

## VITICULTURE IN SERBIA/ROMANIAN BORDER ZONE

Zoran PRŽIĆ

University of Belgrade Faculty of Agriculture  
Nemanjina 6, Bgrade, Serbia  
e-mail: zoranata4@yahoo.com

### Abstract

*Total length of the Republic of Serbia border is 2351.8 km, from which border zone length between Republic of Serbia and Romania is 546.5 km. According to wine-growing areas zoning in the Republic of Serbia, three wine-growing areas are defined: Central Serbia, Vojvodina and Kosovo and Metohija. Vojvodina area in the border zone include South Banat region with two sub-regions: Vršачki and Belocrkvanski, while in Central Serbia area, also in the border zone, there is Mlava Region with three sub-regions: Braničevsko, Požarevačko and Resavsko and region of Negotinska Krajina with four sub-regions: Ključko, Brzopalanačko, Mihajlovačko and Negotinsko.*

*In South Banat region, under vineyards are 1730 ha, of which is 1567 ha under wine and 163 ha under table varieties. This region is characterized with flat landscape dominated by the Vršac Mountains in central part. The dominant soil types are vertisol and chernozem. Grape and wine production is characterized by small family farms with high-intensive plantations. In varietal composition are dominant international and new created white wine varieties such as: Sauvignon blanc, Semyon, Riesling white, Riesling Italien, Chardonay, Kreaca, Muscat otonel, Rkaciteli, Smederevka and Župljanka, and from red wine varieties: Pinot noir, Portugizac and Limberger.*

*In Mlava region under vineyards are 814,7 ha. Dominant are wine varieties. In this region climate is specific under natural borders: Carpathian mountain system and Danube, Mlava and Pek river. This region is characterized with both, traditional and modern grape growing technology.*

*The region of Negotinska Krajina is located in east part of Serbia and cover area of 978 ha, from which is 890 ha are under wine and 88 ha under table varieties. Climate conditioned of this region is affected by the Carpathian mountain system and Danube river. Vertisol, eutric cambisol and sandy soils are present in most vineyards. The region of Negotinska Krajina is characterized with traditional grapes production at small family wineries. This region is famous by autochthonous varieties: Prokupac, Bagrina, Tamjanika crna, Začinak, Smederevka and Plovdina.*

**Key words:** viticulture, Serbia, Romania, region, sub-region

### INTRODUCTION

Total length of the Republic of Serbia border is 2351.8 km, from which border zone length between Republic of Serbia and Romania is the longest (546.5 km) compared to other neighboring countries. The border is combined character (natural-artificial) one part is bounded by natural basin of Danube river (230 km) and rest it is land border (316.5 km) defined by interstate agreements.

According to wine-growing areas zoning from 2012 year, in the Republic of Serbia, three wine-growing areas are defined: Central Serbia, Vojvodina and Kosovo and Metohija. Within these three areas, are defined boundaries of 22 regions, 77 sub-regions and several smaller winegrowing oases. Cultivation of grapevine in border

zone between Serbia and Romania has been the most developed for centuries in areas of Vojvodina and Central Serbia. Vojvodina area in the border zone include South Banat region with two sub-regions: Vršачki and Belocrkvanski, while in Central Serbia area, also in the border zone, there is Mlava region with with three sub-regions: Braničevsko, Požarevačko and Resavsko and region of Negotinska Krajina with four sub-regions: Ključko, Brzopalanačko, Mihajlovačko and Negotinsko. The mentioned wine-growing regions and sub-regions are different in terms of agroecological conditions that prevail in them, by number of producers, varieties and ampelotechnical measures witch is applied during the grapevine cultivation.

## MATERIAL AND METHODS

In the paper were used data of wine-growing areas zoning in Republic of Serbia from 2012, carried out by Department for viticulture University of Belgrade Faculty of Agriculture. Also in paper were used data from the 2012 agriculture census.

The following climate indices were used to assess the suitability of climate of wine-growing areas:

AVG-Average Growing Season Temperatures

WIN-Winkler Degree Days

BEDD-Biologically Effective Degree Days

HI-Huglin Heliothermal Index

CI-Cool Night Index

DI-Drought Index

NT 0-number of days during vegetation with minimal day temperature from 0°C

NT 15- number of days in period of dormancy with minimal or equal day temperature from 15°C

NT 35- number of days in vegetation period with maximal or equal day temperature from 35°C

The border of wine regions and sub-regions were determined using GPS and soil types were determined using standard agrochemical analyzes and pedological maps.

## RESULTS AND DISCUSSION

In South Banat region, under vineyards are 1730 ha, from which is 1567 ha under wine and 163 ha under table varieties (table 1). In the South Banat region in the Serbia/Romania border zone, two sub-regions are distinguished: Vršački (which is the largest in area) and Belockrvanski, which is characterized by a large number of smaller grape and wine producers. In Vršački sub-region in production are dominant wine varieties and in Belockrvanski sub-region table varieties.

Table 1. Total vineyard area in South Banat region

Sub region	Producers with vineyard	Wine varieties (ha)	Table varieties (ha)	Total (ha)
Vršački	255	1.357.57	47.91	1.405.48
Belockrvanski	119	35.53	73.70	109.23
<b>South Banat region</b>	<b>374</b>	<b>1393.1</b>	<b>121.61</b>	<b>1514.71</b>

In both sub-regions, there are favorable climatic conditions for grapevine growing, as indicated by the values of the most important climatic indices used to assess the climate of this area (table 2). This region is characterized by flat landscape dominated by the Vršac Mountains (which is positioned in central part of Vršački sub region). Vršac Mountains with a height of 641 m and length of 18 km in east-west direction, provide favorable and specific climat conditions for grapevine growing.

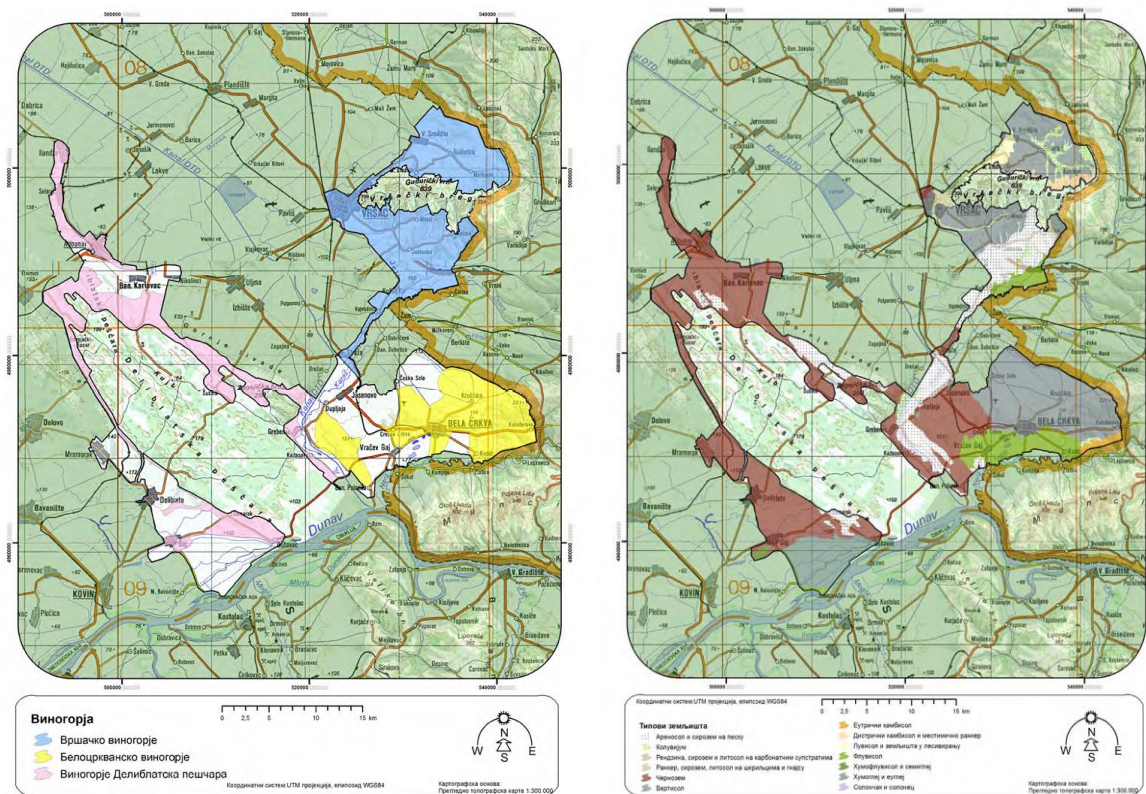
Except to the Vršac Mountains, climate specificity is affected by closeness of Danube river and the Belockrvanska lakes on southern border of this region. The closeness of large water surface directly affect the slower heating and cooling of the surrounding air in vineyards. It can be concluded through values of NT 35 climate index which has lower values in Bela crkva sub-region (Vršac-2.5 and Bela crkva sub-region-1.8).

Table 2. Climate condition of South Banat region

Meteo station	AVG	WIN	BEDD	HI	CI	DI	NT 0	NT 15	NT 35
Vršac	17.3	1627.2	1335.2	2140.7	11.4	192.6	6.3	3.3	2.5
Bela crkva	17.4	1635.7	1346.1	2163.5	11.4	199.4	5.4	3.6	1.8

Most of vineyards, in this region, are positioned at altitude of 90-220 m. The dominant soil types are vertisol and chernozem (picture 1). Grape and wine production is characterized by small family

farms with high-intensive plantations, where the Guyot single, Guyot double trainings system, Casarsa, two-armed modified asymmetric and Roayat cordon are the most used training systems.



Picture 1. Position of South Banat region with two sub regions and soil types

According to the actual trends in viticulture production, the Vršачki sub-region stands out, which is characterized with production on big vineyard complex. On larger vineyards, it is also easier to apply the modern ampelotechnic methods which in this case include dense planting, use of the most modern viticulture specialized machinery for soil cultivating in the inter-row and row space, machines for pre-pruning, mechanical pruning, harvesters for grape harvesting, etc.

In varietal composition are dominant international and new created white wine varieties such as: Sauvignon blanc, Semyon, Riesling white, Riesling Italien, Chardonay, Kreaca, Muscat otonel, Rkaciteli, Smederevka and Župljanka, and from red wine varieties: Pinot noir, Portugizac and Limberger. The dominant table varieties are Muscat Hamburg, Cardinal, Muscat Italia and Datier de

Beyrou. As they are white varieties for high quality white wines dominante in this region, it is precisely the white wines that are recognizable from these regions, especially the top wines made from the Muscat Otonel, Riesling white, Riesling Italien and Kreaca varieties.

In Central Serbia area in Serbia and Romania border zone are Mlava and Negotinska Krajina region. Both regions are characterized long tradition of grape and wine production. Compare to Vojvodina, in these regions autochthonous varieties had significant place.

In Mlava region under vineyards are 814,7 ha (499,22 ha under wine and 315,15 ha under table varieties). Mlava region it consist from three sub-regions: Braničevsko, Požarevačko and Resavsko. Požarevačko sub-region with 370,38 ha is the biggest, followed by Resavsko and Braničevsko sub-regions. This region is

characterized with the grapes and wine production at small vineries, which is

indicated by the large number of registered producers, 6.848 in total. (Table 3).

Table 3. Total vineyard area in Mlava region

Sub region	Producers with vineyard	Wine varieties (ha)	Table varieties (ha)	Total (ha)
Braničevsko	1453	123.55	52.07	175.62
Požarevačko	3000	226.50	143.88	370.38
Resavsko	1158	86.41	56.17	142.58
<b>Mlava region</b>	<b>6848</b>	<b>499.22</b>	<b>315.15</b>	<b>814.37</b>

Altitude, in Mlava region, varied from 70-400 m, and most of vineyards in this region are on 100-270 m. Climate condition (especially temperature during winter and summer) is strongly affected by Carpathian

mountain system and Danube (on the north), Mlava and Pek river (on the west and west-east direction). The most important climate indices collected from four meteo station are shown in table 4.

Table 4. Climate condition at Mlava region

Meteo station	AVG	WIN	BEDD	HI	CI	DI	NT 0	NT 15	NT 35
Kučevo	16.0	1360.2	1199.6	1930.9	9.8	250.6	6.8	2.2	1.6
Petrovac	17.4	1643.2	1331.7	2058.7	12.7	189.8	2.2	0.3	2.4
Veliko Gradište	17.4	1629.4	1350.8	2171.8	11.4	185.8	4.0	1.9	3.7
Žagubica	15.9	1332.0	1175.0	1883.7	9.6	201.1	6.1	2.5	1.9

The relief of Mlava region is heterogeneous. Carpathian mountain and hilly part are in central part of region and flat part is near to Danube, Mlava and Pek river. Altitude level slowly decreases from south-east to nord-west position. Compared to other regions in this region were present different soil types such as: fluvisol, luvisol, litosol, vertisol, chernozem, eutric cambisol and sandy soils (picture 2). Grapes and wine production in the Mlava region is characterized in big percent by old plantations and traditional production, but also new planted vineyards are modern and can be classified in highly intensive and modern vineyards type.

In wine assortment are dominated international varieties for red and white high quality wine production such as Cabernet Sauvignon, Cabernet Franc, Merlo, Pinot noir, Gamay, Chardonnay, Sauvignon blanc.

In vineyards planted between 1970-1995 in big percent is planted Rkaciteli varieties (Georgian variety) which is used for wine production and in Serbia very popular grape brandy production (lozovača in Serbian).

In last two decades with new planted vineyards are importet from France, Italy, Romania, also, new wine and table variety (Marselan, Pinot blanc, Pinot grigio, Victoria) and clones. The biggest number of introduced clones were for next varieties: Cabernet sauvignon: french clones-191, 337, 685, italian clones-R5, VCR 7, VCR 8, VCR 11, VCR 489; Cabernet franc: french clones-214, 326, 327, 330, 409, italian clones-VCR 10; Pinot noir: french clones-113, 114, 115, 165, 459, 667, 777, 779, 792, 828, 870, Italian clones-R4, VCR 9, VCR 18; Merlo: french clones-181, 184, 343, 347, italian clones-R3, R12, R18, VCR1, VCR489; Sauvignon blanc: french

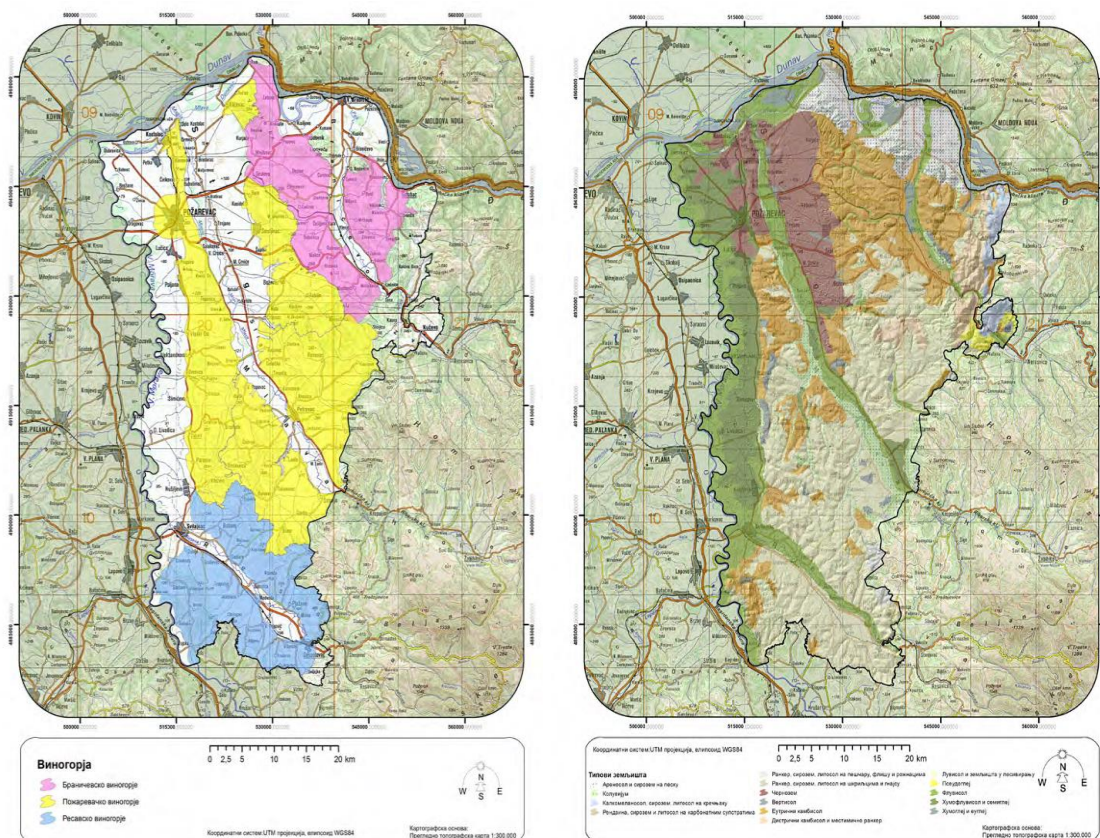
clones-107, 108, 159, 161, 242, italian clones-ISV F3, ISV F5, R3, VCR 236, Chardonnay: italian clones-ISV 4, ISV 108, R8, VCR 4, VCR 10, VCR 435, french clones-75, 76, 95, 117, 121, 548; Marselan: french Clone-980.

The autochthonous varieties Prokupac and Smederevka have big importance and in the new planted vineyards they are highly represented. In last two decade on Prokupac was done clonal selection. Today, 12 clones of the Prokupac variety have been recognized by the Ministry of Agriculture of the Department of Genetic Resources under the designations: PR 2, PR 6, PR 8, PR 9, PR 10, PR 11, PR 12, PR 13, PR 16, PR 17, PR 19, PR 20.

This clones were tested to presence of different viruses, 23 recognized and

potentially recognized clones had "natural free virus status". Naturally virus-free clones can be used to further multiply and produce certified planting material, which would contribute to their rapid expansion into regular winemaking. Some clones of this variety are characterized by increased resistance to *Botritis cinerea*. Smederevka is used for producing of white wines and this variety is very common in all sub-regions of Mlava region.

Among table varieties, Muscat Hamburg dominates, followed by Cardinal, Muscat Italy and Dacier de Beyroust. Victoria which is introduce from Romania and Black magic is introduce from Italy are grown and they are becoming more and more popular table variety in all sub-regions.



Picture 2. Position of Mlava region with three sub regions and soil types

The region of Negotinska Krajina is located in east part of Serbia and cover area of 978 ha, from which is 890 ha are under wine and 88 ha under table varieties.

Table 5. Total vineyard area in Negotinska Krajina region

Sub-regions	Producers with vineyard	Wine varieties (ha)	Table varieties (ha)	Total (ha)
Ključko	596	116.12	3.12	119.24
Brzopalanačko	271	44.29	9.40	53.69
Mihajlovačko	513	120.0	8.37	128.37
Negotinsko	1049	208.75	40.62	249.37
<b>Negotinska Krajina region</b>	<b>2429</b>	<b>489.16</b>	<b>61.51</b>	<b>550.67</b>

This region is characterized with specific climate condition affected by the Carpathian mountain system and Danube river, which made natural border of this

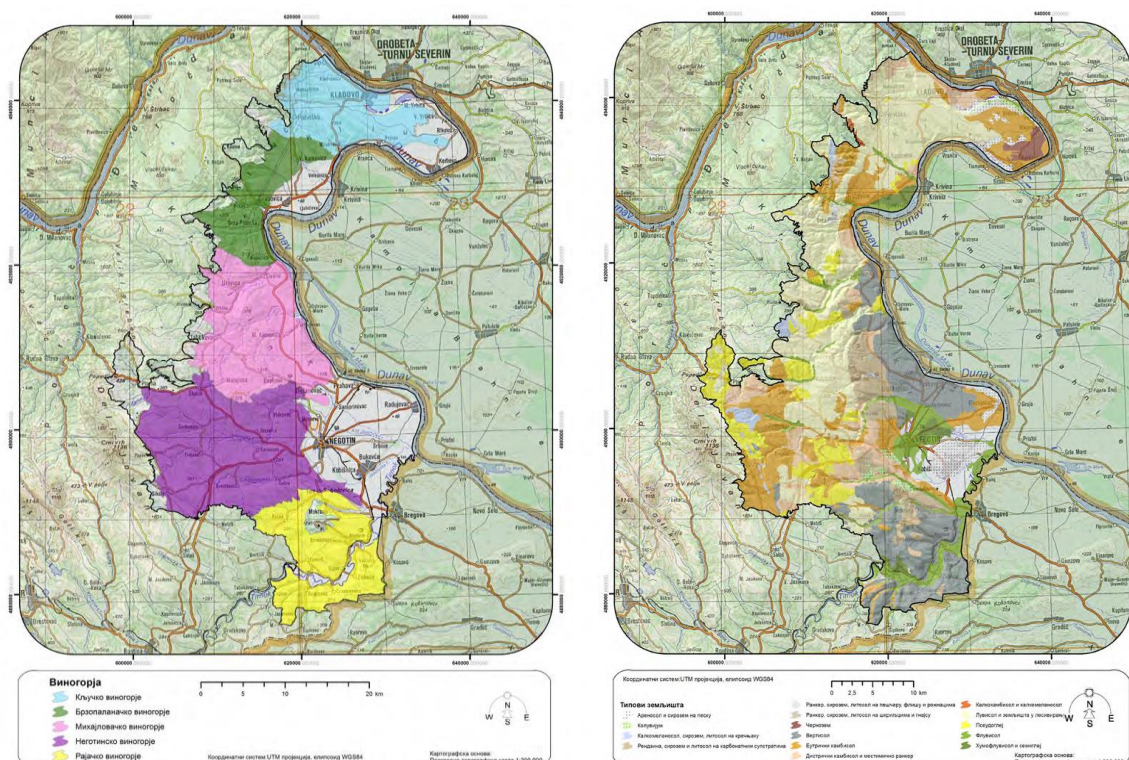
region. In table 6 are presented the most important climate indice for Negotinska Krajina region. This indice are calculated by data collected from four meteo stations.

Table 6. Climate condition at Negotinska Krajina region

Meteo station	AVG	WIN	BEDD	HI	CI	DI	NT 0	NT 15	NT 35
Negotin	17.8	1717.9	1390.8	2278.1	11.5	127.5	3.8	2.8	4.6
Đerdap	18.0	1750.4	1436.6	2198.2	13.5	159.9	0.6	0.4	1.1
Tekija	17.4	1624.2	1368.1	2157.6	12.0	189.9	1.3	0.4	2.2
Donji Milanovac	16.8	1501.5	1302.7	2044.2	11.7	124.9	1.4	0.6	1.8

The relief of Negotinska Krajina region is heterogeneous, it consists of steep and gentle terrain on which most of vineyards are planted. The altitude level slowly

decreases from west to east ending by Danube river basin. Vertisol, eutric cambisol and sandy soils are present in most vineyards (picture 3).



Picture 3. Position of Negotinska Krajina region with four sub regions and soil types

The region of Negotinska Krajina is characterized with traditional grapes production, as well as production of quality and high-quality white and red wines at small family winery. In vineyards it is applied semi-extensive or intensive growing technology, in which Krajinski, Guyot single, Guyot double and Casarsa trainings system are used. This part of Serbia-Negotinska Krajina region, is famous by autochthonous varieties: Prokupac, Bagrina, Tamjanika crna, Začinak, Smederevka and Plovdina. Also in this region are presented red international wine varieties: Cabernet Sauvignon, Merlot, Gamay, Riesling white, Riesling Italien, Chardonnay, Pinot blanc, Muscat Otonel, also less are presented varieties which had colored skin and mesocarp as Gamay tenturier, Alicante Boucshet, Začinak and Krajinski bojadiser. From table varieties, Muscat Hamburg is dominant variety, followed by Muscat Italy, Datier de Beyrouth, Victoria and Moldavia. Due to the specific assortment (primarily autochthonous varieties) and specific aroma of the produced wines (which is created as a combination of autochthonous varieties, climate and different soil types), wines from this region are highly valued and recognizable on the market as well as from consumers.

## **CONCLUSION**

Total border zone length between Republic of Serbia and Romania is 546.5 km. In Serbia/Romania border zone two wine-growing areas are defined: Vojvodina and Central Serbia. Vojvodina area in the border zone include South Banat region with two sub-regions: Vršacki and Belocrkvanski. In Central Serbia area in the border zone there is Mlava Region with three sub-regions: Braničevsko, Požarevačko and Resavsko and region of Negotinska Krajina with four sub-regions: Ključko, Brzopalanačko, Mihajlovačko and Negotinsko.

Most of vineyards, in South Banat region, are positioned at altitude of 90-220 m. Grape and wine production is characterized by small family vineries where the Guyot single, Guyot double trainings system, Casarsa, two-armed modified asymmetric and Roayat cordon are the most used training systems. In varietal composition are dominant international and new created white wine and specific varieties such as: Kreaca, Muscat otonel, Rkaciteli, Smederevka and Župljanka, Portugizac and Limberger. The dominant table varieties are Muscat Hamburg, Cardinal, Muscat Italia and Datier de Beyrouth.

In Mlava region climate condition is strongly affected by Carpathian mountain system and Danube, Mlava and Pek river. In this region were present different soil types such as: fluvisol, luvisol, litosol, vertisol, chernozem, eutric cambisol and sandy soils. Grapes and wine production is characterized by traditional and new planted vineyards which are modern highly intensive type. In wine assortment is dominated standard international varieties and new for this region like Marselan, Pinot blanc, and Pinot grigio. In the new planted vineyards they are highly represented autochthonous varieties Prokupac and Smederevka.

The region of Negotinska Krajina is characterized with traditional grapes production, as well as production of quality and high-quality white and red wines at small family winery. Wines from this region are highly valued and recognizable on the market as well as from consumers.

## **ACKNOWLEDGEMENTS**

This work was carried out with the support between the Faculty of Agriculture in Belgrade and the Ministry of Education, Science and Technological Development of the Republic of Serbia, contract registration number: 451-03-68/2022-14/200116.

## REFERENCES

- Avramov, L., Žunić, D. (2001). *Posebno vinogradarstvo*, Faculty of agriculture Belgrade.
- Fregoni, M. (2010). *Le aree viticole storiche nel mondo: i loro vitigni, la loro protezione e la tipicità dei vini in esse ottenuti*. VIII International Terroir Congress. Soave (VR), Italy, 2(5):3-22.
- Jones, G.V. (2010). *Climate, grape, and wine: Structure and suitability in a changing climate*. Acta Hort. 931, 19-28.
- Jones, G., Davis, R. (2000). *Climate influences on grapevine phenology, grape composition, and wine production and quality for Bordeaux, France*. American Journal of Enology and Viticulture, 51(3):249-261.
- Marković, N., Pržić, Z. (2018): Clonal selection of Prokupac grape variety in Serbia-current results. The 47<sup>th</sup> Conference of the European Society for New Methods in Agriculture-ESNA, proceedings, papers print in Annals of the University of Craiova - Agriculture, Montanology, Cadastre Series, 48(1):146-151.
- Marković, N., Pržić, Z., Rakonjac, V., Todić, S., Ranković-Vasić, Z., Matijašević, S., Bešlić, Z. (2017). *Ampelographic characterization of Vitis cv "Prokupac" clones by multivariate analysis*. Romanian Biotechnological Letters, Vol. 22(5): 12868-12875.
- Marković, N., Pržić, Z., Todić, S., Ličina, V., Niculescu, M., Tešević, V. (2017). *Variation of structural bunch and berries indicators and physico-chemical wine properties of Cabernet sauvignon cv. under influence of defoliation and harvest time in agroecological conditions of central Serbia*. Annals of the University of Craiova - Agriculture, Montanology, Cadastre Series Vol. XLVII 2017/2, pp. 176-187.
- Marković, N., Pržić, Z. (2016). *Technological characteristics of Black Magic, Victoria, Mikele palieri and Muscat Hamburg table varieties grown at Oplencu*. Book of abstracts.
- Marković Nebojša (2012). *Tehnologija gajenja vinove loze*. Zadužbina Svetog manastira Hilandara.
- Marković, N., Atanacković, Z. (2013). *Uvometric and technological clonal variation of Serbian black wine cultivar Prokupac*. 36<sup>th</sup> World Congress of vine and wine: "Vine and Wine between Tradition and Modernity" Bucharest – Romania. Proceedings of the 36th World Congress of vine and wine.
- Marković, J. (1980). Regionalna geografija SFRJ. Građevinska knjiga, Beograd, Srbija.
- Pržić, Z., Marković, N. (2019): Agrobiological and technological characteristics of some grapevine varieties and clones grown in Serbia. The 15th annual meeting "Durable agriculture – agriculture of the future: advanced methods for a sustainable agriculture, silviculture, cadastre and food science". 7th-8th November 2019, Craiova, Romania Annals of the University of Craiova – Agriculture, Montanology, Cadastre Series, Book of proceedings Vol. XLIX/2019:229-237.
- Živković, J., Šavikin, K., Zdunić, G., Gođevac, D., Marković, N., Pržić, Z., Menković, N. (2016). *Influence of bunch morphology on quality of wines produced from clones of grape variety Prokupac* J. Serb. Chem. Soc. 81(8):883–895.
- Zirojević, D. (1964). *Ampelografska ispitivanja odlika Prokupca u cilju njegove selekcije*, Savez poljoprivrednih inženjera i tehničara Jugoslavije-Zavod za vinogradarstvo i vinarstvo u Nišu, 18:1-96.
- Žunić, D., Garić, M. (2010). *Posebno vinogradarstvo-ampelografija II*, Poljoprivredni fakultet Univerziteta u Prištini.

[https://publikacije.stat.gov.rs/G2015/Pdf/G2\\_01514009.pdf](https://publikacije.stat.gov.rs/G2015/Pdf/G2_01514009.pdf)

[https://publikacije.stat.gov.rs/G2015/Pdf/G2\\_01514011.pdf](https://publikacije.stat.gov.rs/G2015/Pdf/G2_01514011.pdf)

<https://www.stat.gov.rs/sr-latn/oblasti/poljoprivreda-sumarstvo-i-ribarstvo/popis-poljoprivrede/>