izmjenama i dopuni *Pravilnika o stavljanju na tržište materijala za vegetativno umnažanje loze* (NN 49/20) ubraja se u regulirane nekarantenske štetne organizme na koje prporišta i matični nasadi moraju biti ispitani vizualnim pregledom, a po potrebi i laboratorijskim analizama. Uzročnik crnog drva je '*Candidatus* Phytoplasma solani', patogen vrlo širokog kruga domaćina (više od 100 biljnih vrsta iz 40 različitih porodica uključujući brojne divlje, ali i kultivirane i ukrasne biljke). Osim zaraženim sadnim materijalom uzročnik se prenosi i

not only in mother blocks and commercial vineyards, but also in abandoned vineyards, wild *Vitis* species, and vines cultivated in the yards (grapevine pergolas and arbours), as they could serve as sources of infection.

Another important aspect of the flavescence dorée control is the monitoring and control of the American grapevine leafhopper. This vector has five larval development stages, with the duration of each stage largely dependent on the climatic conditions. Larvae usually stay on the plant on which they have developed from eggs and feed by sucking the sap on the lower leaves; if climatic conditions are favourable, they may also be found on the upper parts of the vine. The first adult forms appear in June and are present in the vineyard until the end of September. While a magnifying glass is used to monitor the appearance and abundance of larvae, yellow sticky traps are used to determine the abundance of the adult forms. Adult forms usually move within a radius of 20 to 30 meters, but migrations over longer distances have also been reported. American grapevine leafhopper preventative programmes are involving the use of registered insecticides based on collected data on population size, climatic conditions, and the percentage of infected vines. Pyrethrin-based agents are permitted in organic production, but their instability and satisfactory efficacy only for larvae in the first three developmental stages should be taken into consideration. Initial treatment is usually performed 30 days following the appearance of the first larvae. The success of the control of this disease depends on the success and on-time application of this treatment. In our climatic conditions this treatment usually fall down in June and is aimed at supressing the larvae of the first three developmental stages, because they may contain the phytoplasma, but

s više vrsta cvrčaka pri čemu se cvrčak stolbura (*Hyalesthes obsoletus*) smatra glavnim vektorom. Budući da sama vinova loza nije pogodan domaćin za cvrčka stolbura, odrasli oblici se samo povremeno i privremeno hrane na njoj, i to u potrazi za pogodnim biljkama domaćinima. Pritom lozu zaražavaju fitoplazmom koju su u organizam unijeli hraneći se na drugim domaćinima, uglavnom korovnim biljkama. S obzirom na to i činjenicu da nije pogodna za razvoj ličinki cvrčka stolbura koje ishranom na zaraženim biljkama usvajaju fitoplazmu, vinova loza predstavlja tzv. *slijepu ulicu* za fitoplazmu, odnosno zaražena loza nema važnost u daljnjem širenju crnog drva. Međutim, zaražene biljke ipak je potrebno ukloniti kako se ne bi koristile za daljnje razmnožavanje. U širenju crnog drva značajni izvori zaraze mogu biti korovne vrste, domaćini cvrčka stolbura, koje rastu unutar ili u blizini vinograda: slak (*Convolvulus arvensis*), divlja kopriva (*Urtica dioica*), bijela loboda (*Chenopodium album*) te obični sljez (*Malva sylvestris*). Budući da se po simptomima ne razlikuje od zlatne žutice, za točno određenje potrebne su laboratorijske analize. Zbog širokoga kruga domaćina i složene epidemiologije kontrola ove bolesti izrazito je kompliciranа, a učinkovitost je upitna. Uzimajući u obzir očuvanje neciljane entomofaune te očuvanja bioraznolikosti, kontrola se zasniva: (a) na kontroli zdravstvenog stanja matičnih biljaka te sadnog materijala, (b) na suzbijanju korova, domaćina koji mogu poslužiti kao izvori uzročnika, primjenom selektivnih herbicida, (c) na kontroli brojnosti cvrčka stolbura primjenom selektivnih insekticida u rano proljeće, (d) na preventivnom plijevljenju mladica na kojima se cvrčak može hraniti te (d) na korištenju sredstava koja potiču otpornost loze (kombinacije aminokiselina i sl.).

are unable to transmit it (it is transmitted only by larvae of the final developmental stages and by adult forms). If necessary, two additional treatments can be performed: in early July to supress new larvae and in early August to supress adult forms and prevent their migration from surrounding vineyards or wild *Vitis* species.

For more details concerning the control of flavescence dorée see the Order on measures to control and prevent the spread of flavescence dorée (OG 48/18), and the Action Plan to control and prevent the spread of flavescence dorée for period 2018 to 2021.

BOIS NOIR (BN; meaning black wood). According to the Ordinance on amendments to the Ordinance on the marketing of materials for the vegetative propagation of grapevine (OG 49/20), this disease is included in the regulated non-quarantine harmful organisms for which all rooting blocks and mother blocks must be visually inspected and if needed subjected to laboratory analysis. The causal agent of bois noir is '*Candidatus* Phytoplasma solani', a pathogen with a wide host range (more than 100 plant species belonging to 40 families, including numerous wild, cultivated and ornamental plants). In addition to infected propagating material, the agent is also transmitted by several species of planthoppers, with *Hyalesthes obsoletus* considered the main vector. Since grapevine is not a suitable host for this planthopper, adult forms only occasionally and temporarily feed on it while searching for a more suitable plant host. The grapevine is then infected by the phytoplasma which is ingested in the vector during the feeding on other hosts, usually weed plants. Taking mentioned in consideration, including the fact that grapevine is also not suitable for the development of *H. obsoletus* larvae, which take

6.3. POSTUPAK ZAVRŠNOG ISPITIVANJA, REGISTRACIJE I OPISI REGISTRIRANIH KLONOVA

U posljednjem koraku individualne klonske selekcije provodi se tzv. provjera (homologacija), tj. završno ispitivanje klonova na temelju kojeg se izrađuje opis klonova koji je osnova za njihovu registraciju i upis na sortnu listu za vinovu lozu. Navedeni korak individualne klonske selekcije definiran je kroz povezanu legislativu i ujedno predstavlja i formalni postupak u kojem se susreću oplemenjivačka te nadležne državne institucije. Za postupak provjere u RH temeljem važećeg Zakona o sjemenu i sadnom materijalu te povezanim pravilnikom ovlaštena je Hrvatska agencija za poljoprivredu i hranu – Centar za sjemenarstvo i rasadničarstvo (HAPIH-CSR) te Ministarstvo poljoprivrede kroz Povjerenstvo za poljoprivredno rasadničarstvo i Povjerenstvo za priznavanje sorti vinove loze. HAPIH-CSR nadležan je za završno ispitivanje, ali isto tako može dati ovlaštenje oplemenjivačkoj instituciji da sama provede taj postupak uz njihov nadzor. Nakon dobivenog ovlaštenja provodi se ispitivanje najmanje dvije godine (dvije berbe) u nasadu starijem od tri godine, a uključuje istraživanje najvažnijih vinogradarskih i enoloških karakteristika klonskih kandidata sukladno propisanoj metodologiji.

Pokusni nasad

Pokusni nasad koji se koristi za završno ispitivanje klonova trebao bi u pravilu biti uspostavljen na području na kojem se pojedina sorta uzgaja te biti u skladu s najvišim standardima vezanim uz položaj i tehnologiju. Za službenu registraciju taj uvjet nije nužan u smislu postojeće legislative, a opis klona koji se koristi za njihovo priznavanje ponajprije se temelji na

the phytoplasma during feeding on infected plants, so grapevine is considered to be a dead-end for the phytoplasma, and the infected vine has no significance in the further spread of bois noir. However, the infected plant should still be removed, to avoid its use in further propagation. Significant sources of bois noir are weed species that are hosts to *H. obsoletus* and that grow in or near the vineyard: field bindweed (*Convolvulus arvensis*), stinging nettle (*Urtica dioica*), white goosefoot (*Chenopodium album*) and common mallow (*Malva sylvestris*). Since the symptoms do not differ from flavescence dorée, laboratory analyses are required for proper identification. Due to the wide host range and the complex epidemiology, controlling this disease is highly complicated with questionable efficacy. Taking into account the conservation of non-target entomofauna and preserving biodiversity, control is based on: (a) controlling the sanitary status of mother plants and propagation materials, (b) weed control using selective herbicides, particularly host species that can serve as sources of pathogen, (c) controlling the abundance of planthoppers using selective insecticides in early spring, (d) preventative removal of shoots that planthoppers can feed on, and (d) the use of substances that stimulate grapevine tolerance (combination of amino acids, etc.).

6.3. FINAL TESTING PROCEDURE, REGISTRATION AND DESCRIPTION OF REGISTERED CLONES

The final step of individual clonal selection is verification (homologation). In this step, clones undergo final testing in order to draft the description of clones, which then forms the basis for their registration and entry into the

prikazu specifičnosti pojedinih klonova koji se mogu utvrditi i u uzgojnim uvjetima izvan strogog područja u kojem se pojedina sorta najviše uzgaja. Ipak, kako bi navedeni opisi bili relevantni i samim proizvođačima, bolje je da se taj postupak provodi unutar uzgojnog područja pojedine sorte. Na taj način dobivamo podatke o karakteristikama klonova koji su u najvećoj mogućoj mjeri pokazatelj onoga što će klonovi kasnije pokazivati u proizvodnji. Tako postavljen pokusni nasad ujedno može biti i svojevrsni ogledni nasad klonova u idućem razdoblju, u kojem će se proizvođači moći izravno informirati o klonovima i lakše se odlučiti koristiti ih kod podizanja novih nasada.

U pokusnom nasadu za završnu provjeru klonova svaki klon mora biti zastupljen s najmanje 30 trsova. Taj je broj definiran jer u pravilu omogućuje dobivanje minimalne količine grožđa potrebne za analizu i mikrovinifikaciju klonova. U praksi je broj trsova po klonu poželjno povećati, tj. ako je moguće svaki klon trebao bi biti zastupljen s najmanje 50 trsova. Naime, za mjerenja i analize nisu potrebne velike količine grožđa, ali za provođenje mikrovinifikacije trebalo bi osigurati dovoljnu količinu za vinifikaciju volumena barem 50 L. Usto je potrebno predvidjeti da primitak nakon sadnje neće biti potpun. Većim se brojem trsova osigurava propisani minimalni broj. Pokusni nasad mora se formirati s repeticijama kojima se smanjuje eventualni utjecaj varijabilnosti površine (ponajprije položaj niz padinu, varijabilnost tla i sl.) na razlike između klonova, tj. izbjegava se pripisivanja navedene varijabilnosti razlikama između klonova. Statistička obrada uključuje analizu varijance te odgovarajući test za usporedbu srednjih vrijednosti klonova za svako mjereno svojstvo. Najčešće se koriste tri repeticije u kojima osnovnu parcelu kod svakog klona čini minimalno deset trsova.

Grapevine Variety List. This step of individual clonal selection is defined through the relevant legislation, and this is a formal procedure involving both breeders and the relevant state institutions. In Croatia, pursuant to the Act on Seeds and Propagation Materials, and the associated ordinances, the Croatian Agency for Agriculture and Food – Centre for Seed and Seedlings (HAPIH-CSR) and the Ministry of Agriculture, through its Committee for Agricultural Nurseries and the Committee for the recognition of grapevine varieties are authorised for the verification procedure. HAPIH-CSR is authorised to conduct the final testing, and may also issue authorisation for breeding institutions to independently conduct this procedure under their supervision. Once authorisation if granted, testing is conducted for a minimum of two years (two harvests) in plantations older than three years, and includes research on the most important viticulture and enological characteristics of the clonal candidates, pursuant to the prescribed methodology.

Experimental plantation

The experimental plantation used for the final testing of clones should, as a rule, be set up in the area where a certain variety is grown, and it must comply with the highest standards for location and technology. This condition is not necessary for official registration in the sense of the existing legislation, and the description of clones used for their recognition is based primarily on the overview of specificities of a given clone, which can also be confirmed in growing conditions outside the specific area where the variety is usually grown. However, in order for these descriptions to be relevant to producers, it is best for this procedure to be conducted within the growing area of that variety. This enables us

Uz klonove, tj. klonske kandidate koji su predmet ispitivanja, u pokusni nasad potrebno je uključiti i standardni klon sorte (ako postoji). S obzirom na to da kod autohtonih sorti, pa tako i kod Škrleta, u fazi provjere klonova nisu postojali drugi registrirani klonovi, umjesto njih su u pokusnom nasadu korištene dodatne četiri klonske linije koje su izdvojene u prethodnom krugu selekcije. Za završno ispitivanje triju ili više klonova u skladu s važećim propisima ako ne postoje registrirani klonovi, svaki pojedinačni klon uspoređuje se s prosjekom svih ostalih.

Starost nasada koji će se koristiti za završno ispitivanje mora biti barem tri godine. Pri tome treba uzeti u obzir da nasad tek u trećoj godini u potpunosti postiže uzgojni oblik i punu rodnost, i to ako su ostvareni optimalni uvjeti, tj. ako su zahvati od pripreme terena i ishrane do osiguranja optimalne razine vlage u tlu pravovremeni te ako se koristi visokokvalitetan sadni materijal. Uzgojni oblici na bazi jednostrukog *Guyota* najprikladniji su za ovu svrhu, dok kod složenijih uzgojnih oblika u pravilu treba minimalno četiri ili više godina da se u potpunosti formiraju.

Mjerenja osnovnih gospodarskih karakteristika klonskih kandidata

Osnovne gospodarske karakteristike klonova koje je potrebno utvrditi mjerenjem u sklopu završnog ispitivanja jesu: prinos, broj grozdova po trsu, prosječna masa grozda, sadržaj šećera u moštu, sadržaj ukupnih kiselina u moštu i njegova pH-vrijednost.

Prinos i broj grozdova po trsu određuju se izravno brojenjem i vaganjem svih grozdova s najmanje pet ujednačenih trsova svake repeticije. Nakon toga se prosječna masa grozda određuje računski. Sa svake se repeticije nakon vaganja uzima reprezentativni uzorak od deset zdravih i neoštećenih grozdova koji se koriste za

to obtain data on the clone characteristics that are the best possible indicators of how the clones will later behave in production. Such an experimental plantation can also be a type of reference plantation for clones in the future period, in which producers can obtain direct information on clones and thus more easily decide which to use when establishing new plantations.

In the experimental plantation for the final testing of clones, each clone must be represented with a minimum of 30 vines. This number has been defined since it allows for the production of the minimum quantity of grapes needed for analysis and for microvinification of the clones. In practice, the numbers of vines per clone should be increased, to at least 50 vines per clone where possible. Large quantities of grapes are not needed for measurements and analysis, though the minimum quantity for microvinification should be a volume of at least 50 L. It is also necessary to forecast that planting success will not be full. A larger number of vines will ensure the minimum numbers are met. The experimental plantation must include replicates, thereby reducing any possible influence of surface variability (mostly from position on the slope, soil variability, etc.) on differences between clones. Statistical analysis includes the analysis of variance and appropriate tests for comparing the means of values of clones for each measurement property. Three replicates are most often used, where there is a minimum of ten vines for each clone on a plot.

Alongside the clonal candidates that are the subject of testing, the standard clone of the variety, if there is one, should also be included in the experimental plantation. Since there were no other registered clones during the clone verification phase for indigenous varieties, including Škrlet, instead of standard clones, four

daljnje laboratorijske analize osnovnoga kemijskog sastava mošta. Iz grozdova se u laboratoriju istiskivanjem i procjeđivanjem dobiva uzorak mošta, pri čemu je potrebno paziti da se mošt istisne iz svih bobica zbog njihove heterogenosti. Naime, zrelije bobice u pravilu su mekše i lako pucaju pod pritiskom, a one manje zrele mogu ostati cijele. Tako nećemo dobiti reprezentativan uzorak mošta za analizu, pa rezultati nisu točan pokazatelj kemijskog sastava mošta pojedinoga klona. Mjerenje sadržaja šećera najčešće se provodi refraktometrijom, ukupna kiselost određuje se titracijskom metodom, a pH-vrijednost korištenjem pH-metra. Osim ovih mjerenja iskusni stručnjaci (ampelografi) na klonovima provode i vizualnu evaluaciju svojstava pri čemu se dodatno ocjenjuju i druga bitna svojstva kao što su bujnost, zbijenost grozdova te druge specifičnosti. Ako se procijeni da je korisno, mogu se proširiti i analize dodatnih svojstava, npr. uvometrija i mehanička analiza grozda kao i dodatne instrumentalne analize grožđa ili mošta vezano uz arome ili druge skupine sekundarnih metabolita važnih za kvalitetu vina. Za opis klonova potrebno je osigurati i njihovu kvalitetnu fotodokumentaciju.

Mikrovinifikacije

Nakon izdvajanja uzoraka za kemijske analize sa svih repeticija u pokusnom nasadu grožđe svakog preostaloga klona koristi se za mikrovinifikaciju. Ona je zbog malih volumena izuzetno zahtjevna tj. zahtjevnija od klasičnih vinifikacija velikih volumena. Osnovna su opasnost oksidativne promjene mošta u završnim fazama fermentacije ili neposredno nakon nje, posebno u mikrovinifikaciji bijelih sorti. Takve oksidativne promjene čak i pri vrlo niskom intenzitetu izuzetno negativno utječu na primarne arome vina (podrijetlom iz grožđa) koje se dominantno

additional clonal lines that were isolated in the previous selection cycle were used in the experimental plantation. For the final testing of three or more clones, in accordance with the valid regulation, if there are no registered clones, then each individual clone is compared against the mean values of all other clones.

The age of the plantation to be used for the final testing must be at least 3 years. It should also be taken into account that the plantation will only achieve its full training system and full yield in the third year only if the conditions are optimal, i.e., if the works are timely in preparing the land and nutrient supplementation to ensuring optimal moisture levels and if high quality propagation material is used. The singly Guyot training system is most appropriate for this purpose, while for more complex training systems at least four or more years are needed for the vine to be completely formed.

Measuring the basic production characteristics of clonal candidates

The fundamental production characteristics of clones that are ascertained by measurements during final testing are: yield, number of bunches per vine, average bunch mass, sugar content in must, total acid content and pH in must.

The yield and number of bunches per vine is determined by absolute counts and weighing of all bunches from at least five comparable vines in each replicate. Then, the average bunch mass is determined by calculations. For each repetition, after weighing a representative sample of ten healthy and undamaged bunches is taken for further laboratory analysis of the fundamental chemical composition of the must. The bunches are crushed and pressed in the laboratory to obtain the must sample. To ensure its heterogeneity, the must is pressed out

mogu pripisati razlikama između klonova. Kako bi se to spriječilo, potrebno je paziti da se grožđe tijekom berbe ili transporta ne oštećuje te da se berba provodi u ranim jutarnjim satima, tj. pri nižim temperaturama. Alternativno se neoštećeno grožđe može smjestiti u hladnjače kako bi mu se temperatura prije prerade spustila ispod 10 °C. Za preradu se primjenjuje tehnologija za mirna vina s minimalnim utjecajem na svojstva klonova i maksimalno ujednačenim uvjetima za sve klonove. Kod same prerade koristi se uobičajena tehnologija koja uključuje primarnu preradu: muljanje i runjenje grožđa te prešanje hidroprešama ili pneumatskim prešama. Predfermentacijska obrada uključuje sumporenje i taloženje mošta, a nakon toga inokulaciju mošta selekcioniranim kvascima. U moštu je prije fermentacije potrebno odrediti sadržaj dušika dostupnoga kvascima (FAN) te ako je on ispod odgovarajuće razine, obvezna je njegova korekcija kako bi se izbjegli zastoji i neujednačene fermentacije između klonova. Selekcionirani kvasci koji se koriste moraju imati smanjenu do umjerenu produkciju sekundarnih, tj. fermentacijskih aroma i pozitivan utjecaj na primarnu sortnu aromu. Fermentaciju je preporučljivo provoditi u staklenom suđu volumena oko 50 L s prikladnim vrenjačama koje se nalazi u prostoru temperature od oko 15-16 °C, pri čemu zbog malog volumena nije potrebno dodatno hlađenje posuda. Uz vinifikaciju klonova potrebno je posebno vinificirati određeni volumen mješavine svih klonova (višak mošta) koji je potreban za dopunu suđa nakon faze burne fermentacije jer je zbog malih ukupnih volumena ovo kritičan period za pojavu oksidacije. Nastavak vinifikacije odnosi se na pretok koji se u pravilu obavlja neposredno nakon fermentacije uz prethodno sumporenje te nakon cca 30 dana drugi pretok uz filtraciju vina i punjenje u boce.

of all berries. More mature berries are softer and break easily under pressure, while smaller berries can remain whole. This will not give a representative must sample for the analysis, and accordingly, the results will not be an accurate indicator of the chemical composition of the must of an individual clone. Measuring the sugar content is most often performed by refractometry, total acids are determined by the titration method, and pH is measured with a pH metre. Experienced ampelographers conducted a visual evaluation of clone properties, further assessing other important traits such as vigor, bunch compactness and more. If it is deemed useful, the analyses can be expanded to include other characteristics, such as mechanical analysis of bunches or additional instrumental analysis of grapes or must to determine aromas or other groups of secondary metabolites that are important for the quality of wine. For the description of clones, good photographic documentation is also required.

Microvinification

After taking the samples for chemical analysis from all replicates, the grapes from each remaining clone in the experimental plantation are used in microvinification. Due to the small volume, this process is highly demanding, more so than classical vinification of large volumes. The main threat is the oxidation of must in the final phases of fermentation or immediately before, particularly in the microvinification of white varieties. These oxidative changes, even at very low intensities, can have a pronounced negative impact on the primary aroma of the wine (originating from the grapes) that is dominantly attributed to the differences between clones. In order to prevent this, special care must be taken to prevent any damage to grapes

Zatim slijedi laboratorijska analiza vina. Organoleptičko ocjenjivanje vina provodi se najčešće dva mjeseca nakon završetka fermentacije.

Izrada službenog opisa klonova

Nakon završenog ispitivanja klonova i prikupljanja svih potrebnih podataka provodi se njihova obrada i izrada službenog opisa klonova. Osim podataka prikupljenih završnim ispitivanjem, koriste se i drugi dostupni podaci vezani uz lokaciju na kojoj je izdvojen matični trs pojedinoga klona kao i podaci koji su dobiveni u ranijoj fazi selekcije. Uz opise je potrebno priložiti i odgovarajuću fotodokumentaciju, posebno fotografije grozda ili cijelog trsa na kojima su vidljive specifičnosti pojedinoga klona.

Osim opisa klonova uz zahtjev za priznavanje klonova potrebno je prikazati i tijek selekcije od početka te definirati na koji su način zadovoljeni svi potrebni uvjeti propisani važećom legislativom s posebnim osvrtom na sanitarni status klonskih kandidata.

Inicijalni sadni materijal

Uz postupak završnog ispitivanja provodi se i proizvodnja inicijalnog sadnog materijala klonova koji služi za uspostavu predosnovnih matičnih nasada u kojima se u kontroliranim uvjetima čuva najčešće tri do pet biljaka registriranih klonova. Za njihovu proizvodnju potrebno je koristiti plemku s prvorazmnoženoga klonskog potomstva matičnih trsova. Usto, nastoje se osigurati i uvjeti za podizanje osnovnih i/ili certificiranih matičnih nasada kako bi se omogućila proizvodnja certificiranog sadnog materijala klonova nakon registracije i njihovo korištenje u podizanju proizvodnih nasada.

Unatoč cijelom postupku završna provjera klonova provodi se ipak nakon njihove registracije od strane samih proizvođača. Korisno je

during harvest or transport, and the harvest must be conducted in the early morning hours, at lower temperatures. Alternatively, undamaged grapes can be held in the refrigerator to ensure that their temperature prior to processing is less than 10°C. For processing, a basic still wine technology is used, with minimum influence on clone properties and maximum equalisation of conditions for all clones. In processing, the usual technology is used, and includes primary processing: grapes are crushed and desteammed and then pressed using a hydropress or pneumatic press. Pre-fermentation processing includes the addition of sulphur and the sedimentation of the must, and then the must is inoculated with selection yeasts. Prior to fermentation, the content of free amino nitrogen (FAN) must be determined, for if this level is below the required level, correction is essential to avoid any stagnation or uneven fermentation between clones. Selected yeasts used must have a reduced to moderate production of secondary (fermentation) aromas and a positive effect on the primary aroma of the variety. Fermentation is recommended in 50 L glass casks with the appropriate fermentation lock in a room with air temperature of 15–16°C, and further cooling of the tank is not required due to the small volume of must. With the vinification of clones, it is also necessary to perform vinification of a certain volume of the blend of all clones (excess must), needed to fill the casks after the phase of alcoholic fermentation, as due to the small total volume, this is a critical period for the appearance of oxidation. The next step in vinification is transfer, which as a rule is performed immediately after fermentation with prior addition of sulphur, and after 30 days the wine is again transferred, filtered and bottled. The wine is then subjected to lab

nastaviti ih pratiti i nakon postupka, i u uspostavljenom pokusnom nasadu, i u proizvodnim nasadima koji se podižu nakon toga.

Postupak zaključnog ispitivanja (homologacije) i registracije klonova Škrleta

Kako je postupak klonske selekcije Škrleta počeo još 2000., osam godina prije službeno utvrđenih i opisanih kriterija za selekciju i registraciju klonova, postupci i istraživanja primijenjeni na Škrletu u mnogočemu su bili opsežniji

Pokusni nasad sa klonskim kandidatima Škrleta u Popovači (lokacija Palovine) u kojemu je izvršen završni odabir klonova za registraciju.

Experimental plantation with clone candidates of Škrlet in Popovača (Palovine location) in which the final selection of clones for registration was made.

analysis. Organoleptic assessment of wine is usually performed two months after the final fermentation.

Official clone description

Once final testing of the clone is complete and all the necessary data are collected, the data are processed and the official clone description is prepared. In addition to the data collected during the final testing, other available data are also used, such as locations from which the mother vine of a certain clone was isolated and data obtained during earlier selection phases. The description should also include the appropriate photographic documentation, especially photographs of bunches or the entire vine that display the specificities of an individual clone.

In addition to the description of the clone, the clone recognition application also must include an outline of the course of selection from the beginning, and define how all the necessary conditions were met as prescribed by the valid legislation, with a special emphasis on the sanitary status of the clonal candidate.

Initial propagation material

Alongside the final testing procedure, initial propagation material of the clone is produced, which then serves to establish the pre-base mother blocks in which three to five plants of the registered clone are usually kept under controlled conditions. Scions from the initially propagated clonal descendent of the mother vine are used for their production. Efforts are also made to ensure the conditions are met for raising a fundamental and/or certified mother block, which would enable the production of certified propagation material of clones following registration, and their use in raising production plantations.

i detaljniji. Treba imati na umu da je to bio prvi takav projekt u Hrvatskoj i da su prvi, pionirski klonovi, selekcionirani i službeno registrirani upravo oni od Škrleta. U nastavku se opisuju svi primijenjeni postupci i radnje do konačne registracije klonova Škrleta.

Od klonskih kandidata za koje je u prvoj fazi klonske selekcije utvrđeno da su u zdravstvenim i proizvodnim svojstvima pokazali iznadprosječne vrijednosti, tijekom 2006. i 2007. uzeti su pupovi i u suradnji s domaćom rasadničarskom tvrtkom Fragaria d.o.o. iz Zagreba proizvedeni su cjepovi na bezvirusnim podlogama s kojima je u proljeće 2007. (i nadosadnjom 2008.) podignut komparativni pokus po slučajnom bloknom rasporedu (RCBD) sa 7 klonskih kandidata u 4 ponavljanja na izdvojenoj lokaciji (Popovača – Palovine) na zemljištu koje prije nije bilo pod vinogradima. Svaki klonski kandidat uključen u pokus bio je zastupljen s 56 trsova. Metoda ispitivanja bila je u skladu sa zahtjevima *Pravilnika o stavljanju na tržište materijala za vegetativno umnažanje loze – dodatak 7* („Narodne novine" br. 133/06), a nadzor i verifikaciju rezultata provodio je Zavod za sjemenarstvo i rasadničarstvo Hrvatskog centra za poljoprivredu, hranu i selo (danas Centar za sjemenarstvo i rasadničarstvo, HAPIH).

Provjera klonova za potrebe izlučne selekcije (homologacije) i odabira 2 – 3 najbolja i međusobno divergentna klona zasnovana je na ispitivanju gospodarskih karakteristika u poljskom pokusu s ponavljanjima, laboratorijskim analizama grožđa i mošta te pokusnim mikrovinifikacijama i ocjenama vina. Mjerenja i analize počeli su 2010. s ulaskom u puni rod, a završeni su 2014. Nepovoljne vremenske prilike 2010. i 2013. značajno su utjecale na karakteristike grozda te su za završnu analizu korišteni samo podaci iz 2011., 2012. i 2014. godine i na

Despite this entire procedure, the final testing of clones is in fact conducted after their registration by the producers themselves. It is useful to continue monitoring them even after completion of the procedure, both in the established experimental plantation, and in the production plantations that are subsequently raised.

Final testing procedure (homologation) and registration of Škrlet clones

Since the clonal selection procedure of Škrlet began in 2000, eight years before the officially established and described criteria for the selection and registration of clones, the procedures and research applied to Škrlet were more extensive and in greater detail in many aspects. One should keep in mind that this was the first such project in Croatia, and the first pioneer clones selected and official registered were those of Škrlet. Below all the applied procedures and activities taken prior to the final registration of the Škrlet are described.

During 2006 and 2007, buds were taken from the clonal candidates established to have above-average values of health and production properties during the first phase of clonal selection. In cooperation with the Fragraria nursery from Zagreb, grafts were produced on virus-free rootstock and in spring 2007 (and with new planting in 2008), a comparative experiment was established using the randomised complete block design (RCBD) with seven clonal candidates in four replicates at two locations (Popovača – Palovine) on land not previously under vineyards. Each clonal candidate included in the experiment was represented by 56 vines. The research methods were in accordance with the Ordinance on the marketing of materials for the vegetative propagation of grapevine – addendum 7 (Official Gazette 133/06), and

temelju njih je napravljena analiza svih prikupljenih podataka za konačni odabir i službeni opis odabranih klonova. Organoleptička ocjena uzoraka vina iz mikrovinifikacije od strane panela profesionalnih ocjenjivača provedena za vina iz berbi 2010., 2011. i 2012. pokazala je značajne i prilično konzistentne razlike među klonovima, što je omogućilo selekciju klonova prosječne i iznadprosječne kvalitete vina.

S obzirom na to da u vrijeme podizanja pokusnog nasada na tržištu nije bilo registriranih standardnih klonova (najrašireniji klon pojedine sorte), primijenjena je ranije spomenuta iznimka po kojoj se, u slučaju da za danu sortu na tržištu nema ni certificiranog sadnog materijala standardnoga klona ni sorte, vrijednost pojedinoga klona može uspoređivati s prosjekom svih klonskih kandidata uključenih u pokus. Prilikom izvedbe pokusa i laboratorijskih analiza tijekom provjere novih klonova poštivane su odredbe pravilnika koji uređuje ispitivanje sorti vinove loze u postupku upisa sorti vinove loze u sortnu listu.

Tijekom ispitivanja zabilježena su morfološka i fiziološka svojstva radi provjere autentičnosti klonova sa sortom od koje potječu. Dodatno je provedena i genetička identifikacija svih ispitivanih klonova primjenom markera SSR-a te procjena unutarsortne varijabilnosti primjenom markera AFLP-a i S-SAP-a. Za neke od ispitivanih klonskih kandidata napravljene su i detaljne kemijske analize mošta, kao i analiza spojeva odgovornih za primarne arome. Svi navedeni podaci korišteni su za izradu standardnog ampelografskog opisa odabranih klonova.

Usporedno s ispitivanjima za priznavanje klonova najperspektivniji klonski kandidati slobodni od virusa tijekom više godina (2007. – 2012.) razmnožavani su u suradnji s rasadnicima Fragaria i STS Ivanjkovci (Slovenija) u

supervision and verification of results was conducted by the Department for Seeds and Seedlings of the Croatian Centre for Agriculture, food and the Village (today The Centre for Seed and Seedlings, HAPIH).

The verification of clones for the purpose of final selection (homologation) and the selection of the 2–3 best and mutually divergent clones was based on testing the agronomic properties in the replicated field experiment, laboratory analysis of grapes and must, and an experimental microvinification with assessment of the wine. Measurements and analysis began in 2010 with the first full yield, and were completed in 2014. The unfavourable weather in 2010 and 2013 significantly affected the properties of the grapes, and therefore only the data from 2011, 2012 and 2014 were used in the analysis of all collected data for the final selection and official description of the selected clones. The organoleptic assessment of wine samples from microvinification by an expert panel of assessors was performed on wines from the 2010, 2011 and 2012 vintages. Significant and consistent differences were detected between the clones, enabling the selection of clones giving average and above-average wine quality.

Considering that there were no registered standardised clones (most widely used clone of a given variety) at the time of raising the experimental plantation, the previously noted exception was applied in which the value of an individual clone may be compared with the average of all clonal candidates included in the experiment when there is no certified propagation material for a clone of a variety on the market. During this experiment and the laboratory analysis in testing the new clones, the provisions of the ordinance governing the testing of grapevine varieties in the procedure

Strojna sadnja pokusnog nasada s klonovima Škrleta 2013. na lokaciji Voloder.
Machine planting of an experimental plantation with Škrlet clones in 2013 at the Voloder location.

po nekoliko stotina trsova i sađeni kod većih proizvođača Škrleta (Miklaužić, Mikša i Jaram) u sklopu njihovih tada novih nasada podizanih s materijalom kategorije standard kako bi se u idućim godinama steklo veće iskustvo i spoznaje o klonovima prije završnog odabira klonova za registraciju. Tijekom 2013. posađen je makropokus (1 ha) s klonskim sadnim materijalom tri kasnije priznata i još nekoliko neregistriranih klonskih kandidata na lokaciji Voloder u suradnji s vinarijom Miklaužić. U tom pokusnom nasadu provode se pokusi s kombinacijama više klonova i tri različite podloge (K5BB, SO4 i 125AA). Svaka kombinacija klona i podloge zastupljena je s više stotina trsova, što omogućuje proizvodnju većih količina grožđa i vinifikacije s više stotina litara mošta pojedinih klonova. Ova su ispitivanja još u tijeku, a trebala bi rezultirati novim spoznajama o karakteristikama registriranih klonova.

Temeljem stručnog nadzora i uvida u podatke ispitivanja od strane HAPIH-CSR 2014. ispitivanje klonskih kandidata je dovršeno i ta je institucija 2015. izdala potvrde o priznavanju triju klonova oznake „Škrlet klon 29”, „Škrlet

of registration of grapevine varieties into the Variety List were applied.

During testing, morphological and physiological properties were noted to verify the authenticity of the clones with the variety they originated from. Genetic identification of all tested clones was also further verified using SSR markers, and intra-varietal variability was tested using the AFLP and S-SAP markers. For some of the tested clonal candidates, detailed chemical analysis of the must was tested, along with the analysis of compounds responsible for the primary aromas. All these data were then applied in developing the standard ampelographic description of the selected clones.

Parallel with the testing for recognition of clones, over several years (2007–2012) the most promising virus-free clonal candidates were propagated in cooperation with the Fragraria nursery and STS Ivanjkovci nursery (Slovenia) and several hundred vines were planted in the vineyards of the larger Škrlet producers (Miklaužić, Mikša and Jaram) as part of their new plantations raised using standard category materials, with the aim of gaining more

klon 33" i „Škrlet klon 74", što je bio temelj za njihov upis na sortnu listu Republike Hrvatske.

Karakteristike registriranih klonova Škrleta

Na temelju svih dosadašnjih rezultata i iskustava s tri registrirana klona koji su eksperimentalno razmnoženi i testirani na više lokacija, dokazane su njihove međusobne značajne razlike kako u pogledu ampelografskih karakteristika, tako i u pogledu njihove gospodarske vrijednosti. Donosimo pregled njihovih karakteristika i izgled tipičnog grozda pojedinih klonova.

KLON 29

Klon 29 spada u skupinu rodnijih klonova. U svim ispitivanjima imao je prinos po trsu veći od prosjeka svih klonova zajedno. Prosječni prinosi svih klonskih kandidata 2011. i 2012. bili su nešto niži (prosječno 2,4 kg/trsu 2011. i 2,8 kg/trsu 2012.) u odnosu na 2014. (4,47 kg/trsu), a klon 29 uvijek je imao veći prinos (3,0 kg/trsu 2011. i 2012. te 4,57 kg/trsu 2014.). Veći prinos klon 29 ostvaruje iznadprosječnim brojem grozdova. Primjerice prosječan broj grozdova po trsu svih klonskih kandidata 2011. iznosio je 24,5, a istovremeno je klon 29 imao 29,5 grozdova, odnosno čak 20 % više od prosjeka. Slične karakteristike pokazao je u svim istraživanim godinama.

Grozdovi klona 29 prosječne su veličine i mase. U sušnim godinama grozdovi su bili mase 108 g (2011.) i 122 g (2012.), pri čemu je prosjek svih klonova iznosio 95,7 i 123,7 g. Godine 2014. prosječan grozd svih klonova imao je 132 g, a grozd klona 29 137 g. Grozd karakteriziraju srednje krupne bobice s dobrom obojenosti u vrijeme zriobe.

Prema kvaliteti mošta iz mikropokusa klon 29 pokazuje prosječne vrijednosti sadržaja sladora i ukupnih kiselina. Godine 2011. i 2012.

knowledge about the clones in the following years prior to the completion of the final selection of clones for registration. During 2013, a macro-experiment (on 1 hectare) was planted at the Voloder location in collaboration with the Miklaužić winery, using the clonal propagation materials of three subsequently recognised, and several other unregistered clonal candidates. Experiments were then conducted using combinations of different clones on three different rootstocks (K5BB, SO4 and 125AA). Every combination of clone and rootstock was represented by several hundred vines, enabling the production of larger quantities of grapes, and vinification of several hundred litres of must for each individual clone. This research is still ongoing and is sure to result in new findings about the characteristics of the registered clones.

Based on the expert supervision and insight into the testing data by the HAPIH-CSR, the testing of clonal candidates was completed in 2014 and that institution issued its recognition certificate for three clones in 2015: Škrlet clone 29, Škrlet clone 33 and Škrlet clone 74. This then formed the foundation for their entry into the Variety List of the Republic of Croatia.

Characteristics of the registered clones of Škrlet

Based on all the results and experiences to date with these three registered clones that have been experimentally propagated and tested at multiple locations, the significant differences among them have been proven, in the sense of their ampelographic properties, and in the sense of their agronomic value. Below is an overview of their characteristics, and images of representative bunches.

odlikovale su se vrlo visokim sladorima i niskim kiselinama (prosječne vrijednosti svih klonova 2011. iznosile su 101,1 °Oe za slador i 5,83 gL^{-1} ukupnih kiselina, odnosno slador 94,9 °Oe i 4,90 gL^{-1} kiselina 2012.), a vrijednosti klona 29 bile su blizu prosjeka (slador 96 °Oe i kiselost od 5,93 gL^{-1} 2011., odnosno slador 92 °Oe i sadržaj kiselina 4,79 gL^{-1} 2012.). U klimatski različitoj 2014. godini klon 29 zadržava svoje kvalitativne karakteristike sa sadržajem sladora od 63 °Oe te sadržajem kiselina od 7,13 gL^{-1} nasuprot ukupnim prosječnim vrijednostima od 65,6 °Oe i 7,29 gL^{-1} ukupnih kiselina.

Organoleptičkim ocjenjivanjem utvrđeno je da vino klona 29 sadrži sve prepoznatljive karakteristike Škrleta. Ukupna prosječna ocjena svih klonova 2011. godini bila je 77,4 boda, a klon 29 ostvario je 78 bodova. Godine 2012. ukupan prosjek iznosio je 79,3 boda, a klon 29 ocijenjen je sa 79 bodova.

Rezultati kemijske analize vina klona 29 pokazale su da je riječ o klonu koji daje vino prosječnih alkohola i nešto nižeg sadržaja pepela. Prosječne vrijednosti svih klonova 2011. iznosile su 15,08 vol% za sadržaj alkohola i 1,52 gL^{-1} pepela. Klon 29 imao je 15,29 vol% alkohola i sadržaj pepela 1,36 gL^{-1}. Godine 2012. klon 29 ponovio je svoje karakteristike, 13,74 vol%

CLONE 29

Clone 29 is in the group of high-yield clones. In all testing, it had a higher yield per vine than the average of all clones together. The average yields of all clonal candidates in 2011 and 2012 were somewhat lower (average 2.4 kg/vine in 2011 and 2.8 kg/vine in 2012) in comparison with 2014 (4.47 kg/vine), and clone 29 always had a higher yield (3.0 kg/vine in 2011 and 2012 and 4.57 kg/vines in 2014). The higher yield of clone 29 is achieved through the above-average number of bunches. For example, in 2011, the average number of bunches per vine on all clonal candidates was 24.5, while clone 29 had 29.5 bunches, or 20% more than the average. Similar characteristics were seen in all investigated years.

The bunches of clone 29 were of average size and mass. In dry years, bunches had a mass of 108 g (2011) and 122 g (2012), where the average of all clones was 95.7 and 123.7 g, respectively. In 2014, the mass of the average bunch of all clones was 132 g, while in clone 29 it was 137 g. Bunches are characterised by medium-sized berries with good colouration during ripening.

In terms of must quality from the micro-experiment, clone 29 had average values of sugar and total acid content. The 2011 and 2012 vintages stood out for very high sugar content and low acid content (average value of all clones in 2011 was 101.1°Oe for sugar and 5.83 gL^{-1} total acids, and in 2012 94.9°Oe for and 4.90 gL^{-1} for acids), and the values of clone 29 were near average (sugar 96°Oe and acidity 5.93 gL^{-1} in 2011, and sugar 92°Oe and acidity 4.79 gL^{-1} in 2012). In the climatically different 2014, clone 29 retained its quality characteristics, with a sugar content of 63°Oe and total acids of 7.13 gL^{-1} in comparison with the average values of sugar 65.6°Oe and total acids 7.29 gL^{-1}.

alkohola spram prosjeka svih klonova od 14,03 vol%, te 1,39 gL^{-1} pepela spram prosjeka svih klonova od 1,47 gL^{-1}.

KLON 33

Klon 33 pripada skupini manje rodnih klonova. Prinosi po trsu klona 33 u svim godinama ispitivanja bili su ispodprosječni i ukupno gledano najmanji u odnosu na ostale klonove. Prinosi klona 33 iznosili su 1,8 kg/trsu 2011., 2,4 kg/trsu 2012. i 3,61 kg/trsu 2014. dok su ukupni prosjeci bili 2,4 kg/trsu 2011., 2,8 kg/trsu 2012. te 4,47 kg/trsu 2014. Prema gospodarskim karakteristikama vezanim uz svojstva grozda klon 33 ima normalan (prosječan) broj grozdova po trsu, preciznije 22,5, 21,8 i 31,9 grozdova po trsu 2011., 2012. i 2014., što je unutar granica pouzdanosti prosječnih vrijednosti svih klonova zajedno u navedenim godinama (24,5, 22,8 i 34,0 grozda po trsu).

Klon 33 karakterizira ispodprosječna masa grozda. Godine 2011. prosječna masa grozda klona 33 iznosila je 69 g, što je u odnosu na prosječnu masu grozda svih klonova (95,7 g) 27,9 % manji grozd. Godine 2012. grozdovi su bili manji 11 % (110 g u odnosu na prosječnih 123,7 g), a 2014. 23,7 % manji (114 g u odnosu na prosječna 132 g). Manja masa grozda uzrokovana je manjim brojem bobica srednje veličine, što rezultira i manjim ukupnim prinosom. Grozdove klona 33 karakterizira i odlična obojenost bobica u vrijeme pune zriobe.

Najvažnija karakteristika klona 33 njegovo je ranije dozrijevanje koje rezultira boljim nakupljanjem sladora i manjim sadržajem kiselina u moštu, odnosno iznadprosječnim kvalitativnim karakteristikama. U svim godinama ispitivanja klon 33 imao je znatno bolje kvalitativne pokazatelje mošta od prosjeka. Tako je 2011. izmjeren sadržaj sladora u moštu od 104 °Oe

The organoleptic assessment found that the wine of clone 29 contained all the recognisable characteristics of Škrlet. The total average grade of all clones in 2011 was 77.4 points, while clone 29 achieved 78 points. In 2012, the average was 79.3 points and clone 29 received 79 points.

The results of the chemical analysis of wine of clone 29 showed that this clone gives wine with an average alcohol content and somewhat lower ash content. The average values of all clones in 2011 were 15.08% vol% alcohol and 1.52 gL^{-1} ash, while clone 29 had 15.29 vol% alcohol and ash content of 1.36 gL^{-1}. In 2012, clone 29 repeated its characteristic, with a 13.74 vol% alcohol content in comparison with the all-clone average of 14.03 vol%, and ash content of 1.39 gL^{-1} in comparison with the all-clone average of 1.47 gL^{-1}.

CLONE 33

Clone 33 is in the group of lower yield clones. Yields per vine of clone 33 in all test years were below-average, and overall were lower than all other clones. Yields of clone 33 were on average 1.8 kg/vine in 2011, 2.4 kg/vine in 2012 and 3.61 kg/vine in 2014, while the total averages were 2.4 kg/vine in 2011, 2.8 kg/vine in 2012 and 4.47 kg/vine in 2014. According to the agronomic properties relating to the bunch properties, clone 33 had an average number of bunches per vine, i.e., 22.5, 21.8 and 31.9 bunches per vine in 2011, 2012 and 2014, which is within the confidence limits for the average values of all clones together in the same respective years (24.5, 22.8 and 34.0 bunches per vine).

Clone 33 is characterised by a below-average bunch mass. In 2011, the average bunch mass of clone 33 was 69 g, which is 27.9% lower than the average mass of bunches of all clones

dok je prosjek svih klonova bio 101,1 °Oe. Godine 2012. sadržaj sladora bio je 102 °Oe, a prosjek svih klonova je 94,9 °Oe. U klimatski nepovoljnoj 2014. godini klon 33 je zbog ranijeg dozrijevanja imao bolju kvalitetu, sadržaj sladora 68 °Oe i sadržaj ukupnih kiselina od 7,13 gL^{-1} u odnosu na prosjek svih klonova 65,6 °Oe i 7,29 gL^{-1} kiselina.

Prema rezultatima organoleptičkog ocjenjivanja klon 33 je u svim godinama imao ocjene veće od ukupnog prosjeka. Vina berbe 2011. imala su ukupnu prosječnu ocjenu od 77,4 boda, dok je vino klona 33 ocijenjeno sa 79 bodova. Također, vino iz 2012. dobilo je 81 bod u odnosu na ukupan prosjek od 79,3 boda.

Prema rezultatima kemijskih analiza vina vrijednosti klona 33 kretale su se unutar granica varijabilnosti svih klonova. Godine 2011. klon 33 imao je alkohol od 15,39 vol% u odnosu na ukupan prosjek od 15,08 vol%, 2012. 15,11 vol% u odnosu na prosjek svih klonova od 14,03 vol%.

KLON 74

Klon 74 ima prosječne gospodarske karakteristike, ali se ističe izvrsnim karakteristikama vina prema rezultatima organoleptičkih ocjenjivanja. Prosječne je rodnosti, s prinosima po trsu koji su

(95.7 g). In 2012, bunches were 11% smaller than the average (110 g in comparison with the average of 123.7 g), and in 2014 were 23.7% smaller (114 g in comparison with the average of 132 g). The smaller mass of bunches is due to the smaller number of medium-sized berries, resulting in a lower overall yield. The grapes of clone 33 are characterised by excellent colouration of the berries at the time of full ripeness.

The most important characteristics of clone 33 is its earlier ripening, which results in better sugar accumulation and lower acid content in the must, giving it above average quality properties. In all testing years, clone 33 gave significantly better-quality indicators of must than the average. In 2011, sugar content in must was 104°Oe as opposed to the average of 101.1°Oe for all clones. In 2012, sugar content was 102°Oe against the average of 94.9°Oe in all clones. In the unfavourable climate year 2014, clone 33 again achieved better quality due to its earlier ripening, with a sugar content of 68°Oe and total acids of 7.13 gL^{-1} in comparison with the average of all clones of 65.6°Oe sugars and 7.29 gL^{-1} acids.

The results of the organoleptic assessments of clone 33 had above-average scores in all years. The 2011 vintage had a total average score of 77.4 points, while the wine of clone 33 was assessed with 79 points. The 2012 vintage obtained a score of 81 points in relation to the total average of 79.3 points.

The chemical analysis of wine saw the values of clone 33 within the variability levels of all clones. In 2011, clone 33 had an alcohol content of 15.39 vol% in relation to the total average 15.08 vol%, in 2012, the alcohol content was 15.11 vol% in comparison to the all-clone average of 14.03 vol%.

KLON 29

Visoka rodnost (>3 kg/trsu) s iznadprosječnim brojem grozdova po trsu (25). Šećeri i kiseline na razini prosjeka sorte. Grozd prosječne veličine, srednje krupne bobice i dobre obojenosti u vrijeme zriobe. Prosječne kvalitativne karakteristike vina.

CLONE 29

High yield (> 3 kg / vine) with above-average number of bunches per vine (25). Sugars and acids at the level of the variety mean. Bunch of medium size, medium-sized berries and good coloration at ripening. Average qualitative characteristics of wine.

KLON 33

Ranije dozrijeva i ima relativno mali urod po trsu (2 – 2,5 kg) uz prosječan broj grozdova po trsu (20 – 22). U višegodišnjim pokusima ostvaruje najveće sladore (95 – 100 °Oe) uz kiseline na razini prosjeka sorte. Najmanji grozd (100 – 130 g), srednje krupne bobice i odlične obojenosti u vrijeme zriobe (ljubičaste nijanse). Iznadprosječne kvalitativne karakteristike vina.

CLONE 33

It ripens earlier and has a relatively small yield per vine (2 - 2.5 kg) with an average number of bunches per vine (20 - 22). In many years of experiments, it achieves the highest sugars (95 - 100 oOe) with acids at the level of the variety mean. The smallest bunch (100 - 130 g), medium-sized berries and excellent coloration at ripening time (purple hue). Above-average quality characteristics of wine.

KLON 74

Prosječni urod po trsu (2,7 – 2,9 kg) i prosječni broj nešto krupnijih grozdova po trsu. U višegodišnjim pokusima ostvaruje iznadprosječne sladore i kiseline. Grozd prosječne mase (150 g), srednje krupne bobice i dobre obojenosti u vrijeme zriobe. Iznadprosječne kvalitativne karakteristike vina.

CLONE 74

Average yield per vine (2.7 - 2.9 kg) and average number of slightly larger bunches per vine. In multi-year experiments, it achieves above-average sugars and acids. Bunch of average weight (150 g), medium-sized berries and good coloration at the time of ripening. Above-average quality characteristics of wine.

Izgled prosječnog grozda i najvažnije karakteristike triju registriranih klonova

Appearance of the average bunch and the most important characteristics of the three registered clones

u godinama istraživanja iznosili: 2,8 kg 2011., 2,7 kg 2012. i 3,97 kg/trsu 2014. i time su na razini ukupnog prosjeka sorte (2,4 kg/trsu 2011., 2,8 kg 2012. i 4,47 kg 2014.). I prema broju grozdova po trsu klon 74 pokazuje prosječne vrijednosti. Godine 2011. imao je 28,3, nešto više od ukupnog prosjeka od 24,5 grozdova po trsu. Godine 2012. za klon 74 izbrojeno je prosječno 20,9 grozdova po trsu dok je ukupni prosjek svih klonova iznosio 22,8. Godine 2014. prosječno je utvrđeno 34,0 grozda po trsu svih klonova, a klon 74 imao je 30 grozdova.

U svim godinama ispitivanja ovaj klon imao je nešto veću masu grozda. Godine 2011. imao je prosječnu masu grozda od 100 g, dok je ukupni prosjek bio 95,7 g.; 2012. 128 g u odnosu na prosjek svih klonova od 123,7 g i 134 g 2014. u odnosu na ukupni prosjek od 132 g. Klon 74 odlikuje se i srednjom krupnoćom bobica i dobrom obojenosti u zriobi.

Prema vremenu dozrijevanja i kvalitativnim karakteristikama klon 74 ima prosječne vrijednosti i na neki način najbliži je karakteristikama populacije sorte Škrlet. Godine 2011. ovaj klon imao je malo niži slador (100 °Oe) od ukupnog prosjeka (101,1 °Oe). Mošt toga klona je 2012. sadržavao malo više sladora (96 °Oe) od prosjeka (94,9 °Oe), a 2014. ponovno neznatno manje (65 °Oe) od prosjeka svih klonova (65,6 °Oe). Sadržaj kiselina između godina varirao je od 5,60 gL^{-1} 2011., 5,28 gL^{-1} 2012. do 7,40 gL^{-1} 2014. i uvijek bio vrlo blizu prosječnih vrijednosti svih klonova (5,86 gL^{-1} 2011., 4,90 gL^{-1} 2102. i 7,29 gL^{-1} 2014.).

Nasuprot prosječnim gospodarskim karakteristikama (prinos i kvaliteta mošta) vina klona 74 u svim godinama ispitivanja dobila su najviše ocjene na organoleptičkom ocjenjivanju. Vino iz 2011. ocijenjeno je s 80 bodova, a ukupan prosjek iznosio je 77,4 boda. Vino iz

CLONE 74

Clone 74 has average agronomic characteristics but stands out due to the excellent characteristics of the wine, particularly the results of the organoleptic assessments. Clone 74 gives an average yield, with yields per vine in the investigated years: 2.8 kg in 2011, 2.7 kg in 2012, and 3.97 kg/vine in 2014, which was at the level of the variety average (2.4 kg/vine in 2011, 2.8 kg in 2012 and 4.47 kg in 2014). In terms of the number of bunches per vine, clone 74 also showed average values. In 2011, it gave 28.3, somewhat higher than the total average of 24.5 bunches per vine. In 2012, clone 74 gave on average 20.9 bunches per vine, while the total average of all clones was 22.8. In 2014, the average of all clones was 34.0 bunches per vine, while clone 74 gave 30 bunches.

In all investigated years, this clone had a slightly higher bunch mass. In 2011, the average mass of the bunch was 100 g, as opposed to the average of all clones of 95.7 g; in 2012 the mass was 128 g in comparison to the all-clone average of 123.7 g, and in 2014 the mass was 134 g in comparison with the total average of 132 g.

2012. dobilo je 83 boda u odnosu na prosjek od 79,3 boda.

Prema rezultatima kemijskih analiza alkoholne jakosti vina klona 74 (14,11 vol% 2011., 14,02 vol% 2012. i 12,51 vol% 2014.) mogu se smatrati vinima prosječne jakosti (prosjek svih klonova: 15,08 vol% 2011., 14,03 vol% 2012. i 12,51 vol% 2014.). Klon 74 ističe se od ostalih klonova iznadprosječnim sadržajem pepela u vinu. U vinu berbe 2011. izmjereno je 1,61 gL^{-1} pepela, u berbi 2012. 1,52 gL^{-1}, a 2014. 13,4 gL^{-1}, dok su prosjeci iznosili 1,52 gL^{-1}, 1,47 gL^{-1} odnosno 10,5 gL^{-1} 2011., 2012. i 2014. godine.

6.4. USPOSTAVA MATIČNIH NASADA ZA PROIZVODNJU CERTIFICIRANOG SADNOG MATERIJALA ŠKRLETA

Usporedno s drugom fazom klonske selekcije počelo je plansko razmnožavanje 11 bezvirusnih klonskih kandidata i prije konačnog odabira najboljih klonova. Razlog za to bio je loš opći zdravstveni status sadnog materijala kategorije standard koji je u tom trenutku jedini bio dostupan na tržištu. Ideja je bila što više povećati populaciju bezvirusnih klonskih kandidata i zasnovati nove (bezvirusne) matične nasade s preliminarno selekcioniranim materijalom te što prije osigurati pojavu kvalitetnijih cjepova na tržištu. U tom smislu već se 2005. počelo s uzimanjem bezvirusnih pupova za proizvodnju cjepova kategorije standard i udio tog zdravstveno boljeg sadnog materijala iz godine u godinu raste. Većina sadnog materijala Škrleta proizvedena pod tom kategorijom i posađena za podizanje novih vinograda 2006. podrijetlom je iz projekta klonske selekcije.

Clone 74 is characterised by a medium sized berry and good colouration in full ripeness.

In terms of ripening time and the quality characteristics, clone 74 has average values and was nearest to the general characteristics of the population of the variant Škrlet. In 2011, this clone had a somewhat lower sugar content (100°Oe) than the total average (101.1°Oe). The must of this clone in 2012 contained slightly less sugar (96°Oe) than the average (94.9°Oe), while in 2014 this was again slightly less (65°Oe) than the average of all clones (65.6°Oe). The total acid content between years varied from 5.60 gL^{-1} in 2011, 5.28 gL^{-1} in 2012 to 7.40 gL^{-1} in 2014 and in all cases was very near to the average value of all clones (5.86 gL^{-1} in 2011, 4.90 gL^{-1} in 2102 and 7.29 gL^{-1} in 2014).

In relation to the average agronomic characteristics (yield and must quality), the wine of clone 74 achieved the highest scores in organoleptic assessments in all years. The 2011 vintage was assessed with 80 points against the average of 77.4 points, the 2012 vintage received 83 points in comparison with the average of 79.3 points.

In terms of the results of the chemical analysis of alcohol content, the wines of clone 74 (14.11 vol% in 2011, 14.02 vol% in 2012 and 12.51 vol% in 2014) can be considered wines of average strength (average of all clones: 15.08 vol% in 2011, 14.03 vol% in 2012 and 12.51 vol% in 2014). Clone 74 differed from all other clones with the above-average ash content in wine. In the 2011 vintage, ash content was 1.61 gL^{-1}; it was 1.52 gL^{-1} in 2012, and 13.4 gL^{-1} in 2014, while the average values were 1.52 gL^{-1}, 1.47 gL^{-1} and 10.5 gL^{-1} in 2011, 2012 and 2014, respectively.

Prvi matični nasad sa 11 klonskih kandidata Škrleta (Popovača – Palovine 1) posađen 2008. cjepovima proizvedenim 2007. u Institutu za vinovu lozu u Geisenheimu (Njemačka). U ovom pokusnom nasadu čuva se inicijalni bezvirusni reproduktivni materijal koji služi za daljnja razmnožavanja. Pupovi iz ovog nasada korišteni su za proizvednju cjepova kategorije „osnovni" za podizanje glavnog matičnog nasada (Palovine 2) koji trenutno služi za proizvodnju komercijalnog certificiranog sadnog materijala.

The first mother block with 11 clone candidates of Škrlet (Popovača - Palovine 1) planted in 2008 with grafts produced in 2007 at the Grapevine Institute in Geisenheim (Germany). In this experimental plantation, the initial virus-free reproductive material is maintained and used for further reproduction. Buds from this plantation were used to produce the grafts (category Base) to establish the main mother block (Palovine 2) which serves at present for the production of commercial certified planting material.

Inicijalni matični nasad klonskog materijala Škrleta

Značajna prekretnica bila je priprema za podizanje prvog matičnog nasada s kojim će početi proizvodnja certificiranog sadnog materijala. Godine 2006. donesena je odluka za podizanje predosnovnog matičnog nasada iz kojega će se dobivati pupovi najvišeg zdravstvenog i selekcijskog statusa i koji će omogućiti proizvodnju visokokvalitetnog sadnog materijala. Pupovi upotrijebljeni za proizvodnju cjepova za predmetni matični nasad prošli su najstrožu selekciju koja je trajala šest godina, imaju dokazano podrijetlo matičnih trsova te prema zakonskim propisima (*Pravilnik o stavljanju na tržište materijala za vegetativno razmnožavanje loze* – dodatak 4 i 7, NN 133/06) ispunjavaju uvjete za proizvodnju sadnica kategorije predosnovni. Pupovi upotrijebljeni za proizvodnju inicijalnog sadnog materijala za ovaj matični nasad uzeti su u zimu 2006./2007. s približno podjednakog broja

6.4. ESTABLISHMENT OF THE MOTHER BLOCKS FOR THE PRODUCTION OF CERTIFIED ŠKRLET PROPAGATION MATERIALS

Simultaneous to the second phase of clonal selection, planned propagation of 11 virus-free clonal candidates began even before the final selection of the best clones. The reason for this was the poor overall health status of propagation materials of the standard category, which at that time was the only available material on the market. The idea was to increase the population of virus-free clonal candidates to the greatest extent possible, and to established new (virus-free) mother blocks with materials obtained in the preliminary selection, in order to offer high quality grafts on the market. In that sense, already in 2005, virus-free buds were taken for the production of standard category grafts, and the ratio of that higher health

matičnih trsova sedam klonskih potomstava podrijetlom od sedam elitnih trsova iz prve selekcije iz 2000. te su još četiri elitna trsa odabrana kasnije. U svrhu sigurne sljedivosti odabrani matični trsovi unutar klonskih potomstava iz tih pokusa odvojeno su obilježeni, cijepljeni i kasnije posađeni u matični nasad.

Reznice s pupovima poslane su u ožujku 2007. u Institut za vinovu lozu u Geisenheimu (Njemačka). Reznice svakog individualnog trsa najprije su ponovno testirane testom ELISA u Geisenheimu, a potom i PCR-om na Sveučilištu Adelaide u Australiji. Nakon toga cijepljenje sa zdravstveno najkvalitetnijim materijalom obavljeno je na podlozi Kober 5BB, subklon 13Gm – kategorije predosnovni (engl. *prebase*). Ukupno je proizvedeno 285 matičnih cjepova.

Sukladno praksi i u dogovoru od svakog klona zadržana su po tri cijepa za potrebe arhiviranja klonskog materijala Škrleta u Institutu u Geisenheimu (sigurnosno deponiranje koje ostavlja mogućnost naknadne reprodukcije), pa je konačni broj matičnih trsova za podizanje matičnjaka bio 267. S ovim cjepovima 2008. se uspostavlja prvi (povijesni) matični nasad najviše kategorije sadnog materijala (predosnovni) iz kojega će se u idućim godinama proizvoditi cjepovi za podizanje većih matičnih nasada registriranih klonova, ali i manje količine visokokvalitetnih cjepova za eksperimentalne nasade s pojedinačnim klonovima i mješavinom klonova.

Dakle, tijekom 2008., usporedno s dovršetkom podizanja komparativnog pokusa za dokazivanje klonskih karakteristika, matični cjepovi posađeni su na parcelu Palovine 1 u okolici Popovače (k. č. br. 1891/3 u Općini Popovača, Moslavačko-ivanićgradsko vinogorje). Prije podizanja nasada utvrđeno je da na spomenutoj lokaciji nije bilo drugih nasada vinove loze najmanje 20 godina, a provedena je i biološka

propagation material grows every year. As such, the majority of the Škrlet propagation material produced under that category and planted to raise new vineyards in 2006 originates from the clonal selection project.

Initial mother block of Škrlet clonal materials

A significant turning point was the preparation to raise the first mother block from which to start the production of certified propagation materials. In 2006, a decision was made to raise a prebase mother block to obtain buds of the highest health and selection status that would enable the production of high-quality propagation materials. The buds used for graft production for the mother block had passed the most stringent selection criteria over the course of six years, with proven origin of mother vines, and pursuant to the regulations (Ordinance on the marketing of materials for the vegetative propagation of grapevine, Appendices 4 and 7, OG 133/06) met all the conditions for the production of planting materials in the prebase category. Buds used to produce the initial propagation materials for this mother block were taken in winter 2006/07, from an approximately equal number of mother vines of seven clonal descendants originating from seven elite vines from the first selection in 2000, and another four elite vines selected later. For the purpose of secure traceability of the selected mother vines within the clonal descendants from those experiments, they were separately marked, grafted and later planted in the mother block.

Bud cuttings were sent to the Grapevine Institute in Geisenheim, Germany in March 2007. The cuttings from each individual vine were first tested by ELISA at the Geisenheim, and then by PCR at Adelaide University in

analiza tla na prisutnost nematoda iz roda *Xiphinema*. Uzorkovanje tla provedeno je prema uputama državnog Zavoda za zaštitu bilja koji je ujedno proveo analizu iz koje je vidljivo da tlo na kojemu je podignut matični nasad ispunjava propisane uvjete na temelju čega je izdan certifikat.

Nasad se sastoji od 7 redova duljine 76,5 m ukupne širine 15,4 m, s razmakom sadnje između redova 2,2 m, a unutar reda 1,5 m. Sustav uzgoja je Sylvoz kordonac, bez navodnjavanja, posebno prilagođen proizvodnji plemke. Prostorna izolacija iznosi > 50 m. Nasad je ograđen metalnom žičanom ogradom i ima postavljenu protugradnu mrežu.

Treba se prisjetiti da je priprema za ovaj pothvat bila u trenutku kada u Hrvatskoj još nije bio uveden sustav certifikacije loznog sadnog materijala i da je službeni sustav certifikacije profunkcionirao tek 1. siječnja 2008.

Nakon formiranja uzgojnog oblika i potrebnog porasta za potrebe eksploatacije nasad je službeno umatičen i ušao je u eksploataciju 2011./2012. Time su ispunjene sve zakonske norme i stvorena je osnova za proizvodnju certificiranog sadnog materijala sorte Škrlet, za što je korištena mješavina pupova 11 bezvirusnih klonskih kandidata, u skladu s *Pravilnikom o stavljanju na tržište materijala za vegetativno razmnožavanje loze* (dodatak 4 i 7). Tijekom 2012. rasadničarska kuća Fragaria d.o.o. iz Zagreba proizvodi prvu količinu od 7.100 certificiranih cjepova sorte Škrlet (iz mješavine pupova 11 najboljih klonskih kandidata) koji nose plavu etiketu. To je bio prvi certificirani matični nasad visoke kategorije u Hrvatskoj.

Godine 2013. moslavački vinogradari posadili su prve skromne količine tog prvog domaćeg certificiranog sadnog materijala. Njegova se proizvodnja u nešto većim količinama nastavila

Australia. After this, the material with the highest health status was grafted onto Kober 5BB rootstock, subclone 13Gm – prebase category. A total of 285 mother grafts were produced.

In line with the practice and in agreement with the Institute, three grafts from each clone were retained for the purposes of archiving clonal material of Škrlet at the Institute in Geisenheim (security archiving that allows for the possibility of subsequent reproduction). Therefore, the total number of mother vines created to raise the mother block was 267. In 2008, these grafts were used to establish the first (historical) mother block of the highest category of propagation material (prebase), which in the coming years would be used to produce grafts to raise larger mother blocks of registered clones, and smaller quantities of high quality grafts for experimental plantations with individual clones and clone mixtures.

During 2008, in parallel with the completion of raising the comparative experiment to prove the clone characteristics, the mother grafts were planted on the plot Palovine 1 near Popovača (cadastral plot no. 1891/3 in the municipality Popovača, in the Moslavina-Ivanić-Grad wine region). Prior to raising the plantation, it was established that there had been no other grapevine plantations planed at this location for at least 20 years, and biological analysis of the soil confirmed the absence of nemathodes of the genus *Xiphinema*. Soil sampling was conducted according to the instructions of the national Plant Protection Institute, which also conducted analyses indicating that the soil on which the mother block was planted met all the prescribed conditions, and issued the corresponding certificate.

The plantation consisted of seven rows, 76.5 m in length and 15.4 m in total width, with a 2.2 m space between rows and 1.5 m space

Cjepovi kategorije „bazni" proizvedeni u Njemačkoj.
Grafts of the category "base" made in Germany.

idućih godina. S tim certificiranim materijalom vodeći moslavački vinari podigli su zadnjih godina više od 10 ha novih nasada Škrleta koji tek odnedavno ulaze u puni rod i počinju sudjelovati u novim vinima Škrleta.

Matični nasad triju registriranih klonova

Dovršetkom selekcije i službenim ispitivanjima 2014. te registracijom i uključivanjem u sortnu listu triju klonova Škrleta 2015. iste je godine podignut novi matični nasad Palovine 2 u Popovači, gdje je posađeno približno 3.000 matičnih trsova od triju registriranih klonova koji služe za proizvodnju certificiranih pupova. Ovaj nasad kojim upravlja zagrebački Agronomski fakultet službeno je umatičen 2017. Time je ušao u eksploataciju i od tada se iz njega uzimaju pupovi za proizvodnju cjepova navedenih klonova.

Matični nasad omogućuje proizvodnju oko 50.000 cjepova godišnje. Njime je stvorena

between vines within a row. The growing system was the Sylvoz training system, without irrigation, especially adapted for the production of scions. Spatial isolation was > 50 m. The plantation was fenced with a metal wire fence with installed vineyard netting.

It should be recalled that the preparations for this endeavour took place at a time when there was still no implemented certification system in Croatia for grapevine propagation materials, and that the official certification system only became operational on 1 January 2008.

After setting up the training system and achieving the necessary growth needed for exploitation, the plantation was officially registered and entered into exploitation in 2011/12. This met the fulfilment of all legal standards and create the basis for the production of certified propagation materials for the variety Škrlet, using a mix of buds from 11 virus-free clonal candidates, in accordance with Appendices 4 and 7 of the Ordinance on the marketing of materials for the vegetative propagation of grapevine. During 2012, the Fragaria nursery from Zagreb produced the first batch of 7100 certified grafts of the Škrlet variety (from a mixture of buds from the 11 best clonal candidates) that bear the blue label. This was the first certified high category mother block plantation in Croatia.

In 2013, the wine-growers of Moslavina planed the first humble quantities of this first domestically certified propagation material. Its production continued in the following years, in somewhat larger quantities. With these certified materials, the leading Moslavina wine-growers have raised more than 10 ha of new Škrlet plantations in recent years, which only recently have come into full yield and begun to participate in the new Škrlet wines.


a)

b)

Matični nasad triju klonova Škrleta za komercijalnu proizvodnju certificiranog klonskog sadnog materijala na lokaciji Popovača – Palovine 2 (a). Nasad je podignut i održava se u suradnji sa vinarijom Miklaužić, a njime službeno upravlja Agronomski fakultet iz Zagreba. Prvi službeni certifikati (plava etiketa) za pupove klonova Škrleta (b). Ovo je bio na tržištu prvi certificirani klonski sadni materijal neke autohtone sorte vinove loze u Hrvatskoj.

Mother block of three Škrlet clones for commercial production of certified clonal planting material at the location Popovača - Palovine 2 (a). The plantation was established and maintained in cooperation with the Miklaužić winery, and it is officially managed by the Faculty of Agriculture in Zagreb. First official certificates (blue label) for buds of Škrlet clones (b). This was the first certified clone planting material on the market of an autochthonous grape variety in Croatia.

pretpostavka da se u nadolazećim godinama mogu zamijeniti stari nasadi, ali i povećati ukupne površine, isključivo s certificiranim klonskim materijalom. Pupove iz ovog matičnog nasada otkupljuju domaći i inozemni proizvođači certificiranog sadnog materijala i proizvode ih na podlogama po zahtjevu naručitelja. Zaključno se može reći da današnji i budući proizvođači Škrleta imaju na raspolaganju vrhunski sadni materijal. U bližoj budućnosti bit će moguće analizirati u kojoj će mjeri on utjecati na količine i kvalitetu vina Škrleta.

Mother block with the three registered clones

Upon completion of selection and official testing in 2014, and with the registration and entry of the three Škrlet clones into the Variety List in 2015, that same year a new mother block was planted at Palovine 2 in Popovača, with some 3000 mother vines of the three registered clones used to produce certified buds. This plantation is managed by the Faculty of Agriculture, University of Zagreb, and it was officially registered in 2017. With that, it became operational and since then, buds have been taken to produce grafts of these clones.

The mother block enables the production of about 50,000 grafts each year. This has laid the foundations for the replacement of old plantations in the coming years, and for the increase of total vineyard area consisting exclusively of certified clonal material. The buds from this mother block are purchased by domestic and foreign producers of certified propagation materials, and are produced on rootstock according

to buyer demand. In conclusion, it could be said that the current and future producers of Škrlet have premium quality propagation material at their disposal. In the near future, it will be possible to analyse the effects of this material on the quantity and quality of Škrlet wines.

07. PRAKTIČNA ISKUSTVA SA ŠKRLETOM U VINOGRADU I PODRUMU
PRACTICAL EXPERIENCES WITH ŠKRLET IN THE VINEYARD AND THE CELLAR

PRAKTIČNA ISKUSTVA SA ŠKRLETOM U VINOGRADU I PODRUMU

Škrlet je jedna od rijetkih autohtonih kontinentalnih sorti koju nalazimo u proizvodnim vinogradima, moslavački vinski adut i vrlo traženo vino na domaćem tržištu. Tipična je vinska sorta, uzgaja se isključivo radi prerade u vino. Međutim, po mnogo čemu je posebna sorta koja zahtijeva prilagodbu tehnologije u uzgoju i vinifikaciji kako bi dao najviše od svojeg visokog proizvodnog potencijala. Stoga je poznavanje njegovih karakteristika i iskustvo u uzgoju često presudno za uspjeh proizvodnje i kvalitetu vina. Nastojat ćemo prikazati najvažnija iskustva vodećih proizvođača ovoga grožđa i vina, što bi trebalo pomoći svima koji odluče baviti se Škrletom u vinogradu i podrumu.

Sorta je bujna rasta, dugih i debelih mladica, što zahtijeva bujniju podlogu, pa su mladi vinogradi često uspješniji na podlozi *Berlandieri x Riparia* Kober 5BB, nego na danas sveprisutnoj podlozi za kontinentalna vinogorja *Berlandieri x Riparia* SO4. Bujnost često zahtijeva i odgovarajuće razmake sadnje i sustav uzgoja, pa su rijetki vinogradi vrlo gustog sklopa, uskih razmaka i uzgojnih oblika malog opterećenja. Obično se uzgaja pri 2,20 – 2,40 m između redova te 0,9 – 1,10 u redu, što osigurava sklop od oko 4.000 – 5.000 trsova/ha. Škrlet zahtijeva dugo rodno drvo, zbog čega je rez obično mješovit (prigojni reznik s dva pupa i rodni lucanj s 8 – 10 pupova), a ovisno o sustavu uzgoja

PRACTICAL EXPERIENCES WITH ŠKRLET IN THE VINEYARD AND THE CELLAR

Škrlet is a rare indigenous variety that we find in continental vineyards, Moslavina's trump card and a very sought-after wine on the Croatian market. It is a typical wine variety, grown exclusively for wine-making. However, in many respects it is a special variety that requires technological adjustments to growing and vinification to achieve its highest production potential. As such, a strong understanding of its qualities and experiences in growing it are often crucial for successful production and quality of wine. Below we attempt to outline the most important experiences of the leading growers of this grape and wine-makers, to assist anyone deciding to work with Škrlet, both in the vineyard and the cellar.

The variety is vigorous, with long and thick shoots, which requires a vigorous rootstock; accordingly, young vineyards are often more successful on *Berlandieri x Riparia* Kober 5BB than on today's ubiquitous rootstock for continental vineyards *Berlandieri x Riparia* SO4. This vigorous growth often also requires appropriate spacing in planting and the training system, so vineyards with very dense planting, narrow spacing and low-yield cultivation forms are rare. It is usually grown at 2.20–2.40 m between rows and 0.9–1.10 in a row, giving about 4,000–5,000 vines/ha. Škrlet requires a long cane cut, which is why the cut is usually

Trs Škrleta nakon zimskog reza
Škrlet vine after winter pruning

(najčešći su jednostruki *Guyot* ili dvokrak) opterećenje rodnim pupovima iznosi oko 12 – 24 pupa po trsu. Međutim, srednje je rodan na bazalnim pupovima, pa dobru rodnost očituje i pri kraćim lucnjevima (4 – 6 pupova), što uske razmake u redu (70 – 80 cm) čini ipak mogućima, kao i uzgojne oblike s kratkim rodnim drvetom (kordonac *Royat*). Visina stabla je obično 80 – 100 cm, a armaturu čine jači stupovi i 5 – 7 žica, dovoljne visine uzgoja (ukupna visina reda 180 – 200 cm). Zahtjevan je i u zahvatima zelenog reza (plijevljenje i umetanje) s obzirom na rast mladica u svim smjerovima. Mladice se inače lako odlamaju u prvom dijelu vegetacije, pa su moguće štete od jakih vjetrova prije umetanja u žice.

mixed (a spur with two buds and a cane with 8 – 10 buds) and, depending on the training system (the single or double *Guyot* are the most common), the number of left buds is about 12–24 buds per vine. However, it is moderately fertile at the basal buds so that it produces good yields even with shorter canes (4 – 6 buds), making it possible to have narrow spacing in rows (70–80 cm) and cultivation forms with short cordons (*Cordon de Royat*). The height of the trunk is usually 80–100 cm, where the trellis system is comprised of robust posts and 5–7 wires of sufficient height for growing (total row height 180–200 cm). It is also demanding in terms of green pruning (weeding and training) since shoots grow in all directions. Shoots easily break in the first part of the growing season so damage from strong winds is possible before the shoots are wrapped onto wires.

Older experiences in nursery production should also be mentioned, particularly Škrlet's somewhat poorer affinity for grafting on certain rootstock in relation to other varieties. Namely, the one-year-old cane has a wide pith and poorer grafting success is usually attributed to this anatomical specificity. This relates to the production of annual grafts in the nursery, whether grafting by hand or by machine, where better results are obtained by grafting in the constant place (mature or green grafting). It is presumed that these anatomical differences are the cause of poorer callus formation (formation of healing tissue at the junction between the hypobiont and epibiont), and the late formation of conductive tissue (xylem and phloem) between the rootstock and the scion.

Its spring growth starts moderately late (about one week before cv. Graševina), which is very important for avoiding late spring frosts, a more frequent phenomenon in Moslavina in

Treba spomenuti i starija iskustva u rasadničkoj proizvodnji, odnosno lošiji afinitet Škrleta pri cijepljenju na neke podloge u odnosu na druge sorte. Naime, njegova jednogodišnja rozgva ima široku srž i slabiji uspjeh cijepljenja obično se pripisuje toj anatomskoj specifičnosti. To se odnosi na proizvodnju jednogodišnjih cjepova u rasadniku, cijepljenjem u ruci ili strojno, a bolji rezultati su pri cijepljenju na stalnom mjestu (na zrelo ili zeleno). Pretpostavlja se da su te anatomske razlike uzrok lošijega kalusiranja (tvorbi zarastajućeg tkiva pri spajanju hipobionta i epibionta), odnosno kasnijoj uspostavi provodnih snopova (ksilema i floema) između podloge i plemke.

U proljeće kreće srednje kasno (oko tjedan dana prije Graševine), što je vrlo važno za izbjegavanje kasnih proljetnih mrazova, koji su posljednjih godina u Moslavini učestali. Neki proizvođači pribjegavaju i kasnijem rezu (krajem ožujka / početkom travnja) i kasnijem prikraćivanju lucnjeva, što također može doprinijeti kasnijem pupanju. Mladice rastu bujno i brže od ostalih sorti, što ga rijetko čini podložnim napadu grinje. Cvatnja je srednje rana i traje

recent years. Some growers also resort to later pruning (late March/early April) and later cane pruning, which can also contribute to later budding. The shoots grow vigorously and faster than in other varieties, making it rarely susceptible to mites. Škrlet blooms moderately early, lasting about two weeks, and this is a highly sensitive period for Škrlet and flower fertilisation. The variety is prone to flower abscission (its former synonym Puzlek originated precisely because the berries "slip" from the bunch, i.e., drop off after unsuccessful fertilisation), and fertilisation is weaker in cold and humid conditions.

This sometimes requires additional work in the vineyard such as pinching or the application of micronutrients (especially boron, though the use of other microelements such as manganese, iron and zinc also give good results) before flowering to improve fertilisation. Foliar application has significantly improved the fertilisation and production results of Škrlet, although partly loose clusters have shown better results in terms of their quality and disease resistance, especially against botrytis.

Šteta od mraza (a) na Škrletu (Palovine, 26. 4. 2016.), i stanje oporavka mjesec dana kasnije (b).
Frost damage (a) on Škrlet (Palovine, 26. 4. 2016) and recovery a month later (b).

Škrlet nakon loše oplodnje
Škrlet after poor fertilisation

Simptomi plamenjače na listu Škrleta
Symptoms of downy milldew on the Škrlet leaf

oko dva tjedna, no to je vrlo osjetljivo razdoblje za Škrlet i oplodnju cvjetova. Naime, sklon je osipanju cvatova (nekadašnji sinonim Puzlek nastao je upravo zbog toga što bobice spuznu s grozda, tj. otpadnu nakon neuspješne oplodnje), slabijoj oplodnji u hladnim i vlažnim uvjetima.

To ponekad zahtijeva dodatne radove u vinogradu kao što su pinciranje rodnih mladica ili primjena nekih mikrohranjiva (ponajprije bora, ali se dobrom pokazala i primjena drugih mikroelemenata kao što su mangan, željezo i cink) prije cvatnje ne bi li se na taj način popravila oplodnja. Primjena folijarnih gnojiva znatno je poboljšala oplodnju i proizvodne rezultate Škrleta, makar su djelomično rehuljavi grozdovi pokazali bolje rezultate u kvaliteti i toleranciji na bolesti, posebno prema botritisu.

Škrlet is not particularly susceptible to the most important cryptogamic diseases, powdery mildew and grapevine downy mildew. Powdery mildew has virtually been eradicated after elemental sulphur was reintroduced in plant protection. There are years when grapevine downy mildew can cause damage to not only leaves but also inflorescences – young bunches. However, regular plant protection generally resolves this problem. The favourable structure of the bunch (its looseness) and certain berry characteristics (such as skin thickness and firmness) make it a variety that is very tolerant to grey mould – botrytis, which is particularly important in view of the conditions in Moslavina and Pokuplje, especially if other ampelotechnical treatments are also applied, such as shoot defoliation in

Škrlet nije posebno osjetljiv na najvažnije kriptogramske bolesti, pepelnicu i plamenjaču. Pepelnica je pogotovo prestala biti problem vraćanjem elementarnog sumpora u zaštitna sredstva. Plamenjača u nekim godinama zna nanijeti štetu ne samo na lišću, nego i na cvatovima – mladim grozdovima. Međutim, redovita zaštita u pravilu uspješno rješava ove bolesti. Već spomenuta povoljna arhitektura grozda (rehuljavost) te neke karakteristike bobica (debljina i čvrstoća kožice) čine ga vrlo tolerantnom sortom prema sivoj plijesni – botritisu, što je naročito važno u uvjetima Moslavine i Pokuplja. Posebice ako se dodatno primjenjuju neke ampelotehničke mjere koje tome doprinose kao defolijacija mladica u zoni grožđa. Od drugih bolesti valja spomenuti crnu pjegavost (*Phomopsis viticola*), koja može nanijeti štetu u bujnim vinogradima i nakon toga se teško rješava. Stoga je potreban poseban pristup u zaštiti, ali i prihrani vinograda.

Što se prihrane tiče, Škrlet rado usvaja hranjiva, posebno NPK. Međutim, potreban je oprez (posebno s dušikom), trebalo bi izbalansirati sva hranjiva da se izbjegnu negativne posljedice (bolesti, loša kvaliteta grožđa). Jako dobre rezultate Škrlet postiže ako se prihranjuje organskim gnojivima, od dobro provrelog stajnjaka do modernih peletiranih gnojiva. Uravnoteženom odnosu makro- i mikrohranjiva doprinosi i usitnjavanje organskih ostataka, kao što je rozgva nakon zimskog reza ili komina iz podruma.

Zatravnjivanje kao sustav održavanja tla često se primjenjuje u Moslavini, ne samo u ekološkim vinogradima. Razlog tome je dovoljno oborina u vegetacijskom razdoblju (više od polovine ukupne godišnje količine), ali i odlična iskustva – mnogi proizvođači tvrde da su aromatske karakteristike grožđa i vina iz zatravnjenih vinograda bolje. Zatravnjuje se obično

the grape zone. Another disease that should be mentioned is phomopsis leaf and cane spot (*Phomopsis viticola*), as it can cause damage in dense vineyards and is difficult to eradicate. Therefore, a special approach to vineyard protection and supplementation is needed.

In terms of plant nutrition, Škrlet is eager to absorb nutrients, especially NPK. However, caution is required (especially with nitrogen). All nutrients should be balanced to avoid adverse effects (diseases, poor grape quality). Škrlet achieves very good results if fertilised organically (from aged manure to modern pellets). Mulching of organic matter, such as one-year-old canes after winter pruning or pomace from the cellar, also contributes to a balanced macro- and micronutrient ratio.

Grassing as a soil maintenance system is often used in Moslavina, not only in organic vineyards. The reason is that there is enough rainfall during the growing season (more than half of the total annual quantity), but also because of excellent experiences – many growers claim that the aromatic characteristics of grapes and wine are better from grassy vineyards. Grassing is usually natural (spontaneous), but sometimes clover-grass mixtures are sown. It is maintained by mowing (about three times a year), while fertilisation is by deposition and foliar application.

Based on the experiences of Moslavina's wine-makers, Škrlet is a suitable variety for the production of organic wine. The low disease susceptibility contributes to this significantly, and organically produced wines usually have different characteristics. Namely, yields are lower in organic production, sugars are higher, and some of its characteristic freshness is lost. The new style of organically-grown Škrlet is now slowly coming to light. Due to subsidies and higher market demand, an increasing number

na prirodan način (spontano), ali ponekad i sjetvom djetelinsko-travnih smjesa. Održava se košnjom (oko 3 puta godišnje), a prihrana se obavlja deponiranjem i folijarno.

Škrlet je, prema iskustvima moslavačkih vinara, pogodna sorta za ekološku proizvodnju. Mala osjetljivost na bolesti tome znatno doprinosi, a vina iz ove proizvodnje obično su drugačijih svojstava. Naime, prinosi su u ekološkoj proizvodnji niži, šećeri su visoki i gubi se jedan dio karakteristične svježine. Pomalo se profilira nova stilistika Škrleta iz ekološkog uzgoja, a zbog poticaja i veće potražnje na tržištu sve se više proizvođača odlučuje za taj način proizvodnje. Međutim, potrebna je prilagodba vinograda. Stoga je bolje oblikovati nove nasade prema zahtjevima ekološkog uzgoja kako bi se omogućila učinkovitija primjena strojeva i smanjili uvjeti za nastanak bolesti.

Grožđe dozrijeva početkom trećeg razdoblja (po Pulliatu), što je u Moslavini posljednjih godina obično u prvoj polovici rujna. Prije globalnog zatopljenja i klimatskih promjena Škrlet se brao krajem rujna / početkom listopada. Međutim, nekoliko berbi u posebno vrućim godinama kod većine je proizvođača obavljeno

Zatravljivanje kao sustav uzdržavanja tla
Grassing as a soil maintenance system

of growers are opting for this method of production. However, certain adjustments are needed in the vineyard. Therefore, it is better to raise new plantations in conformity with the organic production requirements by enabling more efficient use of machinery and alleviating conditions conducive to the emergence of diseases.

The grapes ripen at the beginning of the third ripening period (according to Pulliat). In Moslavina, in recent years, this is usually in the first half of September. Before global warming and climate change, Škrlet was harvested in late September and early October. However, several harvests in especially hot summers were organised as early as late August. Wine sugars and alcohol were much higher than the average. These wine characteristics (freshness, fruitiness, and smoothness) require close monitoring of grape ripening and determining the optimal harvest time in order to obtain wine with these qualities. This particularly relates to growers with large vineyards, because the harvest usually last longer so grape qualities at the beginning and end of the harvest can vary considerably. The reason for such losses are usually the high day and night temperatures during ripening, and in such years, Škrlet wines lose some of their varietal qualities.

It yields a lot, but rarely excessively, and grape quality is high, which in the case of Škrlet does not necessarily mean high sugar because the best Škrlet wines are not high alcoholic. Bunches are medium-sized, loose, attractive in appearance and, at the time of ripening, boast a range of colours – from green to yellow. This is why Škrlet types were often also mentioned (*zeleni* - green and *žuti* - yellow), but clone selection has shown that this was a modification, i.e., the influence of environmental factors on the outer appearance of bunches (sun exposure, yield,

već krajem kolovoza, a šećer u grožđu i alkohol u kasnijem vinu bio je znatno viši od prosjeka. Spomenute karakteristike vina (svježina, voćnost i pitkost) nameću obavezu pozornog praćenja dozrijevanja grožđa i određivanja optimalnog termina berbe kako bi se dobilo vino upravo takvih karakteristika. Posebno se to odnosi na proizvođače na većim površinama jer ondje berba obično duže potraje, pa karakteristike grožđa na početku i na kraju berbe mogu biti vrlo različite. Razlog gubitka takvih svojstava obično su visoke dnevne i noćne temperature u dozrijevanju, pa vina Škrleta u takvim godinama gube dio svoje sortnosti.

Dobro rodi, ali rijetko prerodi, a kakvoća grožđa je visoka, što u slučaju Škrleta ne znači nužno visok šećer jer najbolja vina Škrleta nisu jaka. Grozdovi su srednje veliki, rastresiti, privlačna izgleda, a u vrijeme dozrijevanja mogu se uočiti razlike u boji grozdova – od zelene do žute. Upravo su se zbog toga često navodili i tipovi Škrleta (zeleni i žuti), ali je klonska selekcija pokazala da je riječ o modifikaciji, tj. utjecaju okolišnih faktora na izgled grozda (osunčanost, prinos...). Po prinosu je zahvalna sorta (obično je urod od 8 do 12 t/ha, u širokom rasponu od 5 do18 t/ha). Zanimljivo je

etc.). In terms of yield, it is a rewarding variety (the harvest ranges usually from 8 to 12 t/ha, with a broader range 5 to 18 t/ha). It is interesting how many prized wines originate precisely from fruitful years. Škrlet can hardly achieve its typical qualities (light, fresh, and aromatic wines) at low yields when the wines are usually strong, full and without pronounced acidity, with different sensory characteristics. Still, this opens a path to different styles with aficionados amongst both growers and consumers.

Škrlet is a variety where grape quantity and yield largely depend on the degree of fertilisation. Accordingly, ampelo-technical treatments (pinching) and foliar application of fertilisation are regularly applied in standard growing technology. However, despite this, if the weather is unfavourable (rainy and cold), fertilisation rates and consequently the yield can plummet (sometimes by more than 50%).

Sugar concentrations are usually 17–18°B and acid levels are high as a rule, greatly contributing to the wine's freshness. However, in years characterised by early vegetation and high summer temperatures and low yields, grape sugar can be considerably higher. Harvesting at the optimal time is very important for the characteristics of future wine. The harvest should be organised at lower grape temperatures, especially in the case of machine harvesting, which is quite frequent in recent years, primarily due to labour shortages. This type of harvesting, provided that it is performed properly, does not have a significant impact on wine quality.

Primary processing is performed in the usual manner, with mandatory precipitation and cooling. Some winemakers use cold-maceration (several hours after crushing, at 8–10°C), which has proven to be good for extracting phenolic and aromatic substances from the skins), as

kako mnoga nagrađena vina potječu upravo iz rodnih godina. Svoja tipična svojstva (lagana, svježa i aromatična vina) Škrlet teško može postići pri niskim prinosima kada su vina obično jaka, puna i bez izražene kiselosti, drugačijih senzornih svojstava. Ipak, to otvara put drugačijim stilovima, koji imaju svoje pristalice među proizvođačima i kupcima.

Škrlet je sorta kod koje količina grožđa i prinos uvelike ovise o stupnju oplodnje. Stoga se već spomenute ampelotehničke mjere (pinciranje) i folijarna prihrana redovito primjenjuju u standardnoj tehnologiji uzgoja. No i usprkos tome u slučaju nepovoljnih vremenskih uvjeta (kišno i hladno vrijeme) može doći do slabije oplodnje i smanjenja prinosa (ponekad i više od 50 %).

Šećer u grožđu obično iznosi 17 – 18 °B, a kiseline su u pravilu visoke, što uvelike doprinosi svježini vina. Međutim, u godinama s ranom vegetacijom i visokim ljetnim temperaturama te niskim prinosima šećer u grožđu može biti znatno viši. Berba u optimalnom terminu vrlo je važna za karakteristike budućeg vina. Poželjno ju je obavljati pri nižim temperaturama grožđa, posebno pri strojnoj berbi, koja je posljednjih godina česta ponajprije zbog nedostatka radne snage. Taj način berbe, ako se obavi na odgovarajući način, ne utječe znatno na kvalitetu vina.

Primarna prerada obavlja se na uobičajen način, uz obavezno taloženje i hlađenje. Neki proizvođači primjenjuju hladnu maceraciju (nekoliko sati nakon muljanja, na 8 – 10 °C), što se pokazalo dobrim za ekstrakciju fenolnih i mirisnih tvari iz kožice), kao i pektolitičke enzime koji pomažu prešanju kod visokog sadržaja pektina. Inače se zbog toga Škrlet teže preša, pa se nerijetko grožđe ne runi, nego preša zajedno s peteljkovinom. Primjena selekcioniranih kvasaca

well as pectolytic enzymes that facilitate pressing at high pectin content. This is why Škrlet is harder to press, and often the grapes are not destemmed, but are pressed with the peduncle. Selected yeasts are regularly used and many yeasts have a significant impact on the sensory, especially olfactory qualities of Škrlet.

In the cellar, it is a bit more demanding than other varieties. It requires more attention to maintain its gentle but valued qualities. Controlled (chilled) fermentation is mandatory, just like other procedures relating to wine care and maturation. In such varieties, where the primary goal is to retain the aromatic qualities and freshness, vinification is anaerobic, requiring the use of stainless steel barrels and glass, as final. Further, Škrlet is sensitive to oxygen exposure so that liquid transfer is usually closed to prevent any wine oxidation. One of the specific traits of Škrlet is its low ash and extract content, sometimes even below the legal minimum, which may lead to problems at the time of marketing. Still, most Škrlet wines are made (and consumed) in the described, usual manner, as an annual wine. However, any deviation from the standard technology usually requires modifications to the vinification process, so that today such wines can be found in almost all market categories. Wines from special years (very warm) may require a different approach to maturation in view of their special physicochemical and sensory qualities (high alcohol and extract content, fullness). For this reason, wine-makers sometimes use wooden barrels, usually neutral or lightly burned oak barrels. Wines that would benefit from maturation in wooden vessels are the orange wines produced after a lengthy maceration process (usually 15 to 30 days), rich in phenols and tart, astringent compounds. Several orange Škrlet wines have

Škrlet pred berbu

Škrlet before harvest

je redovita, a mnogi znatno utječu na senzorne, posebno olfaktorne karakteristike Škrleta.

U podrumu je malo zahtjevniji od drugih sorti, traži više pažnje kako bi zadržao svoje nježne, ali vrijedne karakteristike. Kontrolirana (hlađena) fermentacija u njegovu je slučaju obavezna, kao i ostali postupci vezani za njegu i dozrijevanje vina. Ovakvim sortama, kod kojih je očuvanje aromatskih karakteristika i svježine primarno, cijela vinifikacija protječe u anaerobnim uvjetima, što podrazumijeva suđe od inoksa i u konačnici stakla. Također, Škrlet je osjetljiv na jače izlaganje kisiku, pa su pretoci u pravilu zatvoreni kako bi se spriječila oksidacija vina.

been produced and the results are promising. However, the variations in the technology for making such wines and, consequently, in their qualities are extreme, and they have poor market representation, so that only rare wine-makers opt for them.

Škrlet is generally found amongst the regular harvest wines, mostly in the category of calm, quality annual wines. Dry wines with pronounced acidity and a delicate yellow-green colour are most often produced. The aroma is pronounced but subtle, very pleasant, mostly floral and fruity. It is of medium strength, as a rule approx. 11.5–12 vol. % alcohol, but with

Jedna od specifičnosti vina Škrleta je često nizak sadržaj pepela i ekstrakta, ponekad i ispod zakonskog minimuma, što može dovesti do problema prilikom stavljanja vina u promet. Ipak, većina vina Škrleta proizvodi se (i konzumira) na opisan, uobičajeni način, kao jednogodišnje vino. Međutim, svako odstupanje od standardne tehnologije u pravilu zahtijeva i modifikaciju vinifikacije, pa se danas ta vina mogu naći u gotovo svim tržišnim kategorijama. Tako vina iz posebnih godina (vrlo toplih) zbog posebnih fizikalno-kemijskih i senzornih karakteristika (visok alkohol i ekstrakt, punoća) mogu zahtijevati drugačiji pristup u dozrijevanju. Stoga se katkad koristi drveno suđe, u pravilu neutralne ili slabo paljene hrastove bačve. Vina kojima bi koristilo dozrijevanje u drvenom suđu su tzv. jantarna (*orange*) vina, dobivena nakon dugotrajne maceracije (obično 15 – 30 dana), bogata fenolnim i trpkim, astringentnim spojevima. Nekoliko je jantarnih Škrleta proizvedeno i rezultati su obećavajući. Međutim, varijacije u tehnologiji proizvodnje takvih vina, a time i njihovih karakteristika, vrlo su velike i tržišno su slabo zastupljeni, pa se tek rijetki proizvođači za njih odlučuju.

Škrlet u pravilu nalazimo u vinima redovite berbe, većinu u kategoriji mirnih, kvalitetnih jednogodišnjih vina. Najčešće se proizvode suha vina naglašene kiselosti, nježne žutozelenkaste boje. Miris je izražen, ali nenametljiv, vrlo ugodan, većinom cvjetnih i voćnih karakteristika. Srednje je jakosti, u pravilu oko 11,5 – 12 vol.% alkohola, ali naglašene svježine (visoka kiselost, nizak pH), što je njegova glavna karakteristika. Ove značajke čine ga vrlo pitkim i užitnim, pogotovo danas, u vrijeme posvemašnje ponude visokoalkoholnih, teških bijelih vina. Većina ljubitelja Škrleta doživljava ga i traži kao jednogodišnje vino opisanih karakteristika. No može

pronounced freshness (high acidity, low pH), which is its main characteristic. These qualities make it very smooth and enjoyable, especially today in a time of heavy white wines with a high alcohol content. Most Škrlet aficionados enjoy and expect an annual wine with the described characteristics. However, can this variety also produce mature and archive wines, and what is its ageing potential? What about the production of increasingly popular sparkling wines and can it be used to produce dessert wines of satisfactory quality? Wine-makers and consumers today are increasing posing these questions as the market moves towards new products, and wine experts want to try the whole palette of products from a particular variety to enable its complete evaluation.

Škrlet wines from special positions in good years and in low yield vineyards have a higher alcohol content; they are fuller, more bodied, and usually express their qualitative maximum after longer maturation, from two to five years. There are few such Škrlet wines, but they are changing the way we view the enological potential of this variety, currently based on annual, fresh, and aromatic wines. The sensory properties of mature wines are completely different, especially since yeast maturation (*bâtonnage* or *sur-lie*) is almost regularly used in their production. Wines from certain years have proved excellent, even in the case of very long ageing (over 10 years). High total acidity is very important for this and a few grams of reducing sugar is also desirable. In this way, the sensory properties of archival Škrlet wines can be excellent.

Škrlet has also proven to give good sparkling wines. The high acidity and lovely, discreet aromas of early harvested grapes have proven to be virtues, so these wines are becoming more common in Moslavina. It is usually produced

li ova sorta dati zrela i arhivska vina, koliki mu je potencijal starenja? Kakav je u proizvodnji danas sve popularnijih pjenušavih vina i može li dati desertna vina zadovoljavajuće kvalitete? Ova pitanja proizvođači i potrošači danas sve više postavljaju jer se i tržište okreće novim proizvodima, a vinski znalci žele iskušati cijelu paletu proizvoda neke sorte kako bi je u potpunosti procijenili.

Škrleti s posebnih položaja, iz dobrih godina i iz vinograda s niskim prinosima imaju više alkohole, punija su, korpulentnija i u pravilu svoj kvalitativni maksimum očituju nakon dužeg dozrijevanja, od dvije do pet godina. Takvih Škrleta nema mnogo, ali mijenjaju sliku o enološkom potencijalu sorte koja se temelji na jednogodišnjim, svježim i mirisnim vinima. Senzorna svojstva zrelih vina potpuno su drugačija, pogotovo što se gotovo redovito u njihovoj proizvodnji koristi dozrijevanje na kvascu (*bâtonnage*, odnosno *sur-lie*). Vina iz nekih godišta pokazala su se izvrsnima i pri vrlo dugom čuvanju (duže od 10 godina). Za to je vrlo važna visoka ukupna kiselost, poželjno je i nekoliko grama reducirajućeg šećera. Tako senzorne karakteristike arhivskih Škrleta mogu biti izvrsne.

Škrlet se dobrim pokazao u proizvodnji pjenušaca. Visoka kiselost i lijepe, diskretne arome rano pobranoga grožđa pokazale su se vrlinama, pa su ova vina sve češća u Moslavini. Obično se proizvodi kao sortni ili uz dopušteni dodatak (15 %) drugih sorti. Za sada su prateće lokalne sorte, no možda bi se Chardonnay ili Pinot crni, koji u Moslavini također postižu odlične rezultate, pokazali dobrima i kao dodatak Škrletu u proizvodnji pjenušaca. Još nema dovoljno iskustava o tehnologiji i sortimentu, ali može se reći da se klasična tehnologija (*méthode champenoise*, sekundarna fermentacija u boci) pokazala dobrom, posebno ako duže odležavaju na kvascu.

Moslavački vinari arhiviraju vina iz svojih najboljih berbi. Vina Škrleta mogu sačuvati dobra svojstva i nakon 25 godina u boci.
Moslavina winemakers archive wines from their best vintages. Škrlet wines can retain good properties even after 25 years in the bottle.

as a varietal wine or with the permitted addition (15%) of other varieties. Local varieties are currently used as additions, though perhaps Chardonnay or Pinot Noir, which achieve excellent results in Moslavina, would also prove good as an addition to Škrlet in the production of sparkling wines. There is not enough experience with the technology and assortment yet, but the classic technology (*méthode champenoise*, secondary fermentation in the bottle) has

Pokušaja s predikatnim berbama je bilo. Zbog manje osjetljivosti na botritis u pravilu nema problema s potpunim propadanjem grožđa, što se događa kod drugih sorti u ovom uzgojnom području. Međutim, Škrlet je poseban i po tome da se dužim ostavljanjem grožđa na trsu ne dobiva mnogo na koncentraciji šećera i kiselina, nema ni dobrih iskustava s pojavom plemenite plijesni, što je preduvjet za dobivanje predikatnih vina visoke kvalitete. No da bi se upotpunila paleta Škrleta u svim tržišnim kategorijama, možda bi trebalo razmisliti o drugačijem načinu proizvodnje (npr. prosušivanjem grožđa u zatvorenom).

Od Škrleta se mogu dobiti i dobri destilati. Međutim, obično se destilira ostatak od proizvodnje vina (komovica), ali karakteristike sorte govore da bi se pravilnom primjenom tehnologije proizvodnje vinjaka (ranija berba, vinifikacija bez sulfata, odgovarajuća destilacija i dozrijevanje) mogli dobiti odlični proizvodi. Na taj bi način bila zaokružena cijela paleta proizvoda od ove vrijedne sorte.

proved to be a good choice, especially if they are aged longer on yeast.

There have been several attempts with predicate vintages. Due to the lower susceptibility to botrytis, as a rule, there is no problem with complete decay of grapes, as occurs in other varieties in this growing area. However, Škrlet is also special in that its sugar and acid concentrations do not increase much if the grapes are left on the vine longer, and there are no good experiences with noble rot, which is essential for producing high-quality predicate wines. In order to improve the Škrlet palette in all market categories, a different type of production may need to be considered (e.g., drying grapes indoors).

Škrlet can also be used to make solid distillates. However, it is usually the by-products of production that are distilled (pomace brandy), though the qualities of variety suggest that with proper brandy production technology (early harvest, sulphate-free vinification, proper distillation and maturation) excellent products are possible. This would complete the palette of products made from this valuable variety.

08. UDRUŽIVANJE PROIZVOĐAČA, IZLOŽBE I PROMOCIJA VINA

PRODUCER ASSOCIATIONS, EXHIBITIONS, AND WINE PROMOTIONS

UDRUŽIVANJE PROIZVOĐAČA, IZLOŽBE I PROMOCIJA VINA

Udruživanje vinogradara i vinara u Moslavini ima dugu tradiciju, od početka 20. stoljeća. U Moslavini, točnije u Volodеru, davne 1911. osnovana je Hrvatska seljačka zadruga, a dvije godine kasnije (1913.) i Hrvatska vinarska zadruga moslavačkih vinogradara. Ova druga imala je golem utjecaj na vinogradarstvo i vinarstvo Moslavine jer je bila veliki širitelj naprednih mjera u vinogradarstvu i vinarstvu (Bedić, 1973.). Na njezinim postignućima i iskustvima nastala je poslije II. svjetskog rata i državna tvrtka Moslavačko vinogorje koja je odigrala veliku ulogu u održanju i razvoju vinogradarstva i vinarstva u Moslavini.

Unatrag 40 godina nastaju nove udruge koje povezuju proizvođače vina i rade na širenju stručnih znanja i uvođenju novih tehnologija. Organizirani pristup aktualnim izazovima vinogradarstva i vinarstva uvelike doprinosi poslovnoj uspješnosti pojedinačnih proizvođača. No stvaranjem slobodnog tržišta uloga modernih udruga sve više se ogleda i u razvoju vinske kulture, etabliranju lokalnih sorti i promociji njihovih vina. Škrlet kao sorta i vino promoviran je, etabliran i revitaliziran u očima vinske publike ponajprije kroz rad udruga.

Danas na području Moslavine postoji nekoliko aktivnih vinogradarsko-vinarskih udruga širokog spektra djelovanja, a ovdje ćemo spomenuti samo njihove najvažnije projekte koji

PRODUCER ASSOCIATIONS, EXHIBITIONS, AND WINE PROMOTIONS

Grape- growers and winemakers in Moslavina have a long tradition of association, since the early 20th century. In Moslavina, Voloder to be more precise, the Croatian Peasants' Cooperative was founded back in 1911 followed two years later, in 1913, by the Croatian Wine Cooperative of Moslavina Wine-growers. The latter had enormous impact on Moslavina's viticulture and wine-making as it promoted advanced methods in both the aspects of growing grapes and making the wine (Bedić, 1973). After World War II, the state-owned company Moslavačko Vinogorje was established on the foundations of the cooperative's achievements and experiences, and it played an important role in the survival and development of viticulture and wine-making in Moslavina.

Over the past 40 years, a number of new associations have been formed, bringing together wine producers and working to expand expert knowledge and introduce new technologies. Taking an organised approach to the current challenges in viticulture and wine-making greatly contributes to the success of individual producers. However, following the establishment of the free market, the role of modern associations is also increasingly reflected in the development of a wine culture, raising awareness and demand for local varieties, and the promotion of their wines. Škrlet is promoted

su uvelike doprinijeli kvaliteti i ugledu vina Škrleta.

8.1. UDRUGA VINOGRADARA I VOĆARA MOSLAVINE „LUJO MIKLAUŽIĆ" IZ KUTINE.

Udruga vinogradara i voćara Moslavine osnovana je 1981. i najstarija je strukovna udruga tog tipa na području Moslavine i Pokuplja, ali i šire. Danas okuplja više od 200 aktivnih članova, od velikih proizvođača do hobista, iako je u evidenciji članstva upisano gotovo tisuću imena. Okuplja vinogradare i voćare iz cijele Moslavine, ali i iz drugih regija, i potiče ih na suvremeni način uzgoja i zaštite vinograda i voćnjaka, proizvodnje vina i voća. Surađuje sa znanstvenim ustanovama i organizira stručna predavanja i ekskurzije. Poseban doprinos unapređenju vinarstva dala je pokretanjem stručnih edukacija i ocjenjivanja vina, a što je s vremenom preraslo u najvažniju izložbu vina u Moslavini.

S prvim kušanjima i ocjenjivanjima vina počelo se 1983. i u početku su sudjelovali isključivo članovi Udruge. Tada su četiri uzorka vina dobila ocjenu odličan. Broj uzoraka vina iz godine u godinu je rastao. Ocjenjivanje se upriličivalo uz redovitu skupštinu Udruge u hotelu Kutina. Prva ocjenjivanja vodio je profesor Nikola Mirošević. Udruga je aktivno sudjelovala u osmišljavanju stručnog programa Voloderskih jeseni, a 1989. pokrenuto je i Vincekovo na moslavački način. Prvih godina ocjenjivali su se uglavnom uzorci stolnih vina, ali i nekih sortnih (Graševine i Škrleta). Godine 1993. u spomen na svojeg uglednog preminulog člana (1991.) mijenja ime u Udrugu vinogradara i voćara Moslavine „Lujo Miklaužić".

both as a variety and wine, and it has become established and revitalised in the eyes of the wine audience, primarily through the work of these associations.
Today, there are several active viticulture and wine-making associations in Moslavina, all boasting a wide spectrum of activity. In this publication, we shall single out only their most important projects that have greatly contributed to the quality and reputation of Škrlet wines.

8.1. LUJO MIKLAUŽIĆ MOSLAVINA WINE AND FRUIT GROWERS ASSOCIATION, KUTINA

The Moslavina Wine and Fruit Growers Association was established in 1981 and is the oldest professional association of this type in the area of Moslavina and Pokuplje and wider. Today, it gathers more than 200 active members, from large producers to hobbyists, although the records show almost one thousand members. It gathers wine and fruit growers from all over Moslavina and other regions, encourages them to embrace modern growing and protection methods in their vineyards and orchards, and in wine and fruit production. It cooperates with scientific institutions and organises professional lectures and excursions. It has given a special contribution to the advancement of wine-making by organising professional training and wine assessments, which has since grown into the most important wine exhibition in Moslavina.

Wine tasting and assessments began in 1983 and initially, it was open exclusively to association members. In that year, four wine samples received a mark of excellent. The number of wine samples grew from one year to the next.




Izložbe vina u organizaciji Udruge značajno su doprinijele i unaprijedile kvalitetu moslavačkih vina.
Wine exhibitions organized by the Association have significantly contributed to and improved the quality of Moslavina wines.

Na prijedlog inženjera Ivana Gašpara, tadašnjeg predsjednika Udruge, 1994. godine organizira se prva izložba vina Moslavačkog podrajona i Sisačko-moslavačke županije. Početkom svibnja iste godine Udruga kao glavni organizator, uz suorganizaciju tvrtki INA-Petrokemija i Moslavačko vinogorje i pod pokroviteljstvom Grada Kutine, organizira stručno ocjenjivanje i javnu prezentaciju 78 uzoraka vina, od kojih je 9 dobilo zlatnu diplomu. Ovo je prva izložba u čijoj su pripremi svi uzorci vina prošli laboratorijsku analizu i ocijenjeni od strane stručnog panela na čijem čelu je bila ugledna enologinja prof. dr. sc. Dubravka Premužić, koja je bila predsjednica ocjenjivačkog suda čak 18 puta.

Wine assessments were organised on the margins of the regular association members' assembly held at the Hotel Kutina. In the beginning, assessments were led by Professor Nikola Mirošević. The association actively participated in developing the professional programme for the Autumn in Voloder Festival and, in 1989, it launched the St. Vincent Day à la Moslavina festivities. In those first years, assessment was mostly organised for table wines, but also for some varietal wines (Graševina and Škrlet). In 1993, in memory of its prominent member who died in 1991, the name of the association was changed to the Lujo Miklaužić Wine and Fruit Growers Association of Moslavina.

Ova izložba vina postala je vrlo popularna i već iduće godine bilo je izloženo 117, a 1996. čak 140 uzoraka. Kao vjerojatno najuspješniji projekt Udruge izložba vina organizira se u kontinuitetu sve do danas. Tijekom godina doživjela je brojne programske preinake, ali sačuvala je visoke kriterije ocjenjivanja. Od 1998. izložba je pod pokroviteljstvom Sisačko-moslavačke županije, a nešto kasnije u pokroviteljstvo se uključuju i Grad Kutina (2000.) i Općina Popovača (2001.). Vina se ocjenjuju prema sustavu 20 pozitivnih bodova (metoda po Buxbaumu). Godine 2001. promijenjen je format izložbe: otvorila se prema izlagačima iz drugih dijelova Hrvatske i susjednih država. Tako je prerasla u međunarodnu izložbu vina, ali s fokusom na

Ugledna profesorica Agronomskog fakulteta u Zagrebu i enologinja, Dubravka Premužić, godinama je bila predsjednica ocjenjivačkog panela izložbe vina u Kutini i doprinijela kvaliteti i ugledu moslavačkih vina.

Distinguished professor at the Faculty of Agriculture in Zagreb and oenologist, Dubravka Premužić, for years was the president of the assessment panel of the wine exhibition in Kutina and contributed to the quality and reputation of Moslavina wines.

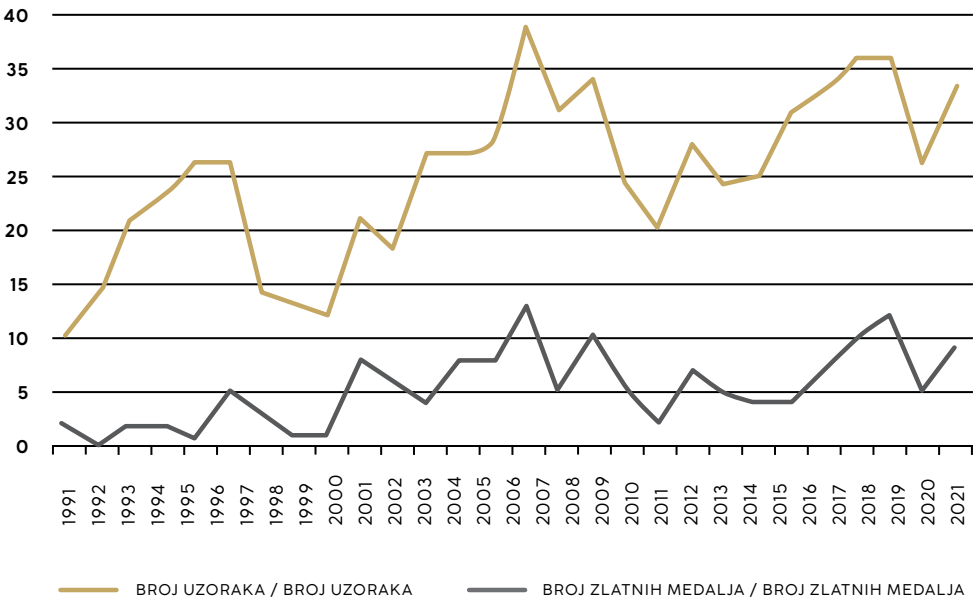
At the proposal of engineer Ivan Gašpar, then president of the association, in 1994 it was organised the first exhibition of wines from the Moslavina subregion and Sisak-Moslavina County. In early May of that year, in cooperation with INA-Petrokemija and Moslavačko Vinogorje and under the auspices of the Town of Kutina, the association organised a professional assessment and public presentation of 78 wine samples, nine of which were awarded a gold certificate. This was the first exhibition where all wine samples underwent laboratory analysis and were assessed by an expert panel presided over by a prominent enologist, Professor Dubravka Premužić, who chaired the assessment panel 18 times. This wine exhibition became very popular and the following year the number of wine samples rose to 117, and then to 140 in 1996. This wine exhibition is likely the most successful project of the association, organised every year in continuity to this day. Over the years, has undergone numerous changes to its programme, but it has retained its high assessment criteria. Since 1998, the exhibition has been organised under the auspices of Sisak-Moslavina County and a few years later by the Town of Kutina (2000) and the Municipality of Popovača (2001). Wine is assessed according to the Buxbaum 20-point method. In 2001, the format changed, and the exhibition opened its doors to exhibitors from other parts of Croatia and neighbouring countries. It has grown into an international wine exhibition, but with a focus on wines made from autochthonous varieties. Today it is known as the Exhibition of Croatian Wines and Wines of Indigenous Varieties MoslaVINA. The programme includes a number of events, from professional to promotional, while wine competitions are organised for several categories,

vinima autohtonih sorti. Danas je poznata pod nazivom Izložba vina Hrvatske i vina izvornih sorti – MoslaVINA. Program uključuje više različitih događanja, od stručnih do promotivnih, a sustav ocjenjivanja vina provodi se za više kategorija, među kojima je posebna i najcjenjenija nagrada za vina Škrleta.

U grafikonu 8.1. prikazuje se broj prijavljenih uzoraka i broj zlatnih odličja za vina Škrleta od prve izložbe 1994. do 2021. U tom je razdoblju ukupno ocijenjeno 700 uzoraka vina Škrleta, od čega su 144 dobila zlatnu diplomu (medalju). Prosječno je po izložbi bilo 25 uzoraka od kojih je pet bilo zlatnih. Ukupno su 52 vinarije i OPG-a bili dobitnici zlatne medalje, od kojih neki više puta, a njih 27 samo jednom. Najviše zlatnih medalja (po 13) tijekom 31 izložbe osvojili su vinarija Miklaužić (trenutačno najveća vinarija u Moslavini) i Boris Mesarić (mala obiteljska vinarija).

and the most special and esteemed is the award for Škrlet wines.

Graph 8.1. shows the number of registered samples and the number of gold certificates for Škrlet wines since the first exhibition in 1994 until 2021. In that period, 700 samples of Škrlet wine were assessed in total, with 144 receiving a gold certificate (medal). On average, 25 samples were registered per exhibition, and five awarded gold. In total, 52 wineries and family holdings received a gold medal, of which several received gold several times and 27 received it once. The Miklaužić Winery (currently the largest winery in Moslavina) and Boris Mesarić (a small family-owned winery) have to date received the largest number of gold medals (13 each) at 31 exhibitions.



GRAFIKON 8.1. Broj uzoraka i zlatnih odličja vina Škrleta tijekom 28 izložbi vina u Kutini

GRAPH 8.1. *The number of samples and gold medals for Škrlet wines during 28 wine exhibitions in Kutina*

ŠAMPION CHAMPION	BR. NO.
BRANKO IPŠA	4
BORIS MESARIĆ	3
VINARIJA SPUGA D.O.O.	3
DARKO BOGDAN	2
VINARIJA FLORIJANOVIĆ	2
VINARIJA MIKŠA	2
VINARIJA KOŠUTIĆ	2

ŠAMPION CHAMPION	BR. NO.
VLADIMIR KOS	1
VINARIJA MIKLAUŽIĆ	1
ZLATKO MAROŠEVIĆ	1
NEVEN BRGLEZ	1
OPG TUŠEK	1
ANTONIO TOMAC	1
KREŠIMIR UDINA	1

TABLICA 8.1. Broj šampionskih titula za vino Škrleta tijekom 31 izložbe vina u Kutini

TABLE 8.1. *The number of champion titles for Škrlet wines at 31 wine exhibitions in Kutina*

U istom razdoblju 14 vinarija ili vinara amatera osvojilo je titulu šampiona (Tablica 8.1.). Godine 2020. održano je redovito ocjenjivanje vina, ali zbog pandemije koronavirusa izložba nije održana.

Tijekom 2000. Udruga inicira i u suradnji s Agronomskim fakultetom iz Zagreba pokreće dugoročni projekt klonske selekcije Škrleta koji je dovršen 2015., o čemu se detaljnije može čitati u prethodnim poglavljima ove knjige. Izuzetno vrijedan projekt je i otvaranje Vinskog dvora u podrumu kutinskog Pučkog otvorenog učilišta, u čijem se lijepo uređenom prostoru predstavljaju vina članova Udruge i održavaju brojne vinske manifestacije.

Udruga je i danas vrlo aktivna, organizira brojne programe i ima vrlo informativne mrežne stranice. U povodu svake izložbe izdaje se iscrpan katalog ocjenjivanih vina, koji uključuje i tekstove o radu Udruge u tekućoj godini.

In the same period, 14 wineries or amateur wine-makers were awarded the champion's title (Table 8.1.). In 2020, the wine competition was held as usual, but the exhibition was not held because of the Covid-19 pandemic.

In 2000, the association initiated and worked in close cooperation with the Faculty of Agriculture in Zagreb to launch a long-term project for Šrklet clonal selection, which was completed in 2015. More about this project is given in the previous chapters of this book. Another important project was the opening of the Wine Palace in the cellar of the Kutina Open University. In this beautiful interior, association members present their wines and hold numerous wine events.

The association is still very active today, organises numerous programmes and has an informative website. For each exhibition, a detailed catalogue of the assessed wines is published every year, with information about the work of the association in the current year.

Udruga Škrlet iz Popovače promovira sljubljivanje vina Škrleta s tradicionalnom moslavačkom kuhinjom.
The Škrlet Association from Popovača promotes the pairing of Škrlet wine with traditional Moslavina cuisine.

8.2. UDRUGA VINOGRADARA I VOĆARA „ŠKRLET" IZ POPOVAČE

Ova udruga, sa sjedištem u Popovači, potječe od Udruge vinogradara općine Popovače koju 1999. osniva dio proizvođača, bivših članova Udruge „Lujo Miklaužić" iz Kutine. Udruga 2005. uzima današnje ime. Trenutačno okuplja oko 180 članova, pretežno malih proizvođača, OPG-ova i nekoliko vodećih vinarija Moslavine. Ima ambiciju unapređivati gospodarski, društveni i kulturni položaj moslavačkih vinogradara i vinara, kao i promicati grad Popovaču i Moslavinu kao vinogradarsku i vinarsku regiju. Programski ciljevi i projekti vrlo su slični onima kutinske udruge „Lujo Miklaužić". Fokus je na stručnoj edukaciji članstva kroz seminare i predavanja pozvanih stručnjaka, organizaciju tečajeva za degustaciju vina i stručnih ekskurzija drugim udrugama i vinarskim regijama. To je vrlo korisno i primarno usmjereno na male proizvođače. Najprepoznatljiviji projekt je izložba mladih vina koja se održava u kontinuitetu od 2017. Koncept izložbe s fokusom na mladim vinima

8.2. ŠKRLET WINE AND FRUIT GROWERS ASSOCIATION, POPOVAČA

This association from Popovača is a descendant of the Wine Growers' Association of the Municipality of Popovača that was founded in 1999 by a group of producers, former members of the Lujo Miklaužić Association from Kutina. In 2005, the association embraced its current name. It currently has around 180 members, mostly small producers, family-held holdings, and several of the leading wineries in Moslavina. Its aim is to improve the economic, social and cultural position of Moslavina's viticulturalists and wine-makers and promote the Town of Popovača and the Moslavina region as a wine- growing and wine-making region. Its programme goals and projects are very similar to those of Kutina's Lujo Miklaužić Association. The focus is on professional education of members through seminars and lectures held by invited experts, organisation of wine tasting courses, and professional excursions to other associations and wine regions. This is all very useful and primarily directed towards small producers. The most recognisable project is the exhibition of young wines held every year since 2017. The concept of the exhibition focuses on young wines and the fact that it is usually held in late winter makes it an original event that does not have to compete for an audience with other exhibitions. The association also organises programmes for St. Vincent's Day and St. Martin's Day in the wineries of its members, and other promotional events connected with traditional food and wine. The Evening of Škrlet and Moslavina Cuisine is a particularly valuable project, bringing together the best wines and traditional cuisine of Moslavina prepared by professional chefs, thus laying

i vrijeme održavanja (u pravilu kraj zime) čine ju originalnom, a vrijeme održavanja ne preklapa se s drugim izložbama. Također, Udruga u vinarijama svojih članova organizira prigodne programe uz Vincekovo i Martinje i druge promotivne događaje vezane uz tradicijsku hranu i vino. Posebno vrijedan projekt je Večer Škrleta i moslavačke kuhinje koji spaja najbolja moslavačka vina i tradicijska jela koja pripremaju profesionalni kuhari, što stvara pretpostavke za razvoj eno-gastro turizma. Udruga aktivno sudjeluje i u projektu dodjele titule Županova vina, najbolje ocijenjenog vina Škrleta za potrebe protokola Sisačko-moslavačke županije. Na inicijativu Udruge, a u realizaciji Općine Popovača, 2017. uređen je reprezentativni Vinski podrum. Ovaj prostor, koji ima i mali laboratorij za ocjenjivanje vina, Udruga koristi za svoje sastanke, stručna predavanja, predstavljanja i izložbe vina.

8.3. UDRUGA MOSLAVAČKA VINSKA CESTA

Udruga Moslavačka vinska cesta osnovana je 2007. ponajprije radi brendiranja i promocije vina sorte Škrlet i Moslavine kao vinarske regije. Glavni projekt bio je upravo „Brendiranje škrleta, promocija autohtone sorte vina Sisačko-moslavačke županije" (2011. – 2014.). Predsjednik Udruge i tadašnja tajnica Obrtničke komore Sisačko-moslavačke županije u suradnji s vinarima 2011. prijavili su projekt. Glavni korisnici projekta pretežno su profesionalni proizvođači (njih 15) s područja Sisačko-moslavačke županije, a u projekt su uključeni i drugi partneri: Sisačko-moslavačka županija; gradovi i općine (Kutina, Popovača, Sisak, Petrinja, Glina, Hrvatska Kostajnica, Lekenik); Obrtnička komora

the foundations for developing food and wine tourism. The association takes active part in the project for awarding the title Prefect's Wine to the best rated Škrlet wine to be used in the protocol of Sisak-Moslavina County. At the association's initiative, and thanks to the support of the Municipality of Popovača, a beautiful wine cellar was opened in 2017. The association uses the wine cellar for its meetings, professional lectures, wine presentations and exhibitions, and the cellar is even equipped with a small laboratory for wine assessment.

8.3. MOSLAVINA WINE ROAD ASSOCIATION

The Moslavina Wine Road Association was founded in 2007, primarily to brand and promote Škrlet varietal wines and Moslavina as a wine region. The main project was called "Branding Škrlet, promoting an indigenous wine variety in Sisak-Moslavina County" (2011–2014). The chairperson of the association and then secretary of the Chamber of Trades and Crafts of Sisak-Moslavina County proposed the project in 2011 in cooperation with winemakers. The main beneficiaries were mostly professional producers (15 in total) from Sisak-Moslavina County, with other partners: Sisak-Moslavina County; towns and municipalities (Kutina, Popovača, Sisak, Petrinja, Glina, Hrvatska Kostajnica, Lekenik); Chamber of Trades and Crafts of Sisak-Moslavina County; and Croatian Chamber of Economy – County Chamber Sisak. The project was jointly funded by wine-makers and partners.

After the project proposal was accepted, in 2012, the Chamber of Trades and Crafts of Sisak-Moslavina County and the Moslavina Wine

Sisačko-moslavačke županije i HGK-Županijska komora Sisak. Projekt su zajednički financirali vinari i partneri.

Nakon što je projekt prihvaćen, Obrtnička komora Sisačko-moslavačke županije i Udruga Moslavačka vinska cesta 2012. počinju trogodišnji projekt kojemu je u fokusu povećanje prepoznatljivosti Škrleta izvan Moslavine i bolji plasman na tržištu. Projekt je bio usmjeren na potporu proizvođačima radi povećanja potražnje i konkurentnosti vina Škrleta. Ime i izvornost tog vina namjeravaju se štititi stjecanjem prava na uporabu žiga – posebno dizajnirane oznake za Škrlet i reguliranjem oznake izvornosti – geografskog podrijetla. Projekt je razrađivao i način ostvarivanja prava na uporabu marketinških znakova „izvorno hrvatsko" i „tradicijski proizvod".

U sklopu tog projekta dizajnirana je posebna markica sa simbolom Škrleta koja se na temelju pravilnika dodjeljivala svim proizvođačima koji su zadovoljili propisane kriterije kvalitete. Škrlet je 2012. – 2014. prezentiran i ocjenjivan na svim priznatim hrvatskim sajmovima poput Vinistre, Sabatine, Gast Expo Opatije i dr. te na međunarodnom sajmu vina u Moskvi i uglednom ocjenjivanju u Londonu (*International Wine Challenge* – IWC, London). Na međunarodnom sajmu vina u Moskvi (2012.) vina Škrleta vinarija Trdenić i Miklaužić osvojila su zlatnu medalju i to su prva i visoka međunarodna odličja. Međutim, tek nastup vina Škrleta na međunarodnom ocjenjivanju IWC u Londonu tri uzastopne godine (2012. – 2014.) predstavlja značajnu prekretnicu u poimanju Škrleta. Vina Škrleta iz vinarija Miklaužić, Tušek, Mikša, Trdenić, Jaram, Cvanciger i Florijanović osvojila su u tri godine ukupno 13 priznanja, od čega četiri srebra, jednu broncu i osam preporuka. Prva sjajna odličja za vina Škrleta s tog uglednog

Road Association launched this three-year project focused to raise the recognisability of Škrlet outside of Moslavina and improve its placement on the market. The project focused on supporting producers with a view to increasing the demand and competitiveness of Škrlet wines. The plan is to protect the name and origin of the wine by acquiring a trademark – a specially designed designation for Škrlet and by regulating the designation of origin – geographical origin. The project also aimed to elaborate the way of realising the right to the use of marketing signs "authentically Croatian" and "traditional product".

A special mark with the symbol of Škrlet was designed within this project and pursuant to the ordinance is awarded to all producers who met the prescribed quality criteria. In 2012–2014, Škrlet was presented and assessed at all recognised Croatian wine fairs, such as Vinistra, Sabatina, Gast Expo Opatija and others, and at the international wine fair in Moscow and a respected wine competition in London (*International Wine Challenge* – IWC, London). At the international wine fair in Moscow (2012), Škrlet wines from the Trdenić and Miklaužić wineries won gold; these were its first high-ranking international medals. However, it was the presentation of Škrlet wines at the international rating event IWC in London for three consecutive years (2012–2014) that was a significant turning point in the understanding of Škrlet. Škrlet wines from the Miklaužić, Tušek, Mikša, Trdenić, Jaram, Cvanciger and Florijanović wineries won a total of 13 awards in three years: four silvers, one bronze, and eight recommendations. The association did an excellent job in presenting these first remarkable accomplishments of with Škrlet wines in the media and from that moment on, Škrlet

ŠKRLET
HRVATSKA

Veliki doprinos u brendiranju i promociji Škrleta dala je Udruga Moslavačka vinska cesta. Na poticaj Adolfa Cvancigera (vinarija Cvanciger), a velikim marom Violete Jelić (tada Obrtnička komora SMŽ) i Mislava Kašnera, predsjednika Udruge, kreiran je promotivni logotip Škrleta. Ovaj izvrsni uradak potpisuje poznata dizajnerska kuća Bruketa&Žinić&Grey.

The Moslavina Wine Road Association made a great contribution to the branding and promotion of Škrlet. At the instigation of Adolf Cvanciger (Cvanciger winery), and with great enthusiasm of Violeta Jelić (then Chamber of Trades and Crafts of Sisak-Moslavina County) and Mislav Kašner, president of the Association, the promotional logo of Škrlet was created. This excellent work is signed by the famous design house Bruketa & Žinić & Gray.

ocjenjivanja Udruga je izvrsno medijski prezentirala, i od tog trenutka grožđe i vino Škrleta stječu simpatije i priznanje medija, šire javnosti i kolega vinara. Više nije bilo dvojbi da Škrlet može biti komercijalno uspješna sorta. I ovaj se put potvrdila naša stara mudrost da tek kad vas priznaju i nagrade u inozemstvu, počet će vas cijeniti i doma.

Projekt brendiranja Škrleta značajno je pridonio izgradnji identiteta i ugleda. Potaknuo je interes za sadnju novih nasada i potrebu vinara za ujedinjavanjem radi proizvodnje dostatnih količina vina ujednačene kvalitete, a privukao

grapes and wines have been gaining approval and recognition in the media, amongst the general public and fellow wine-makers. There is no longer any room for doubt that Škrlet can be a commercially successful variety. Once again, the old wise saying rings true: only once you find recognition and win awards abroad will you be appreciated at home.

The project of branding Škrlet has contributed considerably to building of its identity and reputation. This has sparked interest in raising new plantations and has encouraged winemakers to join forces to produce sufficient quantities of wine of uniform quality, as well as attracting producers from outside the county. Designations, refreshed label designs, excellent promotion, and education of both producers and consumers have all had a strong impact on improving its market placement. Branding as a continuation of the clonal selection project has certainly given impetus to wine-makers and resulted in a strong market position of Škrlet. Unfortunately, the attempt to create systematic branding has not yet been achieved, though some of its results are still used in other forms, primarily amongst advanced and professional producers.

8.4. ŠKRLET PRODUCERS ORGANISATION OF MOSLAVINA

This organisation seated in Popovača was founded in 2016 to connect professional wine-makers. In the public eye, it has become known because of its important joint wine project. The organisation consists of the seven largest wine producers in Moslavina: Ilovčak, Jaram, Florijanović, Kezele, Miklaužić, Mikša, Trdenić and Voštinić-Klasnić. Their joint wine

je i proizvođače izvan Županije. Oznakama, osvježavanjem dizajna etiketa, vrhunskom promidžbom te edukacijama proizvođača i potrošača uvelike se utjecalo na bolji plasman na tržištu. Brendiranje kao nastavak projekta klonske selekcije svakako je dao zamah vinarima i boljem pozicioniranju Škrleta na tržištu vina. Nažalost, pokušaj sustavnog brendiranja nije zaživio u praksi, ali se neki njegovi rezultati u drugom obliku i dalje koriste, primarno među naprednim i profesionalnim proizvođačima.

8.4. PROIZVOĐAČKA ORGANIZACIJA ŠKRLET MOSLAVINA

Ova organizacija sa sjedištem u Popovači nastala je 2016. radi povezivanja profesionalnih vinara. U javnosti je postala poznata zbog znakovitog projekta zajedničkog vina. Organizaciju čini sedam najvećih proizvođača vina u Moslavini: Ilovčak, Jaram, Florijanović, Kezele, Miklaužić, Mikša, Trdenić i Voštinić-Klasnić. Njihovo zajedničko vino čini kupaža vina svih članova dobivena od odabranoga grožđa s najboljih položaja koju proizvode pod zajedničkom etiketom u limitiranom izdanju od 5.000 boca. To zajedničko vino plasira se na tržište pod zajedničkim brendom Škrlet-Moslavina. Dizajn boce uključuje ranije spomenuti logotip Škrleta, razvijen je u projektu Udruge Moslavačka vinska cesta.

8.5. UDRUGA ŠKRLET MOSLAVINA

Na temelju ideje proizvođačke organizacije Škrlet Moslavina iste godine osniva se i Udruga Škrlet Moslavina, a koja pravi kvalitativno veliki skok u promociji vina Škrleta. Ima sjedište u Šumećanima. Udruga Škrlet Moslavina eta-

Glavni projekt Udruge – „zajedničko vino", pomaknuo je granice u kvaliteti vina i dizajnu boce i etikete.
The main project of the Association - "common wine", has pushed the boundaries in wine quality and bottle and label design.

is a wine blend from all members obtained from selected grapes from the best positions produced under a joint label in a limited edition of only 5000 bottles. Their joint wine is placed on the market under the joint brand Škrlet-Moslavina. The bottle design includes the Škrlet logo mentioned earlier, developed as part of the Moslavina Wine Road Association project.

blirala se manifestacijom ŠkrletOVO, koja je prvi put održana 2017., te kasnije 2018. i 2019. u Ivanić-Gradu. U organizaciji su još sudjelovali Turistička zajednica Ivanić-Grada i Grad Ivanić-Grad. Škrletovo je zamišljeno kao jednodnevna manifestacija na kojoj se vješto izmjenjuju znanstveni paneli i kušanje vina sorte Škrlet sa zabavnim sadržajima u opuštenoj atmosferi. Sadržaj za sebe može pronaći svatko od uzvanika i gostiju, od vinara, distributera vina i vinskih blogera do pojedinaca koji jednostavno žele uživati u vinu. Ovom manifestacijom sorta Škrlet odjeknula je u vinskim medijima te si otvorila put na sva važnija vinska događanja u Hrvatskoj. Drugi projekt za pamćenje je i Škrlet Corner, na kojem se na izlagačkom štandu na svakoj manifestaciji u Ivanić-Gradu uvijek može popiti čašica Škrleta. Ove dvije udruge u sinergiji djeluju s dva predsjednika i profesionalnim proizvođačima s ciljem promocije sorte i poboljšanja kvalitete vina. Ubrzo nakon osnutka Udruga Škrlet Moslavina pokreće projekt „Standardizacija vina Škrlet i izrada brend strategije oznake kvalitete vina Škrlet". Projekt je financiran od Zagrebačke županije, a angažirane su dvije tvrtke („DAKO", obrt za poslovne usluge – za izradu strategije brendiranja i Eno expert d.o.o. – za konzultacije iz vinarstva). U strategiji brendiranja predložena je zajednička oznaka kvalitete pod nazivom „Škrlet *Quality*", a uključivala je analizu tržišta vina i ankete određenih skupina potrošača. Anketa o potrošnji bijelih vina i o poznavanju sorte Škrlet provedena je na 200 ispitanika. Rezultati tog pionirskog istraživanja pokazali su da je 72,3 % ispitanika čulo za sortu, ali istovremeno i da 53,8 % ispitanika (potrošača bijelih vina) na zagrebačkom tržištu nikad nije kušalo vino od te sorte. Među potrošačima koji su kušali Škrlet, njih 89 % smatra ga dobrim do jako dobrim vinom. Ispitanici kao

8.5. ŠKRLET MOSLAVINA ASSOCIATION

Based on an idea by the Škrlet Producers Organisation of Moslavina, the Škrlet Moslavina Association was founded the same year, as a truly great step forward in the promotion of Škrlet wines. Its headquarters are in Šumećani. The Škrlet Moslavina Association organises the ŠkrletOVO event, held in Ivanić-Grad for the first time in 2017 and also later in 2018 and 2019. The Ivanić-Grad Tourist Board and the Town of Ivanić-Grad also participated in the organisation. ŠkrletOVO was envisioned as a one-day event with transitions between scientific panels, wine tasting of Škrlet varietal wines, and entertainment in a relaxed atmosphere. Everyone at the event, from special guests, wine-makers, wine distributors, wine bloggers, or people who simply want to enjoy wine can find something to their liking. Through this manifestation, the Škrlet variety resonated across the wine media and blazed a path to all the important wine events in Croatia. Another project was Škrlet *Corner*, where a glass of Škrlet is always available at the exhibition stand at all events held in Ivanić-Grad. These two associations work in synergy with two presidents and with professional producers with a view to promoting the variety and improving wine quality. Soon after its establishment, the Škrlet Moslavina Association launched a project entitled "Standardisation of Škrlet Wine and Brand Strategy Development for Škrlet Wine Quality Designation". The project was financed by Zagreb County. Two companies were hired for the job (DAKO for developing the branding strategy and Eno expert d.o.o. for enological consulting). The branding strategy proposed a joint quality designation called "Škrlet *Quality*" and

prednost ističu njegovu pitkost, autohtonost i to da je domaće vino. Kao glavni nedostatak ističu da je slabo dostupno, odnosno da ga je teško kupiti. Izrađena strategija brendiranja vina Škrleta 2019. završava prijedlogom Pravilnika o dodjeli i korištenju oznake kvalitete za vino „Škrlet *Quality*". Udruga do ovog trenutka još nije pokrenula aktivnosti u tom pravcu. Ostaje otvoreno bi li takav projekt trebao biti obuhvatniji i s profesionalnom organizacijom.

Od brojnih sajmova, izložbi vina i manifestacija na kojima su proizvođači sudjelovali 2017. i 2018. dvije su posebno zanimljive. Na manifestaciji ŠkrletOVO na Gornjem gradu sorta Škrlet prvi je put javno predstavljena na području grada Zagreba. Na manifestaciji Zadar Wine Fest, vinari su zajedničkim nastupom prvi put otvorili put sorti Škrlet na Jadran.

Može se zaključiti kako je velik broj proizvođača Škrleta, od malih (hobista) preko onih koji vino proizvode i stavljaju na tržište unutar svojih OPG-ova do velikih profesionalnih proizvođača, uključen u rad jedne ili više udruga, čije programe i projekte najvećim dijelom financiraju županije, gradovi i općine iz svojih proračuna, uz povremene donacije velikih tvrtki poput Petrokemije. Stoga se, kao što se može primijetiti, mnogi projekti i aktivnosti raznih udruga preklapaju i ponavljaju. To samo po sebi nije štetno, ali često vodi u rasipanje entuzijazma i sredstava, zbog čega dobro zamišljeni projekti ne postižu primjerene učinke.

Veći i profesionalni proizvođači Moslavine u pravilu su bili, ili još uvijek jesu, članovi svih spomenutih udruga. Dvije najstarije usmjerene su više na edukaciju brojnog članstva koje pretežno čine mali proizvođači („Lujo Miklaužić" Kutina i „Škrlet" Popovača), a dvije (Moslavačka vinska cesta i Škrlet Moslavina) na

included a wine market analysis and surveys were held amongst certain groups of consumers. A survey about white wine consumption and knowledge about the Škrlet variety was conducted on 200 interviewees. The results of this pioneer research showed that 72.3% of interviewees were familiar with the variety, but that 53.8% of interviewees (white wine consumers) on the Zagreb market have never tasted wines made from this variety. For those consumers who had tasted Škrlet, 89% responded that it was a good to very good wine. Interviewees stated its finer points as its smoothness, indigenous status, and that it is a domestic wine. Its main disadvantage was found to be that it is not widely available, i.e., that it is difficult to buy. The Škrlet wine branding strategy for 2019 ends with a proposal of the Ordinance on the awarding and use of the wine quality designation "Škrlet *Quality*". So far, the association has not embarked on any further activities in this respect. It remains to be decided whether such a project should be more encompassing and professionally organised.

In terms of the many fairs, wine exhibitions and events attended by Škrlet producers in 2017 and 2018, two were particularly interesting. At the ŠkrletOVO manifestation in the Upper Town of Zagreb, the Škrlet variety was publicly presented for the first time in the City of Zagreb. At the Zadar Wine Fest manifestation, wine-makers joined ranks for the first time to clear a path for the Škrlet variety to the Adriatic market.

The conclusion is that a large number of Škrlet producers – from small ones (hobbyists) to those producing and marketing wine through family-held holdings to large professional producers – is involved in the work of one or several

profesionalne vinare. Jasno je da se problemi i potrebe profesionalnih vinara koji proizvode i trže najveći dio vina značajno razlikuju od onih manjih proizvođača (OPG i hobisti). Neupitna je korist i potreba obaju tipova udruga, ali za značajnije iskorake i budući doprinos vinarskog sektora gospodarstvu Moslavine i Županije bit će potrebni još napredniji oblici udruživanja (zadruge, klasteri i sl.). Interesi udruživanja i financiranje zajedničkih projekata većih proizvođačkih organizacija morat će izaći izvan okvira lokalne uprave. Ovakva udruženja dobro su poznata i dobro funkcioniraju u mnogim europskim zemljama i u njima je potrebno potražiti uzor organiziranja.

associations, whose programmes and projects are primarily funded from county, town, and municipality budgets, with occasional donations by large companies such as Petrokemija. Therefore, one cannot help but notice that many projects and activities organised by various associations overlap and repeat themselves. This is not harmful in and of itself, but often leads to a dissipation of both enthusiasm and funding, which is why well-planned projects do not achieve their desired effect.

Larger and professional producers in Moslavina generally were and still are members of all of the mentioned associations. The two oldest ones (Lujo Miklaužić in Kutina and Škrlet in Popovača) focus more on the education of its large membership, mostly small producers, while the two others (Moslavina Wine Road and Škrlet Moslavina) target professional wine-makers. It is clear that the problems and needs of professional wine-makers who produce and market the largest wine share differ significantly from those of small producers (family holdings and hobbyists). Clearly, both types of associations are useful and very needed, though in order to ensure more substantial steps and future contributions of the wine sector to the economy of Moslavina and the county, even more advanced forms of association (cooperatives, clusters, etc.) will be needed. Association interests and joint project funding by larger organisations of producers will have to step outside the framework of local administration. Such associations are well-known and function well in many European countries and they should be considered as a model form of organisation.

Udruga Škrlet Moslavina čini velike napore u približavanju vina Škrleta urbanim centrima.
The Škrlet Moslavina Association is making great efforts to bring Škrlet wine closer to urban centers.

09. TRENDOVI I BUDUĆI IZAZOVI
TRENDS AND FUTURE CHALLENGES

TRENDOVI I BUDUĆI IZAZOVI

U posljednjih 25 godina u uzgoju i preradi grožđa ostvarili su se veliki pomaci od tradicionalnog načina uzgoja i prerade grožđa koji su se temeljili na iskustvu starijih generacija do primjene naprednijih načina uzgoja poštujući pravila struke koji uporište imaju u znanstveno dokazanim metodama i rezultatima istraživanja. Sustavna, moderna i kontrolirana proizvodnja počinje od podizanja nasada i analize terena na kemijski i mehanički sastav tla kako bi se provele potrebne agrotehničke i geodetske mjere korekcije za prilagodbu zemljišta uzgoju Škrleta. Velika briga vodi se i o zdravlju i plodnosti tla te očuvanju okoliša i održivom razvoju. Stoga se u vinogradima u gnojidbi primjenjuje kombinacija visokosofisticiranih mineralnih i organskih gnojiva preko tla i lista koja daju bolje rezultate s manjim negativnim učinkom na okoliš. Također, jedan od velikih pomaka u odnosu na nekadašnji način uzgoja je i primjena napredne mehanizacije koja ubrzava rad i smanjuje troškove u proizvodnji te umanjuje potrebu za ručnim radom, a podiže i kvalitetu konačnog proizvoda. Dobar primjer je primjena strojne rezačice za osnovnu rezidbu u jesensko-zimskom periodu, strojne rezačice za zelenu rezidbu tijekom vegetacije te strojne vezačice, strojnog zatezanja žice na armaturi, kao i strojne berbe, što među prvima uvodi vinarija Trdenić.

TRENDS AND FUTURE CHALLENGES

Over the past 25 years, several bold steps forward have been from the traditional methods of grape growing and processing, based on the experiences of older generations, towards the use of advanced growing methods that abide by the rules of the profession founded on scientifically proven methods and research results. Systematic, modern and controlled production begins with raising plantations and analysing the terrain to determine the chemical composition and mechanical properties of soil to select the right agrotechnical and geodetic corrective measures to adapt the land to the cultivation of Škrlet. Great care is taken to ensure soil health and fertility, environmental protection and sustainable development. Therefore, a combination of highly sophisticated mineral and organic fertilisers is applied in vineyards via soil and leaf as they yield better results with less of a negative impact on the environment. Further, another great step forward compared to the former ways of grape growing is in the use of advanced mechanisation, which speeds up the work, reduces production costs, diminishes the need for manual labour, while also increasing the quality of the final product. A good example is the use of machine cutters for basic pruning in the autumn-winter period, machine cutters for green pruning during the growing season, and machine binders, machine wire tensioning,

Ono što je znatno doprinijelo preradi grožđa jest strojna berba kombajnom, čime ne samo da se ubrzava berba, nego se i poboljšavaju svi bitni parametri kvalitete budućeg vina jer se smanjuje sadržaj hlapljivih kiselina i čuva aroma. Strojnom berbom smanjuje se i ukupni sumpor i štedi se energija pri hlađenju mošta. Naime, pri strojnoj berbi u relativno kratkom jutarnjem, hladnijem dijelu dana, nema potrebe za dodatnim hlađenjem grožđa, a manja je i količina primijenjenog sumpora, što pozitivno utječe na smanjenje sadržaja ukupno vezanog sumpora u vinu koji mu u velikoj količini daje gorčinu.

Danas se u proizvodnji vina Škrleta čine bitni odmaci od nekadašnje proizvodnje mladog svježeg vina. Proizvođači se već u primarnoj preradi grožđa vode stilistikom konačnog proizvoda koju žele postići koristeći selekcionirani kvasce ili enzime za pospješivanje arome. S obzirom na to mogu se izdvojiti tri enološka pravca prema kojima sorta Škrlet odlično prati trendove.

Veći proizvođači Škrleta uglavnom proizvode mladi, svježi Škrlet, zbog kojeg su zasigurno prepoznati u očima kupaca. Trend proizvođača je da s mladim vinom izlaze već u godini berbe, prema zahtjevima vinske publike.

Drugi enološki pravac je proizvodnja strukturiranih, ozbiljnih vina, snažnijeg tijela, pri čijoj proizvodnji grožđe prolazi put maceracije od nekoliko sati pod kontroliranim uvjetima te se u proizvodnji takvih vina koriste i metode *bâtttonage* i *sur lie*. Vina ostavljena na talogu kvasaca nakon fermentacije, uz povremeno lagano miješanje, dokazano su bogatija okusom i aromama, dugovječnija i stabilnija. U tom vinu do izražaja dolazi *terroir*, to su zreli Škrleti koji najbolje pokazuju svu raskoš i potencijal sorte. Malo drugačiji stilovi vina od ove sorte otvorili su nove vidike, koje bi trebali slijediti i drugi vinari u cilju ponude dugovječnijih vina koja su

as well as machine harvesting, which was first introduced by the Trdenić winery.

However, combine harvesting has significantly contributed to the processing of grapes. This not only speeds up the harvest, but also improves all important parameters of the quality of future wine, as it reduces the content of volatile acids and preserves the aroma. Machine harvesting also reduces total sulphur and saves energy when cooling the must. When grapes are machine harvested during a relatively short morning, during the cooler part of the day, there is no need for additional cooling of grapes and less sulphur is used, which has a positive effect on reducing the total sulphur content in wine as in large quantities sulphur makes wine bitter.

Today, the production of Škrlet wine is experiencing some important deviations from the way young fresh wine used to be produced. Producers are guided by the style of the final product they want to achieve already during the primary processing of grapes by using selected yeasts or enzymes to enhance the aroma. With this in mind, there are three enological directions taken, in which the Škrlet variety is keeping in step with the newest trends.

Larger producers of Škrlet mostly produce young, fresh Škrlet wine, and these wines have been recognised by customers. Producers tend to listen to the demands of the wine audience and place young wine on the market already by the end of the harvest year.

The second enological direction is the production of structured, serious wines with stronger body. Grapes used in the production of such wines undergo several hours of maceration under controlled conditions. The *bâttonage* and *sur lie* methods are also used in the production of such wines. Wines kept on yeast after fermentation, with occasional light stirring, are

prikladna i kao pokloni ili suveniri. Predvodnici i dobri primjeri ovakvih tipova vina su vinarija Voštinić Klasnić s vinom Škrlet *Unikat* kasne berbe (selekcija najboljega grožđa od certificiranoga klona 33) i odležani Škrlet u sklopu kolekcije Škrlet *Private Collection* vinarije Trdenić iz 2015. I vinarija Miklaužić od 2015. na tržište stavlja vino Škrleta odležavano dvije godine i proizvedeno od grožđa iz ekološkog uzgoja.

Treći su enološki pravac pjenušci za koje se sorta Škrlet koristi kao bazno vino. Škrlet se pokazao odličnim izborom za bazu (85 %) zbog svojih dobrih svojstava svježine i arome. Pjenušac se proizvodi tradicionalnom metodom te daje izuzetne rezultate jer je izražajne svježine i arome. Prvi pokusni pjenušac napravila je vinarija Miklaužić još 2012., a danas nekolicina proizvođača ima taj tip vina u ponudi (Lagena, Trdenić, Voštinić Klasnić i dr.).

S obzirom na to da su od 2015. dostupna tri registrirana klona sorte Škrlet (o kojima smo pisali u prethodnim poglavljima), počeli su se podizati novi nasadi s tom kategorijom sadnog materijala. Na temelju prikupljenog broja plemki i uspjeha cijepljenja kod rasadničara procjenjuje se da je u posljednjih pet godina podignuto oko 16 hektara vinograda s klonskim materijalom na području Moslavine. Obzirom na različite kvantitativne i kvalitativne karakteristike registriranih klonova proizvođači Škrleta trebali bi se pozabaviti ispitivanjem njihova potencijala u podizanju kvalitete vina u sva tri spomenuta enološka pravca. Iako je većina tih vinograda još u fazi formiranja i postizanja pune rodnosti, već postoje prva iskustva s vinifikacijom pojedinačnih klonova, pa se klonovi 33 i 29 koriste više za strukturirana vina, dok se klon 74 preporučuje za proizvodnju svježih vina i pjenušaca radi visokog roda i izraženih viših kiselina (iskustva vinarije Voštinić

demonstrably richer in flavour and aromas, are longer lasting and more stable. The *terroir* comes to the fore in this wine; it is the mature Škrlet wines that best show all the splendour and potential of the variety. Slightly different styles of wine from this variety have opened new vistas that should be followed by other wine-makers in order to offer longer-lasting wines that are also suitable as gifts or souvenirs. The leaders of the pack and good examples of these types of wines are the Voštinić Klasnić winery with its Škrlet *Unikat* late harvest wine (selection of the best grapes from certified clone 33) and the aged Škrlet in the Škrlet *Private Collection* of the Trdenić winery from 2015. Since 2015, the Miklaužić winery has also been marketing a two-year old Škrlet, produced from organically grown grapes.

The third enological direction are the sparkling wines using the Škrlet variety as the base Wine. Škrlet has proved to be an excellent choice for the base (85%) because of its good characteristics of freshness and aroma. This sparkling wine is produced using the traditional methods and it has excellent results because of its pronounced freshness and aroma. The first experimental sparkling wine was made by the Miklaužić Winery back in 2012, and today several other producers market this type of wine (Lagena, Trdenić, Voštinić Klasnić, etc.).

Since three registered clones of the Škrlet variety have been available since 2015 (as outlined in the previous chapters), new plantations with this category of planting material have been raised. Based on the collected number of scions and grafting success in nurseries, it is estimated that in the last five years about 16 hectares of vineyards with clonal material have been raised in the Moslavina region. Given the different quantitative and qualitative characteristics of

Klasnić). U nadolazećim godinama svakako se može očekivati više spoznaja o vrijednosti i namjeni pojedinih klonova.

Značajan trend u vinogradarstvu danas je i ubrzani prijelaz na ekološko vinogradarstvo, posebice već etabliranih proizvođača. Ekološko vinogradarstvo način je gospodarenja koji postiže kvalitetne i stabilne prinose, a nastoji očuvati plodnost tla. Prema europskoj strategiji „Od polja do stola" do 2030. ekološka bi proizvodnja trebala dosegnuti 25 %, a u Republici Hrvatskoj trenutačno je tek pet posto vinograda u ekološkom sustavu proizvodnje grožđa. S obzirom na već istaknutu relativno dobru otpornost na najvažnije bolesti, Škrlet se na odgovarajućim položajima može bolje od drugih sorti koristiti za proizvodnju grožđa prema ekološkim načelima. Od većih proizvođača vinarija Miklaužić se od 2010. bavi ekološkim uzgojem grožđa sorte Škrlet na površini od pet hektara, a u idućim godinama planiraju u potpunosti prijeći na taj sustav uzgoja. Prema službenim podacima trenutačno je deset hektara (oko 15 %) vinograda Škrleta u sustavu ekološke proizvodnje grožđa, a što je optimistično s obzirom na ukupnu površinu zasađenu tom sortom i znatno više od nacionalnog prosjeka. Međutim, većina proizvođača koji imaju vinograde Škrleta u ekološkom uzgoju na tržište stavljaju vina pod oznakom da su dobivena od ekološki uzgojenoga grožđa. Ta vina nisu prema propisima ekološka jer za status ekološkog vina moraju biti primijenjene i ekološke procedure u podrumu, što podrazumijeva stručni nadzor i certifikaciju. Ipak, nekoliko manjih vinarija imalo je (npr. vinarija Kosovec) ili još uvijek na tržištu ima deklarirano ekološko vino (npr. vinarija Glavica). Gledajući inozemne trendove potražnje i perspektivu izvoza vina na tržište EU-a, neupitna je mogućnost plasmana ekoloških vina. Međutim, opravdanost i

the registered clones, Škrlet producers should consider examining their potential in raising the quality of wine in all three enological directions. Although most of these vineyards are still in the process of formation and reaching full yield, there are already initial experiences with vinification of individual clones, with clones 33 and 29 used more for structured wines, while clone 74 is recommended for fresh wines and sparkling wines because of the high yields and pronounced higher acids (experiences of the Voštinić Klasnić winery). In the coming years, one can certainly expect more knowledge to emerge about the values and intended uses of individual clones.

A significant trend in viticulture today is the accelerated transition to ecological viticulture, especially by already established producers. Ecological or organic viticulture is a management method that achieves quality and stable yields while preserving soil fertility. According to the European strategy "From Farm to Fork", organic production is expected to reach levels of 25% by 2030. Currently, only 5% of vineyards in the Republic of Croatia use organic grape production systems. In view of the known relatively good resistance to most serious diseases, at adequate sites Škrlet could be more suitable than other varieties for organic grape growing. Among the larger producers, since 2010 the Miklaužić Winery has been active in ecological viticulture of the Škrlet variety, growing it on five hectares. In the coming years, this winery plans to completely switch to this cultivation system. According to official data, ten hectares (about 15%) of Škrlet vineyards are currently registered in the organic grape production system, which is promising given the total area planted with this variety and that this is much higher than the national average. However,

mogućnosti snižavanja troškova proizvodnje i certifikacije ekoloških vina zahtijevaju veću pozornost proizvođača, struke i regulatornih tijela.

9.1. ŠKRLET U GASTRONOMIJI

Posljednje desetljeće zanimanje za vina sorte Škrlet ne jenjava, pa je porastom proizvodnje i publike koja u njemu uživa dobio svoje dvije verzije u moslavačkim vinarijama.

Prva je ona bazna, poznatija široj publici koja uživa u bijelim, laganim, svježim vinima. Takva se vina vrlo dobro uparuju sa širokim spektrom jela. Odavno je Škrlet pokazao da može pratiti mnoga riblja jela. Tako je izvrsno sljubljen sa škampima, i još uvijek je prvi izbor kad su takva jela u pitanju. Ovakav tip vina uglavnom ne prolazi kroz malolaktičnu fermentaciju, pa u nekim slučajevima kad je svježina prenaglašena izvrsno odgovara jelima koja su napravljena na maslacu. Tako će ovo vino vrlo dobro pratiti lazanje koje su zbog umaka bešamel prožete mliječnim okusima. Kako svako vino ima drugačije naglašenu aromu, tako ako se žele naglasiti herbalnost i cvjetni mirisi Škrlet odlično ide uz jela koja su napravljena na maslinovom ulju, dok će bijela riba obogaćena s nekoliko kapljica limuna iz Škrleta izvući citrusne arome i dati mu mineralnost.

Držimo li se tradicionalnog načina sljubljivanja vina s jelima regije iz koje dolaze, onda je Škrlet izvrstan izbor uz predjela od svježeg sira obogaćenog bučinim uljem. Takav stil Škrleta odlična je okrepa nakon masnih jela koja se preferiraju na kontinentu poput pečene svinjetine ili janjetine s ražnja. O tradicionalnoj kuhinji Moslavine pisala je Večernjakova novinarka Božica Brkan u svojoj knjizi *Oblizeki – Moslavina za stolom* iz 2006.

most producers who have Škrlet vineyards in ecological cultivation market their wines with the claim on the label that they are obtained from organically grown grapes. Such wines do not satisfy the legal requirements for organic wine label, however, since in order to receive organic wine status, ecological procedures also have to be applied in the cellar, including professional supervision and certification. However, several smaller wineries had (e.g., Kosovec winery) or still have (e.g., Glavica winery) declared organic wine on the market. In view of international trends for the demand and the prospects of exporting wine to the EU market, the possibility of placement of organic wines on the market is indisputable. However, the justifiability and possibility of lowering the costs of organic wine production and certification requires greater attention from producers, the profession, and the regulatory authorities.

9.1. ŠKRLET IN GASTRONOMY

In the last decade, the interest in Škrlet wines has not abated, so with increasing production and an expanding audience to enjoy it, Škrlet now already has two versions in Moslavina wineries.

The first one is the basic version, known to the audience that enjoys white, light, fresh wines. Such wines pair very well with a wide range of dishes. Škrlet has long shown that it can complement many seafood dishes. It was so perfectly paired with prawns that it is still the first choice for such dishes. This type of wine generally does not go through malolactic fermentation, so in some cases when its freshness is overemphasised, it is excellent with dishes prepared with butter. Thus, this wine will go very well with lasagne, which is full of creamy

Druga verzija Škrleta koji dolazi s parcela koje prirodno imaju nešto manji urod kao što su novopodignuti nasadi ili oni u ekološkom uzgoju. Ta vina obično zbog velike koncentracije aroma i nešto viših alkohola obično dozrijevaju u starim hrastovim bačvama te na tržište dolaze dvije do tri godine nakon berbe za razliku od bazne verzije koja se u boce puni već u prosincu iste godine. Odležani Škrleti imaju drugačiji aromatski profil od svježe verzije. Vina ovog stila punog su tijela, a arome koje se u njemu mogu osjetiti su zrelog i sušenog voća. Takav se Škrlet vrlo dobro sljubljuje s jelima od pirjane, pržene ili dimljene ribe. Odlično se slaže s riječnom ribom koja je dominantna u moslavačkoj kuhinji zbog blizine Lonjskog polja. Također, ova verzija Škrleta dobro se slaže s tjesteninom obogaćenom umacima koji naglašavaju svježinu i voćnost te uz rižota s

flavours thanks to the béchamel sauce. As every wine has a slightly differently accentuated aroma, if one wants to emphasize herbs and floral fragrances, Škrlet goes well with dishes made with olive oil, while white fish enriched with a few drops of lemon will extract the citrus aromas from Škrlet and give it a tone of minerality.

If we adhere to the traditional way of pairing wine with the dishes of the region it comes from, then Škrlet is an excellent choice with appetizers of fresh cheese with pumpkinseed oil. This style of Škrlet is an excellent refreshment after the heavier dishes that are preferred on the continent, such as roast pork or grilled lamb. Journalist Božica Brkan from the *Večernji List* daily wrote about the traditional cuisine of Moslavina in her book *Oblizeki - Moslavina at the table* ("Good Food – Moslavina at the Table") from 2006.

The second version of Škrlet comes from plots with naturally lower yields, such as new or organically farmed plantations. Due to the high concentration of aromas and slightly higher alcohol content, these wines are usually matured in old oak barrels and appear on the market two to three years after the harvest, unlike the basic version, which is bottled in December of the same year. Aged Škrlets have a different aromatic profile than the fresh version. The wines in style are full-bodied, while the aromas that can be felt in it are ripe and dried fruit. This style of Škrlet goes very well with stewed, fried or smoked fish dishes. It goes well with freshwater fish that is dominant in the Moslavina cuisine due to its proximity to the Lonjsko Polje wetland. This version of Škrlet also goes well with pastas, which emphasise its freshness and fruitiness, and particularly well with a chanterelle risotto. Due to the higher concentration of aromas, these wines can also

lisičarkama. Zbog veće koncentracije aroma, ovakva vina mogu se poslužiti i uz deserte kao što su štrudle od jabuka te kolači od prhkog tijesta koji su punjeni sirom, jabukama, marelicama ili breskvama. Škrlet kao vino u obje svoje verzije može pokriti veliki spektar aroma u jelima, pa odgovara jelima i mediteranske i kontinentalne kuhinje. Zbog verzija koje vinari stvaraju, Škrlet se može odlično posluživati od aperitiva do deserta.

Hrvatska vinska scena ne obiluje časopisima koji se bave vinima. Postoji ih nekoliko koji se bave gastronomijom pa ujedno pišu i o vinima. No vinski blogeri, publicisti i novinari svepri-sutni su na hrvatskoj vinskoj sceni i prate sve važne vinske događaje, sajmove i izložbe. Često su oni promotori određene vinarije, vinara ili samog vina. Ako pogledamo nekoliko godina unatrag, primjećujemo da većina proaktivnih vinskih blogera prihvaća sortu Škrlet i rado piše o njoj, a njihovi dojmovi su gotovo uvijek pozitivni. O Škrletu među ostalim pišu i kao o zanimljivoj sorti, prepoznatoj kod kontinentalne vinske publike. Kao dobri poznavatelji stanja na tržištu vinski novinari mogu dati i dobre savjete poput toga da je važno navesti ugostitelje da ponude Škrlet u svojim objektima, što će se zasigurno slijediti budu li vina Škrleta napredovala.

Uzimajući u obzir gastronomsku ponudu podregije Moslavina, možemo reći da bi se u budućnosti vina Škrleta mogla plasirati na tržište u tri pravca. Prvi pravac su vrhunski restorani u kojima uz paletu mogućnosti sljubljivanja ove sorte s jelima odležana vina zasigurno mogu pronaći svoje mjesto. Proizvođači u tom smislu trebaju pojačati promociju tog tipa vina. Drugi pravac su seoska domaćinstva koja uz tradicionalnu kuhinju mogu svoju ponudu temeljiti na vinu Škrleta redovite berbe kao prepoznatljivost za taj oblik gastronomske ponude. Dobar

be served with desserts such as apple strudels and cheese, apple, apricot or peach tarts and pies. Škrlet in both its versions can cover a wide range of aromas in dishes, suitable accompanying dishes of the both Mediterranean and continental cuisine. As it comes in a number of versions depending on the wine-maker, Škrlet is an excellent wine to serve with all courses, from aperitifs to desserts.

The Croatian wine scene does not have many wine magazines. There are several about gastronomy that also write about wine. However, wine bloggers, publicists, and journalists are omnipresent on the Croatian wine scene and they follow all important wine events, fairs, and exhibitions. They often promote a particular winery, wine-maker or wine. Looking a few years back, it can be observed that many of the proactive wine bloggers have accepted the Škrlet variety and like to write about it, while their impressions are almost always positive. They also write about Škrlet as an interesting variety, recognised by the continental wine audience. As solid connoisseurs of the market, wine journalists can also give good advice, such as the importance of encouraging the hospitality industry to offer Škrlet in their establishments, which will surely follow if Škrlet wines continue to improve.

Taking into account the culinary offer of the Moslavina subregion, we could say that in the future Škrlet wines could be placed on the market in three ways. The first is in top restaurants where, with a range of possibilities in pairing this variety with dishes, aged wines can certainly find their place. Producers should intensify the promotion of this type of wine in this respect. The second is in rural households that can complement their traditional cuisine with an offer of regular harvest Škrlet wines as something recognisable for this form of the

primjer takvog ugostiteljskog objekta je seosko domaćinstvo Kezele, već popularno mjesto okupljanja Zagrepčana, gdje uz tradicionalni moslavački stol nude i svoj Škrlet, na čemu su izgradili brend. Kada bi bilo više takvih seoskih domaćinstava koja bi u ponudi imala lokalna jela i vino Škrleta, ugostiteljsko-vinski turizam mogao bi imati važnu ulogu u povećanoj izravnoj prodaji vina. Treći pravac unapređenja prodaje vina ove sorte su dobro organizirani posjeti vinarijama u Moslavini preko turističkih agencija. Blizina Moslavine glavnom gradu svakako je prednost koju bi trebalo iskoristiti za organizirane turističke posjete pri kojima vinari koriste prednost prodaje na vlastitom pragu, što se smatra ekonomski najisplativijim načinom prodaje.

9.2. BUDUĆNOST ŠKRLETA

Napori moslavačkih vinara i vinogradara orijentiranih na sortu Škrlet u posljednjih pet godina urodili su plodom. Za sortu se čulo diljem Hrvatske, a aktivnosti na njezinoj promidžbi stalno su u tijeku. S obzirom na vinski potencijal i najčešću tehnologiju proizvodnje sorta Škrlet u svjetskim razmjerima može se usporediti s austrijskom sortom Grüner Veltliner, glavnim vinom grada Beča. Ova sorta do devedesetih godina 20. stoljeća jedva je bila prepoznatljiva na svjetskom tržištu, a danas se vina ove sorte nalaze u vinskim kartama najvećih svjetskih restorana. Možemo reći da je izazov Škrleta, s obzirom na blizinu glavnom gradu i vinski potencijal u svim onim kategorijama koje on nudi, slijediti primjer Grüner Veltlinera. Ovakvu poveznicu u stilistici i potencijalu vina Škrleta i Grüner Veltlinera već su sugerirali vinski promotori. Jedna od najvećih ambicija proizvo-

culinary offer. A good example of this type of establishment is the Kezele Rural Tourism Estate, a highly popular destination for Zagreb residents. Here, the hosts offer their own Škrlet wine with the traditional Moslavina cuisine, which has assisted them in building their own brand. If there were more such rural households offering local dishes and Škrlet wine, hospitality and wine tourism could have an important role in increasing direct wine sales. The third way of improving wine sales of this variety are organised tours of wineries in Moslavina, organised by tourist agencies. The proximity of Moslavina to the capital is definitely an advantage and it should be used for organised tours, allowing wine-makers to sell their wine o their own doorstep, as the most economically profitable means of sale.

9.2. THE FUTURE OF ŠKRLET

The efforts invested by wine-makers and wine-growers from Moslavina who have focused their attention on the Škrlet variety in the past five years have finally come to fruition. People all over Croatia now know about this variety and activities on its promotion are always ongoing. In view of its wine potential and the most frequent production technology, the Škrlet variety is comparable to Austria's Grüner Veltliner variety, the main wine of the city of Vienna. Until the 1990s, this variety was hardly recognizable on the world market, and today the wines of this variety are in the wine lists of the world's top restaurants. We can say that the challenge facing Škrlet, in view of its proximity to the capital and its wine potential in all the categories it offers, is to follow in the footsteps of Grüner Veltliner. Wine promotors already suggested this

đača Škrleta trebala bi biti da to vino postane standardno bijelo vino Zagreba i okolice.

S obzirom na različite lokalne nazive Škrleta (prije svega Ovnek) jasno je da brojni sinonimi zasigurno ukazuju na dugu povijest neke sorte, a duga povijest sorte u pravilu pomaže u promociji vina. Međutim, iz marketinške perspektive nije odveć korisno za vina iste sorte koristiti više sinonima (lokalnih naziva) jer to može zbunjivati kupce. Moderna tržišta traže i žele brendirati jedno prepoznatljivo i lako izgovorljivo ime. U hrvatskom jeziku Škrlet ispunjava ove uvjete i tijekom zadnjih 20-30 godina njegovo ime i prepoznatljiva kvaliteta vina dobro su se usidrili u vokabularu enologa i vinskih pisaca.

S komercijalne strane povećao se broj proizvođača, stilistika vina izašla je iz okvira tradicionalne i moslavački vinari zaista imaju što ponuditi na vinskom tržištu. Potencijal sorte izvrsno iskorištavaju veće vinarije koje drže proizvodnju, dok se manje vinarije vrlo entuzijastično probijaju na tržište s nestandardnim vinima Škrleta. Svakako se može reći da vinari iz Moslavine prate svjetske, a ne samo domaće trendove u proizvodnji vina. Današnje generacije vinara odmiču se od tradicionalnog uzgoja i prerade i sada je najvažnije da ustraju u promociji sorte i kvaliteti svojih vina. Prema prikupljenim podacima od vinara i drugim dostupnim izvorima, samo na ocjenjivanjima vina u organizaciji elitnog vinskog magazina Decanter (Decanter World Wine Awards – DWWA) u zadnje tri godine vina Škrleta dobila su 20 priznanja (7 srebrnih, 10 brončanih i 3 preporuke). Dobitnici ovakvih međunarodnih priznanja (uz već spomenuta priznanja IWC-a) navode se u prilogu o proizvođačima Škrleta na kraju knjige. To dokazuje da vina Škrleta nisu tek lokalna ili regionalna vina zadovoljavajuće kvalitete (kako se ponekad prezentiraju u domaćim medijima),

connection between the style and potential of Škrlet and Grüner Veltliner wines. One of the greatest ambitions of Škrlet producers should be that this wine becomes the go-to white wine of Zagreb and the surrounding areas.

In view of the different local names given to Škrlet (primarily Ovnek), it is clear that its many synonyms are indicative of the long history of this variety, and the fact that a variety has a long history usually helps in the promotion of wine. However, from marketing perspective, it is not overly useful for wines of the same variety to have several synonyms (local names), as this can confuse customers. Modern markets demand and seek to brand one recognisable and easily pronounceable name. In the Croatian language, Škrlet fulfils these conditions and in the past 20 to 30 years its name and the recognisable quality of its wines have become firmly anchored in the vocabulary of enologists and wine writers.

On the commercial side, the number of producers has risen and its style has flowed outside the traditional canon, so that winemakers from Moslavina truly do have something to offer on the wine market. Larger wineries that engage in production are taking excellent advantage of the variety's potential, while smaller ones are enthusiastically entering the market with their non-standard Škrlet wines. One could definitely say that the Moslavina wine-makers are keeping up with trends in wine production not just in Croatia, but also the world. Today's generations of wine-makers are moving away from traditional viticulture and processing, and now it is most important that they persist in the promotion of this variety and in the quality of their wines. According to data collected from wine-makers and other available sources, in the past three years Škrlet wines have received 20 awards (7 silvers,

već su kvalitetom međunarodno usporediva i imaju velik potencijal na znatno širem tržištu. U tom smislu potrebno je osmišljeno i stručno dodatno poraditi na kategoriziranju i brendiranju. No sigurno je da će za izlazak na veća tržišta biti potrebna stručno utemeljena standardizacija kvalitete. Isto tako, obzirom na kvalitetu i visoke ocjene s uglednih vinskih sajmova, potrebno je stvoriti premium vina Škrleta koja će se naći u višim cjenovnim rangovima.

Projekt brendiranja Škrleta sa zaštićenim žigom koji je pokrenula Udruga Moslavačka vinska cesta i koji je iznjedrio estetski vrlo dobar i prepoznatljiv znak (trenutačno u njezinu vlasništvu) potrebno je oživiti. U suradnji sa svim dionicima, profesionalnim vinarima, županijskom Obrtničkom komorom, vinarskim udrugama i lokalnim samoupravama bit će potrebno postići dogovor i poraditi na osnivanju neke vrste ceha vinara te profesionalizirati kontrolu dodjele žiga (markice) za vina koja kvalitetom zadovoljavaju određeni standard. Markica kao oznaka sigurne kvalitete mora biti dostupna svim registriranim proizvođačima Škrleta koji ju žele na svojim bocama, a vina u tim bocama moraju zadovoljiti kriterije kvalitete utvrđene neovisnim stručnim ocjenjivanjem, uz prihvatljiv trošak postupka.

Također, za iskorak u promociji vina Škrleta i daljnji poticaj povećanju izravne prodaje potrebno je oživiti Vinski dvor u Kutini kao svojevrsnu vinoteku svih moslavačkih Škrleta, gdje bi posjetitelji Moslavine i Lonjskog polja mogli degustirati i kupiti najbolja vina svih moslavačkih vinara. Iako je projekt Vinskog dvora pokrenula i realizirala Udruga vinogradara i voćara Moslavine „Lujo Miklaužić" iz Kutine, koja je uz Grad Kutinu i njegov vlasnik, pretvaranje Vinskog dvora u regionalnu vinoteku Škrleta sigurno je moguće realizirati. Sličan potencijal i ulogu može imati i Vinski podrum u Popovači.

10 bronzes, and three recommendations) at the wine competitions organised by the elite wine magazine Decanter (Decanter World Wine Awards – DWWA). The winners of these international awards (and the IWC recognitions mentioned earlier) are listed in the appendix on Škrlet producers at the end of this book. This proves that Škrlet wines are not just local or regional wines of satisfactory quality (as they are sometimes presented in the domestic media), but wines of internationally comparable quality, with strong potential to do well on a much wider market. In this regard, it is necessary to continue working on organised and professional categorisation and branding. It is certain that to venture out onto on larger markets, a professionally founded standardisation of quality will be needed. Further, in view of the quality and high scores received at prominent wine fairs, it is essential to create premium Škrlet wines for the upper price ranges.

The Škrlet trademark branding project launched by the Moslavina Wine Road Association that resulted in an aesthetically solid and recognisable label (currently owned by the association) needs to be revived. In cooperation with all stakeholders, professional wine-makers, the county Chamber of Trades and Crafts, wine-making associations and local authorities, it will be necessary to reach an agreement and work towards establishing a wine-makers' guild, and to professionalise the stamp award control procedures for wines meeting the set quality standards. The stamp as the designation of ensured quality must be available to all registered producers of Škrlet who want to affix it to their bottles, while the wine in such bottles must fulfil the quality criteria established through independent professional assessments, with acceptable procedural costs.

Idejni projekt „Hrvatske kuće vina" koji je inicirala i početkom 2020. predstavila Sisačko-moslavačka županija vrijedan je razmišljanja i trebao bi biti dugoročno glavni izazov i cilj promocije Škrleta i Moslavine kao vinske destinacije. Prema tom idejnom projektu u poslovnoj zoni Popovače u blizini izlaza s autoceste planirana je izgradnja reprezentativnog i multifunkcionalnog objekta. Pored samog prostora za izlaganje i kušanje vina te predviđenih edukativnih sadržaja o proizvodnji vina, planirani su i drugi sadržaji poput restorana i suvenirnice. Ideja arhitekta usmjerena je na atraktivnost i prepoznatljivost u prostoru. Zasniva se na suvremenoj arhitekturi koja prati tradiciju Moslavine i Posavine, a što se ostvaruje atraktivnom drvenom konstrukcijom.

U naprednim vinarskim zemljama ovakvi objekti sve su češće ključne točke na kojima se vinske regije izravno promoviraju i prezentiraju.

Further, as a step forward in the promotion of Škrlet wines and further incentives to increase direct sales, it is necessary to revive the Wine Palace in Kutina as a kind of wine shop of all the Moslavina Škrlets, where visitors to Moslavina and Lonjsko Polje can taste and purchase the best wines made by all Moslavina winemakers. Although the Wine Palace project was initiated and implemented by the Lujo Miklaužić Wine and Fruit Growers Association from Kutina, and which together with the city of Kutina owns the facility, the transformation of the Wine Palace into a regional Škrlet wine shop is certainly feasible. The Wine Cellar in Popovača could have similar potential and role.

The conceptual project of the "Croatian Wine House", initiated and presented in early 2020 by Sisak-Moslavina County, is worth considering and in the long-run should be the main challenge and goal in promoting Škrlet

Izradu idejnog projekta „Hrvatske kuće vina" inicirala je Sisačko-moslavačka županija. Županija je dugi niz godina financirala i projekt klonske selekcije Škrleta.

The development of the conceptual project "Croatian Wine House" was initiated by the Sisak-Moslavina County. For many years, the county also financed the Škrlet clonal selection project.

Oni su u pravilu izgrađeni uz frekventne prometnice, plijene pogled atraktivnim izgledom, a posjetiteljima nude ugodno zaustavljanje uz mogućnost stručno vođenih degustacija i kupovinu vina po diskontnim cijenama. Ovakvi promotivno-prodajni centri idealno su mjesto i za organizaciju različitih stručnih i poslovno-promotivnih okupljanja. Za sada u Hrvatskoj gotovo da i nema takvih objekata.

Na temelju dobrih postojećih iskustava u bližoj budućnosti možemo očekivati daljnje povećanje površina pod Škrletom, čak i izvan Moslavine i Pokuplja. U podizanju novih nasada dominantno će se koristiti klonski sadni materijal. Realno je očekivati ubrzano uvođenje modernih tehnologija u vinogradu i podrumu, a uz pojačanu promociju može se očekivati širenje prodajnih kanala i više cijene vina te etabliranje vina Škrleta kao standardnog vina Zagreba i okolice.

and Moslavina as a wine destination. According to this conceptual design, the construction of a representative and multifunctional facility is planned in the Popovača business zone near the motorway exit. In addition to the space for exhibiting and tasting wine and the planned educational content on wine production, other facilities such as restaurants and souvenir shops are also planned. The architect's idea focuses on attractiveness and spatial recognisability. It is based on modern architecture in line with the traditions of Moslavina and Posavina, brought to life in an attractive wooden structure.

In advanced wine-making countries, such facilities are increasingly key points where wine regions are directly promoted and presented. They are usually built along busy roads, they captivate the eye with their attractive appearance, and they offer a pleasant break for visitors with a possibility of guided wine tasting and buying at discount prices. Such promotional and sales centres are an ideal place for organising different professional and business-promotional gatherings. For the time being, there are virtually no such facilities in Croatia.

Based on good experiences to date, in the near future we can expect further expansion of areas planted with Škrlet, even outside Moslavina and Pokuplje. Clonal propagation material will be predominantly used in the raising new plantations. It is realistic to expect faster introduction of modern technologies in both the vineyard and the cellar, and through strengthened promotion activities, we can expect the expansion of sales channels and higher wine prices and the establishment of Škrlet wine as the standard wine of Zagreb and its surroundings.

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Proizvođači vina Škrleta iz podregija Moslavina i Pokuplje s prosječnom godišnjom proizvodnjom većom od 2.000 litara

Škrlet wine producers from the subregions Moslavina and Pokuplje with an average annual production of more than 2,000 liters

Prikazani podaci prikupljeni su izravno od proizvođača koji su se odazvali anketi i njihova točnost nije odgovornost autora.

Data aquired are from direct contact from producers through intervirew and their accuracy are their sole responsibility.

NAZIV PROIZVOĐAČA / PRODUCER	POVRŠINA VINOGRADA (ha) / VINEYARD AREA	TIPOVI VINA / WINE TYPES				
		MIRNO SVJEŽE / STILL FRESH	MIRNO ODLEŽAVANO / STILL AGED	PJENUŠAVO / SPARKLING	DESERTNO / DESSERT	
PROIZVOĐAČI VINA ŠKRLETA S PROSJEČNOM GODIŠNJOM PROIZVODNJOM VEĆOM OD 10.000 LITARA / ŠKRLET WINE PRODUCERS WITH AN AVERAGE ANNUAL PRODUCTION OF MORE THAN 10,000 LITERS						
VINARIJA MIKLAUŽIĆ podregija Moslavina	28,0	●	●	●	●	
LAGENA WINERY podregija Moslavina	6,0	●	●	●	●	
VINARIJA MIKŠA podregija Moslavina	4,0	●	○	○	○	
VOŠTINIĆ KLASNIĆ WINERY & GALLERY podregija Moslavina	4,0	●	●	●	●	
VINARIJA TRDENIĆ podregija Moslavina	3,2	●	●	●	○	
VINARIJA FLORIJANOVIĆ podregija Moslavina	3,0	●	●	○	○	
JARAM VINA podregija Moslavina	3,0	●	○	○	○	

VEĆINA PROIZVOĐAČA IMA VINA S OZNAKOM KZP I ZOI / MOST PRODUCERS HAVE LABELED WINES (KZP AND PDO)

1) Kvalitetno ili vrhunsko vino sa zaštićenim zemljopisnim podrijetlom (KZP) / Quality or High quality wine with protected geographic origin
2) Zaštićena oznaka izvornosti (ZOI) / Protected designation of origin (PDO)

	NAJVREDNIJA DOMAĆA NAGRADA/ PRIZNANJE PREMA ODABIRU VINARA MOST VALUABLE PRIZE CHOSEN BY WINEMAKER	NTERNATIONAL WINE CHALLENGE[3]	DECANTER WORLD WINE AWARDS[4]	KONTAKT CONTACT
	VINOVITA 1998. - ŠAMPION IZLOŽBE / EXHIBITION CHAMPION	2012 - SREBRO / SILVER, 2013 - PREPORUKA / RECOMMENDATION, 2014 - PREPORUKA / RECOMMENDATION	2019 - BRONCA / BRONZE	TRNAJEC 202, POPOVAČA 098 262 439 MIKLAUZICMARKO3@GMAIL.COM WWW.VINARIJA-MIKLAUZIC.HR FACEBOOK: VINARIJA-MIKLAUŽIĆ-210094109591564 INSTAGRAM: VINARIJAMIKLAUZIC
	MOSLAVINA 2019. - ZLATO / GOLD		2020. - BRONCA / BRONZE	NAFTAPLINSKA 73, GOJLO, KUTINA 098 290 622 LAGENA.WINERY@GMAIL.COM WWW.LAGENAWINERY.COM FACEBOOK: LAGENAWINERYMOSLAVINA INSTAGRAM: LAGENA_WINERY
	MOSLAVINA 2016. - ŠAMPION IZLOŽBE / EXHIBITION CHAMPION	2013. - SREBRO / SILVER, 2014 PREPORUKA / RECOMMENDATION	2019 - SREBRO / SILVER, 2020 - BRONCA / BRONZE, 2021 - SREBRO / SILVER	VINOGRADSKA 113, REPUŠNICA 091 174 2464 ANTEMIKSA@GMAIL.COM WWW.VINARIJA-MIKSA.HR FACEBOOK: VINARIJA.MIKSA INSTAGRAM: ANTEMIKSA
	ŠKRLETOVO 2017. - NAJBOLJI ŠKRLET	2015 - PREPORUKA / RECOMMENDATION, 2017 - BRONCA / BRONZE	2019 - SREBRO / SILVER, 2020 - PREPORUKA / RECOMMENDATION, 2021 - BRONCA / BRONZE	GRABERSKO BRDO 226, GRABERJE IVANIĆKO 098 822 095 INFO@VK.HR WWW.VK.HR FACEBOOK: VKWINERYGALLERY INSTAGRAM: VK_WINERY_GALLERY
	MOSLAVINA 2019. - NAJBOLJI ODLEŽANI ŠKRLET, BERBA 2018. / THE BEST AGED ŠKRLET, HARVEST 2018	2012 - PREPORUKA / RECOMMENDATION, 2014 - BRONCA / BRONZE	2020 - BRONCA / BRONZE, 2021. - SREBRO, BRONCA / SILVER, BRONZE	TRNOVKA 28, POPOVAČA 098 216 870 VINARIJA@VINARIJA-TRDENIC.HR WWW.VINARIJA-TRDENIC.HR FACEBOOK: VINARIJA.TRDENIC INSTAGRAM: VINARIJA.TRDENIC
	MOSLAVINA 2009. - ŠAMPION IZLOŽBE / EXHIBITION CHAMPION	2012 - PREPORUKA RECOMMENDATION	2019 - PREPORUKA, 2020 - PREPORUKA	POTOK, SREDANIJA 3, POPOVAČA 098 130 4111 IVICAFLORIJANOVIC@YAHOO.COM WWW.VINARIJA-FLORIJANOVIC.HR FACEBOOK: FLORIJANOVIC INSTAGRAM: VINARIJAFLORIJANOVIC
	MOSLAVINA 2014. - ZLATO / GOLD	2013 - PREPORUKA RECOMMENDATION, 2014 - BRONCA / BRONZE, 2018 - PREPORUKA RECOMMENDATION	2019 - BRONCA / BRONZE	REPUŠNICA, VINOGRADSKA 098 981 2382 MATEA@LONIA.HR; KRSTE@LONIA.HR SPUGAK-VINARSTVO.HR FACEBOOK: JARAM-VINA-267616213285590

3) podaci dostupni na / data available at: https://www.internationalwinechallenge.com/
4) podaci dostupni na / data available at: https://awards.decanter.com/

NAZIV PROIZVOĐAČA / PRODUCER	POVRŠINA VINOGRADA (ha) / VINEYARD AREA	TIPOVI VINA / WINE TYPES				
		MIRNO SVJEŽE / STILL FRESH	MIRNO ODLEŽAVANO / STILL AGED	PJENUŠAVO / SPARKLING	DESERTNO / DESSERT	
PROIZVOĐAČI VINA ŠKRLETA S PROSJEČNOM GODIŠNJOM PROIZVODNJOM VEĆOM OD 10.000 LITARA / ŠKRLET WINE PRODUCERS WITH AN AVERAGE ANNUAL PRODUCTION OF MORE THAN 10,000 LITERS						
OPG TOMISLAV SELETKOVIĆ podregija Moslavina	2,1	●	○	○	○	
ŠKRLET JUŠIĆ podregija Moslavina Nema KZP[1] i ZOI[2] / No KZP[1] and PDO[2].		●	○	○	○	
PROIZVOĐAČI VINA ŠKRLETA S PROSJEČNOM GODIŠNJOM PROIZVODNJOM OD 5.000 DO 10.000 LITARA / ŠKRLET WINE PRODUCERS WITH AN AVERAGE ANNUAL PRODUCTION OF 5,000 TO 10,000 LITERS						
OPG DANICA DOLOVČAK podregija Pokuplje Nema KZP[1] i ZOI[2] / No KZP[1] and PDO[2]. Ne prima posjetitelje / Does not accept visitors.	1,5	●	○	○	○	
OPG ZORAN JANČAR podregija Moslavina	1,2	●	○	○	○	
OPG ANDRIJA RANOGAJEC podregija Moslavina Ne prima posjetitelje / Does not accept visitors.	1,2	●	○	○	○	
VINA KAHLER podregija Moslavina	1,0	●	○	○	○	

VEĆINA PROIZVOĐAČA IMA VINA S OZNAKOM KZP I ZOI / MOST PRODUCERS HAVE LABELED WINES (KZP AND PDO)

1) Kvalitetno ili vrhunsko vino sa zaštićenim zemljopisnim podrijetlom (KZP) / Quality or High quality wine with protected geographic origin
2) Zaštićena oznaka izvornosti (ZOI) / Protected designation of origin (PDO)

	NAJVREDNIJA DOMAĆA NAGRADA - PRIZNANJE PREMA ODABIRU VINARA / MOST VALUABLE PRIZE CHOSEN BY WINEMAKER	INTERNATIONAL WINE CHALLENGE[3]	DECANTER WORLD / WINE AWARDS[4]	KONTAKT / CONTACT
	VINA OD DAVNINA 2020. - ZLATO / GOLD			MRAMORSKA ULICA 51, GORNJA GRAČENICA, VOLODER 099 334 6096 INFO@SELETKOVIC.EU WWW.SELETKOVIC.EU FACEBOOK: VINASELETKOVIC
	MOSLAVINA 2020. - SREBRO / SILVER			VINOGRADSKA 151, GORNJA GRAČENICA 098 901 9518 ANTONIO.JUSIC@GMAIL.COM FACEBOOK: ANTONIO TONI JUŠIĆ
				VRH LETOVANIČKI 13 098 901 3633 BUBYMDOLOVCAK@GMAIL.COM
	MOSLAVINA 2021. - ZLATO / GOLD			ANDRIJE HEBRANGA 8, KUTINA 098 904 9419 ZORAN.JANCAR@HOTMAIL.COM FACEBOOK: OPG-JANČAR-ZORAN-1028769713814222
	POPOVAČA 2017. - ŠAMPION IZLOŽBE / EXHIBITION CHAMPION			VJEKOSLAVA KOCHA 25, VOLODER 099 683 4264 RANOGAJEC.MATIJA@GMAIL.COM
				KRALJA ZVONIMIRA 37, BATILJA, KUTINA 099 439 3377 ZORAN1506@GMAIL.COM FACEBOOK: PROFILE.PHP?ID=100010037148794 INSTAGRAM: VINA_KAHLER

3) podaci dostupni na / data available at: https://www.internationalwinechallenge.com/
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NAZIV PROIZVOĐAČA / PRODUCER	POVRŠINA VINOGRADA (ha) / VINEYARD AREA	TIPOVI VINA / WINE TYPES				
		MIRNO SVJEŽE / STILL FRESH	MIRNO ODLEŽAVANO / STILL AGED	PJENUŠAVO / SPARKLING	DESERTNO / DESSERT	
PROIZVOĐAČI VINA ŠKRLETA S PROSJEČNOM GODIŠNJOM PROIZVODNJOM OD 2.000 DO 5.000 LITARA ŠKRLET WINE PRODUCERS WITH AN AVERAGE ANNUAL PRODUCTION OF 2,000 TO 5,000 LITERS						
U.O. KLET ROMIĆ podregija Moslavina	1,8	●	○	○	○	
OPG KAŠNER podregija Moslavina	1,0					
KEZELE podregija Moslavina	1,0	●	○	○	○	
OPG IVAN KOSOVEC podregija Pokuplje	1,0	●	○	○	○	
OPG KOŠUTIĆ VERICA podregija Moslavina	1,0	●	○	○	○	
OPG SLOBODAN JURIŠIĆ podregija Moslavina	0,6	●	○	○	○	

VEĆINA PROIZVOĐAČA IMA VINA S OZNAKOM KZP I ZOI / MOST PRODUCERS HAVE LABELED WINES (KZP AND PDO)

1) Kvalitetno ili vrhunsko vino sa zaštićenim zemljopisnim podrijetlom (KZP) / Quality or High quality wine with protected geographic origin
2) Zaštićena oznaka izvornosti (ZOI) / Protected designation of origin (PDO)

	NAJVREDNIJA DOMAĆA NAGRADA - PRIZNANJE PREMA ODABIRU VINARA / MOST VALUABLE PRIZE CHOSEN BY WINEMAKER	INTERNATIONAL WINE CHALLENGE[3]	DECANTER WORLD WINE AWARDS[4]	KONTAKT / CONTACT
			2020 - BRONCA/ BRONZE, 2021 - BRONCA/ BRONZE	MATE LOVRAKA 43, KUTINSKA SLATINA 098 961 2268 NIKICA.KATIC@GMAIL.COM KLET-ROMIC.BUSINESS.SITE FACEBOOK: PROFILE. PHP?ID=100057417010808 INSTAGRAM: KLETROMIC
	MOSLAVINA 2019. - ZLATO / GOLD			KUTINSKA LIPA 135, KUTINA 098 261 179 INFO@VINA-KASNER.HR WWW.VINA-KASNER.HR FACEBOOK: VINARIJAKASNER
	VINA OD DAVNINA 2020. - ZLATO / GOLD		2019 - BRONCA / BRONZE	VINOGRADSKA 6, ŠUMEĆANI 01 288 9900 INFO@KEZELE-VINO.HR WWW.KEZELE-VINO.HR FACEBOOK: SEOSKI.TURIZAM.KEZELE INSTAGRAM: SEOSKITURIZAMKEZELE
				JURAJA ĆUKA 74, POPOVAČA 091 547 6130 VINA.KOSOVEC@GMAIL.COM FACEBOOK: VINAKOSOVEC INSTAGRAM: KOSOVEC_WINERY
	MOSLAVINA 2019 - ZLATO / GOLD		2020 - SREBRO / SILVER, 2021. - SREBRO / SILVER	MATIJE GUPCA 103, KUTINA 098 165 1520 INFO@VINA-KOSUTIC.HR WWW.VINA-KOSUTIC.HR FACEBOOK: VINAKOSUTIC INSTAGRAM: VINAKOSUTIC
				MLADINSKI PUT 105, VRH LETOVANEČKI 091 534 4423 LUCIJA-LUCIJA@HOTMAIL.COM VINARIJA-JURISIC.BUSINESS.SITE FACEBOOK: PROFILE.PHP?ID=100011675103881

3) podaci dostupni na / data available at: https://www.internationalwinechallenge.com/
4) podaci dostupni na / data available at: https://awards.decanter.com/

NAZIV PROIZVOĐAČA / PRODUCER	POVRŠINA VINOGRADA (ha) / VINEYARD AREA	TIPOVI VINA / WINE TYPES				
		MIRNO SVJEŽE / STILL FRESH	MIRNO ODLEŽAVANO / STILL AGED	PJENUŠAVO / SPARKLING	DESERTNO / DESSERT	
PROIZVOĐAČI VINA ŠKRLETA S PROSJEČNOM GODIŠNJOM PROIZVODNJOM OD 2.000 DO 5.000 LITARA / ŠKRLET WINE PRODUCERS WITH AN AVERAGE ANNUAL PRODUCTION OF 2,000 TO 5,000 LITERS						
VINARIJA AUGUST podregija Moslavina	0,5	●	○	○	○	
OPG MALEC podregija Moslavina	0,5	●	○	○	○	
OPG ANKICA GAŠPAREC podregija Moslavina Nema ZOI[2] / No PDO[2].	0,3	●	○	○	○	
OPG HERAK podregija Pokuplje Nema ZOI[2] / No PDO[2].	0,3	●	○	○	○	
VINA GLAVICA podregija Moslavina	0,2	●	○	○	○	
OPG MATIJA ŽABIĆ podregija Moslavina Nema KZP[1] i ZOI[2] / No KZP[1] and PDO[2].	0,2	●	○	○	○	

VEĆINA PROIZVOĐAČA IMA VINA S OZNAKOM KZP I ZOI / MOST PRODUCERS HAVE LABELED WINES (KZP AND PDO)

1) Kvalitetno ili vrhunsko vino sa zaštićenim zemljopisnim podrijetlom (KZP) / Quality or High quality wine with protected geographic origin
2) Zaštićena oznaka izvornosti (ZOI) / Protected designation of origin (PDO)

	NAJVREDNIJA DOMAĆA NAGRADA - PRIZNANJE PREMA ODABIRU VINARA / MOST VALUABLE PRIZE CHOSEN BY WINEMAKER	INTERNATIONAL WINE CHALLENGE[3]	DECANTER WORLD WINE AWARDS[4]	KONTAKT / CONTACT
				TRNOVKA 29, POPOVAČA 097 777 1000 AUGUST.WINERY@GMAIL.COM WWW.VINARIJA-AUGUST.COM AUGUST VINARIJA&RESTORAN FACEBOOK: VINARIJAAUGUST INSTAGRAM: VINARIJA_AUGUST
				VULINČEVA 19, IVANIĆ GRAD 098 456 625 MC-MALCOM@ZG.T-COM.HR WWW.VINARIJA-MALEC.COM FACEBOOK: VINARIJA.MALEC
	MOSLAVINA, 2010. - SREBRO / SILVER			DIŠNIK 179A, GAREŠNICA 091 555 2177 GASPARECANDREA@GMAIL.COM FACEBOOK: ANKICA.GASPAREC
	ZLATNA DIPLOMA / GOLDEN DIPLOMA PETRINJA 2012.			VRH LETOVANIČKI, RUPČIĆEV PUT 82B, LEKENIK 098 262 601 INFO@OPG-HERAK.HR WWW.OPG-HERAK.HR FACEBOOK: OPGHERAK INSTAGRAM: OPGHERAK
			2021. - BRONCA / BRONZE	VINOGRADSKA 134, GORNJA GRAČENICA 091 205 2044 ANTUN.GLAVICA@GMAIL.COM FACEBOOK: VINA.GLAVICA INSTAGRAM: VINA.GLAVICA
	ČAZMANSKI VINOKAP 2020 - NAJBOLJE OCIJENJENI ŠKRLET I VINO ČAZMANSKOG VINOGORJA			KAPELICA 101, GAREŠNICA 091 248 0904 MATIJA.ZABIC@GMAIL.COM VINA-ZABIC.HR

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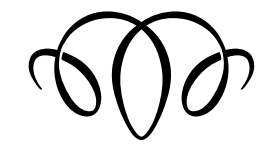

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