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Quality assessment of interspecific hybrids in the Banja Luka region: morphological traits of grape and physicochemical properties of must

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Abstract

The primary objective of this study was to evaluate the morphological characteristics of bunches and berries, as well as the physicochemical properties of must, in five interspecific grapevine hybrids grown in the Banja Luka area: Bronner, Morava, and Muscaris (white cultivars), and Cabernet Cortis and Prior (red cultivars). Morphological characterization was performed according to the Prostoserdov method. Must quality assessments have included measurements of the total soluble solids (°Brix), the total titratable acidity (g/L), and pH using standard OIV (2024) procedures. The total phenolic content (TPC) was determined according to Mazza et al. (1999). Cabernet Cortis and Muscaris exhibited the highest bunch mass and soluble solids content. The highest average berry mass was recorded in Morava (20.89 g), whereas Cabernet Cortis had the lowest values (15.33 g). The total titratable acidity and must pH were generally within acceptable oenological limits, except in Prior, which showed a slightly elevated pH. Phenolic evaluation across winemaking stages (must → wine after first racking → young wine) followed the expected trends for both red and white cultivars. The highest TPC was recorded in young Cabernet Cortis wine (1490.20 mg GAE/L), while Muscaris exhibited the lowest value (156.3 mg GAE/L). Overall, all cultivars under study have demonstrated satisfactory grape quality based on their morphological and physicochemical attributes.

***Key words**:* Interspecific hybrid, Grape, Morphology, Physicochemical traits.

Introduction

Grapevine cultivars traditionally used for wine production belong primarily to *Vitis vinifera* L. Although appreciated for their sensory attributes, *V. vinifera* cultivars exhibit limited tolerance to fungal diseases, pests, and abiotic stresses. The development of interspecific hybrids — particularly following the phylloxera outbreak in the 19^{th} century — offered a strategy to incorporate resistance traits from North American *Vitis* species while retaining favourable oenological qualities. Modern breeding programs increasingly aim to develop cultivars adapted to climate-change-associated stressors.

Globally, interspecific hybrids still represent a relatively small proportion of the total vineyard area; however, their use is expanding, particularly in organic viticulture, where they represent approximately 6.2% of the global organically cultivated vineyard area (International Organization of Wine and Vine [OIV], 2021). Such hybrids are also gaining importance in northern regions of Bosnia and Herzegovina, including the Banja Luka viticultural zone.

Numerous studies in Europe (Töpfer et al., 2011; Gąstoł, 2015; Czaplicka et al., 2022; Duley et al., 2025) and in Bosnia and Herzegovina (Mijatović et al., 2015; Jovanović-Cvetković et al., 2017; 2022) have evaluated the biological and technological potential of interspecific hybrids. Detailed knowledge of bunch and berry morphology is crucial for ampelographic identification, phytosanitary risk assessment, and technological processing, while their chemical composition directly affects oenological potential (Dai, 2011; Chacón-Vozmediano et al., 2021).

Given the limited data for this region, the aim of the present study was to assess the morphological and physicochemical traits of selected interspecific hybrids grown in northern Bosnia and Herzegovina.

Material and Methods

Plant material

The research was conducted in 2023 and included five grapevine interspecific hybrids grown in the Banja Luka area (coordinates: 44.766667°N 17.183333°E), Republic of Srpska, Bosnia and Herzegovina. All interspecific hybrids are listed in the Vitis International Variety Catalogue (VIVC) (Julius Kühn-Institute, 2025). The basic passport data of interspecific hybrids under study are: Bronner (VIVC, N°/17129), Morava (VIVC, N°23777), Muscaris (VIVC, N°22628), Cabernet Cortis (VIVC, N°20005), and Prior (VIVC, N°19993). The cultivars were grown in the same cultivation training system with a Royat single cordon trained with 12 buds per vine. In the year of the research, approximately the same agrotechnical treatment was applied to all cultivars.

Meteorological data

Data of meteorological conditions in Banja Luka, i.e., average monthly air temperatures and the total monthly precipitation in 2023., (Republic of Srpska Institute of Statistics, 2024) are shown in Figure 1.

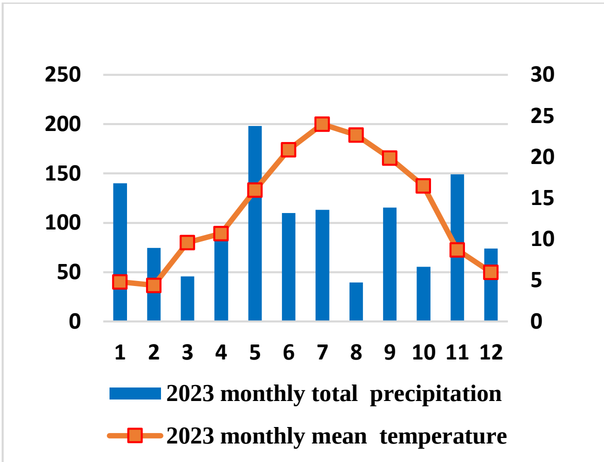

Fig. 1 - Average monthly air temperatures and the total monthly precipitation in Banja Luka, 2023.

According to the data, the weather conditions in the initial period of vegetation were not satisfactory, considering that the maximum level of precipitation was recorded in May (198.1 mm), which is unfavourable from a biological point of view (poor pollination and fertilization), as well as during the grape ripening period, in August, when the precipitation level was the lowest (39.6 mm). On the other hand, air temperatures were mostly in accordance with the time of year.

Ampelographic characterization of the bunch and berries

The characterization of the 10 representative bunches and 10 berries of the tested cultivars was carried out by determining the most important physical and structural characteristics using the Prostoserdov method (Prostoserdov, 1946).

Physicochemical characterization of must/ wine

The must quality evaluation included testing of basic physicochemical parameters: the content of total soluble solids - sugar (TSS) determined by refractometric measurement, the content of total titratable acids (TTA) determined by the neutralization of acids method with a 0.1M of NaOH solution and pH value according to the standard method recommended by the International Organization of Vine and Wine (OIV, 2024).

The content of total phenolic compounds (TPC) was evaluated in different stages of microvinification process: in must, in the wine obtained immediately after fermentation (1st racking of wine) and young wine (6 months after storage). The evaluation was performed using the method recommended by Mazza, et al. (1999). All analyses were performed in triplicates.

Statistical analyses

Statistical analyses were conducted using R-Commander (Fox & Bouchet-Valat, 2021). Data visualization and statistical tests were performed with the ggplot2 (Version 3.4.1; Wickham, 2016) and agricolae (Version 1.3.5; de Mendiburu, 2021) packages. Differences in qualitative parameters of the bunch, berries, and must among grape cultivars were assessed using one-way ANOVA. The residual analysis was conducted to verify ANOVA assumptions, outliers were identified using the box plot method and the identify_outliers function from the rstatix package (version 0.7.2; Kassambara, 2023), normality was tested with the Shapiro-Wilk's test, and homogeneity of variances was assessed using the Levene's test. When significant differences were detected, the Tukey's HSD test ($p < 0.05$) was used for multiple comparisons. If assumptions had not been met, data were log-transformed. Differences in the TPC content among cultivars were evaluated using the Kruskal-Wallis rank-sum test, followed by the Dunn's test with the Holm's correction for multiple comparisons.

Results and Discussion

Physical characteristics of the bunch

The results of the analysis of the physical characteristics of the bunch tested varieties have shown significant differences among cultivars for most bunch traits (Table 1).

The bunch mass of the cultivars under study ranged from 238.4 g to 293.0 g. Muscaris and Bronner exhibited the highest values, while Cabernet Cortis and Prior showed a lower bunch mass, although without statistically significant differences. Previous research conducted in the same locality (Jovanović-Cvetković et al., 2022) similarly reported a significantly higher bunch mass in Muscaris, whereas Morava displayed much lower values (169.44 g) compared with the present study (242.9 g), indicating a strong vintage effect. This aligns with Ivanišević et al. (2022), who observed notable variation in the Morava bunch mass across seasons and cultivation systems, with 28% higher mass under conventional than under organic production.

Tab. 1 – Characteristics of the bunch of the interspecific hybrids under study

Cultivar	Bronner	Morava	Muscaris	Cabernet Cortis	Prior
Bunch mass (g)	273.1 ± 17.37	242.9 ± 16.91	293.0 ± 16.38	240.9 ± 23.26	238.4 ± 9.17
Bunch length (cm)	16.5 ± 0.51[ab]	13.3 ± 0.43[c]	16.9 ± 0.64[a]	17.1 ± 0.58[a]	14.7 ± 0.48[bc]
Bunch width (cm)	11.6 ± 0.87[ab]	13.1 ± 0.24[a]	10.1 ± 0.42[b]	12.7 ± 0.68[a]	11.2 ± 0.59[ab]
Grape stem mass (g)	10.1 ± 0.70[a]	5.4 ± 0.51[b]	12.5 ± 0.73[a]	7.2 ± 0.72[b]	6.5 ± 0.58[b]
Number of berries per bunch	172.0 ± 11.35[ab]	112.3 ± 8.97[c]	169.4 ± 11.51[ab]	189.7 ± 14.63[a]	131.2 ± 5.35[bc]
Mass of berries/ bunch (g)	263.0 ± 16.80	237.5 ± 16.49	280.4 ± 15.74	233.7 ± 23.08	231.8 ± 8.74

The data are presented as the mean ± standard error. Letters indicate significant differences between cultivars, determined by one-way ANOVA and the Tukey's multiple comparison test at a 95% confidence interval.

The bunch compactness (density) is a key morphological parameter influencing yield and grape quality. Compact clusters favour pathogen development, reduce air circulation, and limit sun exposure of inner berries, potentially leading to heterogeneous ripeness (Tello & Ibáñez, 2014). Multivariate analyses combining classical phenotyping and 3D scanning in 116 genotypes (Meneses et al., 2025) identified ‘berries per bunch’, berry weight and width’, and ‘bunch weight and length’ as primary descriptors of compactness. In our study, OIV descriptor No. 204 (2021) has confirmed dense to very dense clusters in all cultivars except Morava, which formed loose bunches.

The bunch length ranged from 13.3 cm (Morava) to 17.1 cm (Cabernet Cortis), while the width varied from 10.1cm to 13.1cm, with significant differences among cultivars. According to OIV descriptor No. 208 (2021), Cabernet Cortis, Muscaris, and Bronner had cylindrical clusters, whereas Prior and Morava showed conical and funnel-shaped forms.

The stem mass differed markedly from 5.4 g in Morava to 12.5 g in Muscaris, reflecting genotypic variation in rachis development. The cultivars were thus divided into those with lighter rachises (Morava, Prior, Cabernet Cortis) and heavier ones (Bronner, Muscaris). Similar genotype-related differences were reported by Souza et al. (2021).

The berry number per bunch ranged from 131 (Prior) to 189 (Cabernet Cortis), largely reflecting differences in berry set and contributing to cluster density. Despite the highest berry number, Cabernet Cortis maintained a moderate bunch mass due to smaller berries relative to Muscaris and Bronner. The berry mass per bunch followed similar trends, with the highest values in

Muscaris (280.4 g) and lowest in Prior (231.8 g). Overall, the results underline clear varietal differentiation in cluster architecture, shaped by genetic background and adaptation to local environmental conditions.

Physical characteristics of berries

In terms of physical characteristics of berries, clear varietal differences were observed (Table 2), with statistically significant differences among the cultivars for all evaluated traits.

Tab. 2 - Characteristics of the berries of the interspecific hybrids under study

Cultivar	Bronner	Morava	Muscaris	Cabernet cortis	Prior
Mass of 10 berries (g)	16.74 ± 0.83^{bc}	20.89 ± 0.56^{a}	19.27 ± 0.54^{ab}	15.33 ± 0.76^{c}	20.21 ± 0.63^{a}
Average berry length (mm)	13.28 ± 0.28^{bc}	13.38 ± 0.16^{bc}	14.08 ± 0.25^{ab}	12.85 ± 0.25^{c}	14.72 ± 0.18^{a}
Average berry width (mm)	13.04 ± 0.26^{b}	14.08 ± 0.16^{a}	13.2 ± 0.31^{ab}	11.95 ± 0.23^{c}	14.10 ± 0.15^{a}
Berry length/ width ratio	1.02 ± 0.01^{b}	0.95 ± 0.01^{c}	1.06 ± 0.01^{a}	1.07 ± 0.00^{a}	1.04 ± 0.01^{ab}
Skin mass of 10 berries (g)	2.18 ± 0.09^{c}	2.28 ± 0.08^{c}	3.17 ± 0.18^{ab}	2.65 ± 0.13^{bc}	3.37 ± 0.14^{a}
Seed mass of 10 berries (g)	1.14 ± 0.08^{a}	1.29 ± 0.04^{a}	1.18 ± 0.05^{a}	0.89 ± 0.05^{b}	1.09 ± 0.05^{ab}
Number of seeds/ 10 berries	29.1 ± 1.33^{a}	27.1 ± 1.14^{a}	25.8 ± 1.3^{a}	19.2 ± 0.84^{b}	16.5 ± 0.95^{b}
Flesh mass of 10 berries (g)	13.42 ± 0.7^{c}	17.32 ± 0.5^{a}	14.93 ± 0.4bc	11.14 ± 0.47^{d}	15.75 ± 0.59^{ab}

The data are presented as the mean ± standard error. Letters indicate significant differences between cultivars, determined by one-way ANOVA and the Tukey's multiple comparison test at a 95% confidence interval.

The average mass of ten berries differed markedly among cultivars, ranging from 15.33 g to 20.89 g, reflecting inherent genotypic differences in berry size potential. Morava and Prior exhibited the heaviest berries, whereas Cabernet Cortis had the lowest berry mass, consistent with its overall smaller berry size. When compared with previous research on white interspecific hybrids grown in the Banja Luka area (Jovanović-Cvetković et al., 2022), all three cultivars (Muscaris, Bronner, and Morava) displayed lower berry mass than in the present study, confirming a strong seasonal influence on this parameter.

Berry dimensions also varied among cultivars. The berry length ranged from 12.85 mm (Cabernet Cortis) to 14.72 mm (Prior), while the width ranged from 11.95 mm to 14.10 mm, showing moderate variability. The length-to-width ratio (0.94–1.07) indicated that most cultivars produced nearly spherical berries, except for Cabernet Cortis, which tended toward a slightly elongated shape.

Regarding internal tissue composition, the skin mass of ten berries ranged from 2.18 g in Bronner to 3.37 g in Prior, illustrating clear cultivar-specific differences in skin thickness. The seed mass ranged from 0.89 g (Cabernet Cortis) to 1.29 g (Morava), while the average number of seeds per berry was highest in Bronner (2.9) and lowest in Prior (1.6). These differences likely reflect both genetic traits and variation in pollination efficiency. Similar patterns were reported by Kowalczyk et al. (2022), who documented substantial variation in the seed number among interspecific hybrids (1.6 in Regent to 3.9 in Solaris), with strong correlations between the berry weight and seed count.

The flesh mass of ten berries followed the same trend as total berries, with the highest values in Morava (17.3 g) and Prior (15.8 g), and the lowest in Cabernet Cortis (11.1 g). As expected, flesh represented the dominant component of berry weight, typically exceeding 80% in all cultivars. Overall, these results highlight pronounced varietal differences in berry morphology and structure. As noted by Mello et al. (2015), the final berry size and composition at harvest reflect the combined effects of genetic, environmental, and agronomic factors, which ultimately influence wine characteristics.

Structural characteristics of the bunches and berries

In Panel A (Figure 1), the berries constituted the dominant fraction of the total cluster mass in all cultivars, consistently exceeding 90%, whereas the stem (rachis) contributed only a minor proportion, typically between 4% and 7%. Although this distribution pattern is characteristic for most table and wine grape cultivars, statistically significant differences ($p < 0.05$) were recorded among the hybrids. Prior and Morava exhibited the lowest relative proportion of the stem mass, suggesting a more efficient fruit-bearing structure in which a greater proportion of assimilates is allocated to berry development rather than rachis growth. In contrast, Muscaris and Bronner displayed slightly higher rachis proportions, indicating more robust or structurally developed stems. Such differences are not merely morphological; they may influence bunch compactness, susceptibility to fungal infections, berry separation during processing, and even overall efficiency.

Panel B (Figure 2), which illustrates the internal composition of the berries, shows that the flesh fraction predominated in all cultivars, accounting for approximately 75–80% of the total berry mass. This was followed by the skin fraction (10–15%) and seeds (5–10%). While the general distribution of tissues aligned with patterns typical of wine and hybrid grape cultivars, significant inter-cultivar differences were detected. Bronner and Morava exhibited a comparatively smaller proportion of the skin tissue, which reflects thinner epidermal layers. Conversely, Cabernet Cortis, Muscaris, and Prior displayed a larger skin fraction, indicating thicker or more structurally developed skins - a finding fully consistent with the higher skin mass values previously recorded in Table 2.

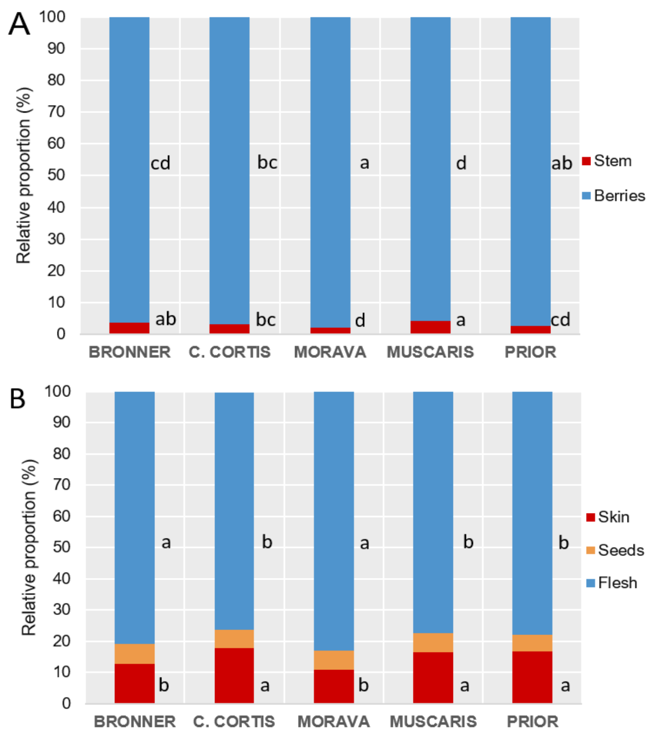

Fig. 2 - Relative proportion (%) of the stem and berries in the bunch (A) and relative proportion (%) of the skin, seeds, and flesh in the berry (B) for different table grape cultivars. Letters indicate significant differences between cultivars, determined by one-way ANOVA and the Tukey's multiple comparison test at a 95% confidence interval.

These differences in berry tissue distribution have important technological implications. Thicker skins, such as those observed in Cabernet Cortis and Prior, generally contain higher concentrations of anthocyanins, tannins, and other phenolic compounds, thus strongly influencing the colour intensity, antioxidant potential, and overall polyphenolic profile of must and wine. In contrast, cultivars with thinner skins may yield wines with lighter structure or different extraction kinetics during maceration. The seed proportion and mass may also affect bitterness and astringency, as seeds are known to be rich in tannins.

Overall, cultivar-specific variation in both cluster and berry composition provides valuable insights into the technological suitability and potential market value of these interspecific hybrids. Such differences determine not only the mechanical behaviour of the fruit during harvest and processing but also its oenological potential, shaping the sensory and chemical characteristics of the resulting wines.

Physicochemical characteristics of must

Marked differences were observed among cultivars in the main chemical parameters of the must (Table 3), with statistically significant differences for all analyzed traits.

Table 3 - Chemical properties of must of the interspecific hybrids under study

Cultivar	Bronner	Morava	Muscaris	Cabernet Cortis	Prior
TSS (%Brix)	21.15 ± 0.03[c]	19.7 ± 0.04[d]	23.42 ± 0.05[a]	22.17 ± 0.04[b]	21.22 ± 0.07[c]
TTA (g/l)	6.62 ± 0.02[d]	7.91 ± 0.02[a]	7.44 ± 0.01[c]	7.68 ± 0.03[b]	7.65 ± 0.03[b]
pH	3.14 ± 0.00[e]	3.17 ± 0.00[d]	3.34 ± 0.01[b]	3.2 ± 0.01[c]	3.51 ± 0.00[a]

The data are presented as the mean ± standard error. Letters indicate significant differences between cultivars, determined by one-way ANOVA and the Tukey's multiple comparison test at a 95% confidence interval.

The TSS content (sugar) ranged from 19.7 °Brix in Morava to 23.42 °Brix in Muscaris must. The highest sugar concentration recorded in Muscaris indicates a strong capacity for sugar accumulation under local climatic conditions, while Cabernet Cortis (22.2 °Brix) and Bronner (21.2 °Brix) also exhibited values typical of high-quality wine cultivars. The lower TSS observed in Morava suggests either insufficient maturity at harvest or an inherently lower capacity for sugar accumulation, which corresponds with its comparatively higher titratable acidity.

The total titratable acidity (TTA) ranged from 6.62 g/L in Bronner to 7.91 g/L in Morava, with intermediate values in the remaining cultivars. Muscaris and Cabernet Cortis, which had higher TSS values, also showed satisfactory acidity levels (7.44 g/L and 7.68 g/L, respectively). In general, moderate acidity levels indicate balanced ripening and contribute to favourable sensory attributes. Must pH values ranged from 3.14 in Bronner to 3.51 in Prior, with significant differences observed among the cultivars.

Findings by other authors (Porro et al., 2019; Pedò et al., 2019) have similarly shown that Muscaris and Cabernet Cortis stand out with higher TSS levels compared with Bronner and Prior, which is consistent with our observations. These studies also report TTA values ranging from 6.09 to 7.30 g/L and pH values between 3.08 and 3.38, aligning closely with the present results. Nadulski et al. (2025) likewise noted that Muscaris had the highest TSS content-exceeding 22 °Brix, among several tested hybrid cultivars (e.g., Seyval Blanc, Regent, Hibernal). Analyses of Morava performed by Korać et al. (2009)

and Ivanišević et al. (2022) showed TSS values near 20.5 °Brix and acidity between 6.77 and 8.8 g/L, which is in accordance with the values obtained in this study.

Phenolic content of must/ wine

The total phenolic content (TPC) varied significantly among cultivars (Figure 3) and sample types (the Kruskal–Wallis test, $p < 0.001$), indicating pronounced genotypic and processing effects on total phenolic content.

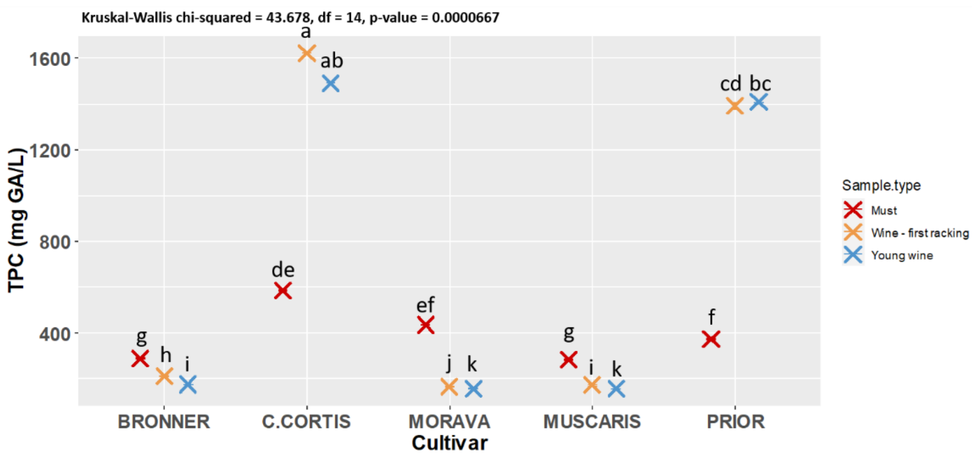

Fig. 3 - The total phenolic content (TPC; mg of gallic acid (GAE)/L) in must, wine sampled after the first racking, and in young wine. Letters indicate significant differences between cultivars, determined by the Kruskal-Wallis test and multiple comparisons (the Dunn's test), with the Holm's correction for p-values.

The content of total phenols across the examined stages, from the pre-fermentative phase (must) to the final young wine, followed the expected oenological pattern. In red varieties, the total phenolic content increases markedly during fermentation, reaching its maximum as a result of the extraction and diffusion of anthocyanins and other phenolics from the berry skins, followed by a decrease after pressing and racking (Kennedy, 2008). In contrast, white wines inherently contain lower levels of phenolic compounds due to the absence of anthocyanins in white grape skins and the reduced maceration time typically applied during white wine production. These differences reflect a distinct natural chemical composition of red and white cultivars. As noted by Clarke et al. (2023), in white winemaking the pre-fermentative phase, especially the pressing process, is crucial for determining final polyphenolic content. The pressing method (destemming and crushing vs. direct pressing), the type of press, and the pressure applied all influence the extraction of phenolics, while subsequent production steps further modify their concentration and composition. In the present study, the highest total phenolic content (TPC) values were recorded in the red cultivars, Cabernet Cortis and Prior, particularly in samples collected after the first racking (1621.50 and 1408.48 mg GAE/L, respectively). As expected, TPC values in the white cultivars were considerably lower, ranging from 156.45 to 177.17 mg GAE/L. These findings are consistent with previous studies by Kapusta et al. (2018) and Pachnowska et al. (2025), which also reported significantly higher phenolic concentrations in red wines compared with white wines produced from interspecific hybrids. The cluster analysis presented in the heatmap (Figure 4), based on the averaged physical and chemical parameters of the cultivars under study, revealed distinct grouping patterns that reflect similarities in their morphological characteristics, must quality, and phenolic profiles.

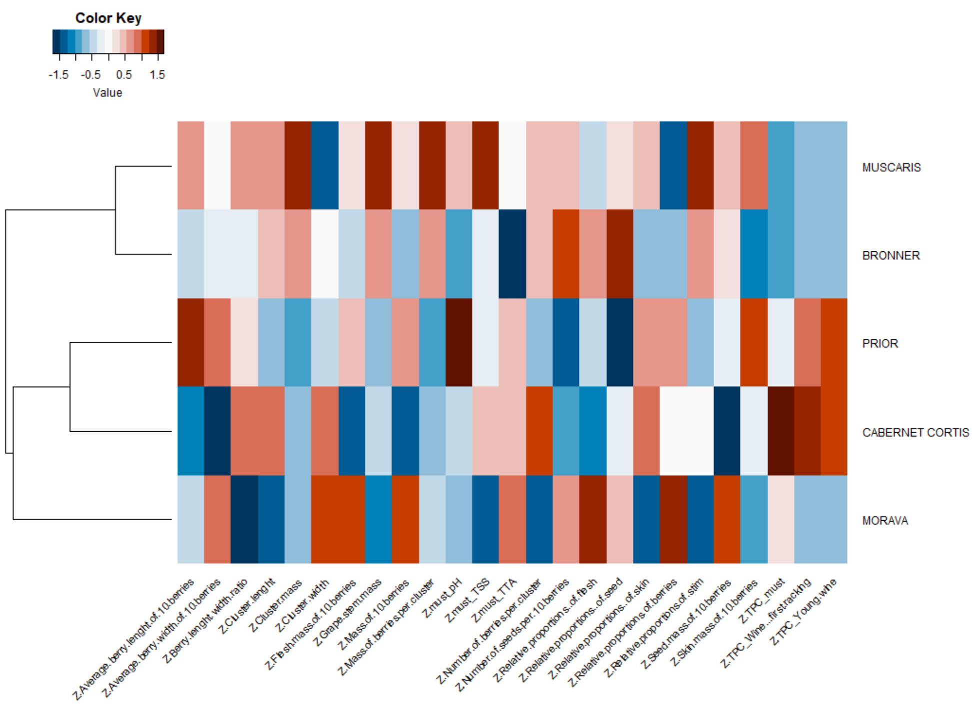

Fig. 4 - The heatmap shows standardized data for qualitative parameters of the bunch and berries across different grape cultivars and for chemical parameters of their must and wine. The data was scaled by row, and clustering was performed using the Ward's method, based on the Euclidean squared distance. The colour palette highlights higher (red) and lower (blue) values

Varieties with a higher cluster mass and berry mass per cluster, such as Muscaris and Bronner, group together, whereas varieties with lower values for these parameters, such as Prior, Cabernet Cortis, and Morava, form separate clusters. Muscaris and Bronner are characterized by longer and narrower clusters with medium-sized berries. In contrast, Prior stands out with the largest berries among all varieties but has the lowest berry mass per cluster. The relative proportions of berry components, i.e., -skin, seeds, and flesh also contribute to clustering. Prior, with a lower seed proportion, is clearly distinct from Morava, which has a higher flesh proportion. Meanwhile, Bronner stands out for having the highest number of seeds per berry. In addition to morphological traits, chemical parameters of must and wine play a significant role in grouping. The high total phenolic content (TPC) in Cabernet Cortis distinctly separates it from other varieties, while varieties with lower TPC, such as Bronner and Muscaris, show greater similarity. The TSS, TTA and pH further influence variety classification. Varieties with higher TSS and pH, such as Muscaris, differentiate from those with higher TTA, including Prior, Cabernet Cortis, and Morava. Notably, Bronner has had the lowest TTA in must.

Conclusion

The results of this study indicate that all evaluated interspecific hybrid cultivars produced grapes of satisfactory quality, which is largely attributable to their favourable morphological traits and balanced physicochemical properties observed during the study year. These findings confirm good adaptability of the examined cultivars to the ecological conditions of the Banja Luka viticultural area.

Given the increasing importance of disease-tolerant and climate-resilient grapevine hybrids, further research should focus on a broader set of agrotechnological characteristics, including multi-year evaluations and trials in additional growing regions. Such studies would provide a more comprehensive understanding of the production potential, technological behaviour, and oenological suitability of these cultivars under diverse environmental conditions.

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Квалитет грожђа интерспециес хибрида у региону Бање Луке: морфолошке особине грозда и физичкохемијска својства шире

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Сажетак

Примарни циљ овог истраживања био је да се оцијене морфолошке карактеристике гроздова и бобица, као и физичкохемијска својства шире, код пет интерспециес хибрида винове лозе гајених на подручју Бање Луке: Bronner, Morava и Muscaris (бијеле сорте), те Cabernet Cortis и Prior (црвене сорте). Морфолошка карактеризација спроведена је према методи Простосердева. Процена квалитета шире обухватила је мјерења укупне растворљиве материје (°Brix), укупне титрибилне киселости (g/L) и pH вриједности према стандардним OIV (2024) методама. Укупни садржај фенола (TPC) одређен је према методи Mazza et al. (1999). Највећу масу грозда и највиши садржај шећера показале су сорте Cabernet Cortis и Muscaris. Највећа просјечна маса десет бобица забиљежена је код сорте Morava (20,89 g), док је најнижу имала сорта Cabernet Cortis (15,33 g). Укупне титрибилне киселине и pH вриједност шире били су у границама задовољавајућих енолошких параметара, изузев сорте Prior, која је имала нешто вишу pH вриједност. Евалуација фенолних једињења кроз фазе производње вина (шира → вино након првог претока → младо вино) одвијала се у складу са очекиваним трендовима код црвених и бијелих сорти. Највиши садржај укупних фенола утврђен је у младом вину сорте Cabernet Cortis (1490,20 mg GAE/L), док је најнижи забиљежен код сорте Muscaris (156,3 mg GAE/L). У цјелини, све испитиване сорте показале су задовољавајући квалитет грожђа на основу морфолошких и физичкохемијских параметара.

Кључне ријечи: интерспециес хибрид, грожђе, морфологија, физичкохемијска својства

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