PROSPECTION AND GENETIC IDENTIFICATION OF GRAPE CULTIVARS FROM

OLD SERBIAN VINEYARDS

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INTRODUCTION

Serbia is located in the Central Balkans, a region acknowledged for a long-standing viticulture tradition. In fact, archaeological findings and other pieces of evidence indicate that viticulture and winemaking practices in Serbia can be traced back to the Iron and Bronze Ages (Burić, 1972). As in other countries of the Western Balkans, modern Serbian wine production relies on the cultivation of a few well-recognized international grape varieties together with some local varieties, such as 'Prokupac', 'Smederevka' (syn. 'Dimyat'), 'Plovdina' (syn. 'Pamid'), or 'Tamjanika Crna' (Bešlic *et al.*, 2012). Nevertheless, other local grape cultivars can be found across Serbia, sometimes grown by small winemakers in specific regions of the country, or in remote locations at the

edge of disappearance. Studies in neighbouring countries have highlighted the relevance of studing these endangered genetic resources to reveal how national genetic pools were formed, as well as to provide useful information on the historical development of viticulture in the Balkans (Maraš et al., 2021; Žulj Mihaljević et al., 2015). Here, we report the first results on the genetic identification of 163 samples collected from cultivated grapevines in old vineyards from different viticulture regions of Serbia. To our knowledge, this is the largest prospection of local grape cultivars performed in the country so far.

MATERIAL AND METHODS

Prospection in old Serbian vineyards

CULTIVAR IDENTIFICATION

Sampling leaves of 163 grapevines

gDNA extraction, purification & quantification

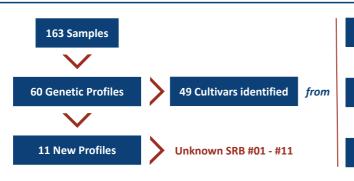
Genetic profiling 7 SSRs + 48 SNPs Comparison with VIVC and ICVV databases

Cultivar Identification

Genetic Relationships



RESULTS AND DISCUSSION



SSR and SNP analyses produced up to **60 different genetic profiles**. After pairwise comparison with those stored in the VIVC (Maul and Röckel, 2022) and the ICVV databases, **49 grapevine cultivars** were identified. The most common one was 'Prokupac' (31 times), followed by 'Pamid' (29 times), and 'Braghina Rosie' (15 times). We also found some cultivars from Near East regions (like 'Chaouch Blanc', or 'Parmak Cerven'), and others of Western Europe (like 'Pinot Noir', or 'Semillon'). In addition, **11 new genetic profiles** were found.

Western Europe
Ferdinand de Lesseps (VIVC: 4088), Knipperle (6312),
Muscat Fleur D'Oranger (8221), Muscat Hamburg (8226),
Pinot (9279), Semillon (11480), Villard Blanc (13081).

Balkan Peninsula

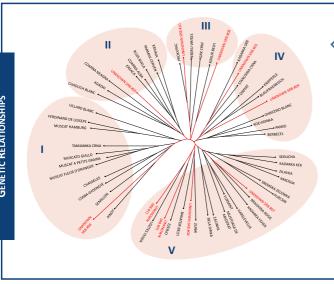
(1644), Tamjanika Crna (8057), Dimyat (5716); Ruza Bijela (10419), Zacinak (13400), Coarna Alba (2724), Sremska Zelenika (15934), Bela Dinka (16848), Berbecel (1148), Coarna Neagra (2726), Grk Cerni (2067), Kadarka SRB (24623), Kreaca (6501), Krivaja (24929), Krkosija (16850), Mustoasa de Maderat (8311), Seducha (10855) ...

Prokupac (VIVC: 9734), Pamid (8899); Braghina Rosie

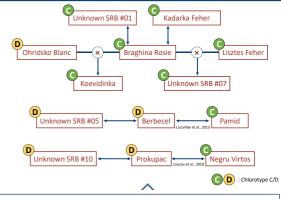
Near East regions

Agadai (VIVC: 95), Chaouch Blanc (10196), Parmak Cerven (8945).

Thus, the current Serbian grapevine genetic pool includes a series of indigenous cultivars of local origin, and some exogenous cultivars from different regions that were introduced into Serbia for different purposes. Interestingly, identification results revealed that the variety known in Serbia as 'Jagoda' corresponds to the interspecific hybrid 'Ferdinand de Lesseps'. Thus, the name 'Jagoda' might be considered as a new synonym of 'Ferdinand de Lesseps'.



Phylogenetic analysis on the basis of evolutionary dissimilarities between the 60 genetic profiles identified in old Serbian vineyards, based on 48 SNPs and 7 SSRs. Genetic profiles arranged in five groups, which clustered from just 6 genotypes to 21. All groups included identified and non-identified (red font) genetic profiles. Interestingly, all the Muscatrelated varieties identified in this work grouped in one cluster (Cluster I), including the local muscat cultivar 'Tamjanika Crna'.



First-order genetic relationships (trios and duos) detected between the grapevine genetic profiles identified in old Serbian vineyards, based on 48 SNPs and 7 SSRs. Our results suggest a relevant role for the female cultivar 'Braghina Rosie' for shaping local grapevine cultivars, which aided to spread the chlorotype C in the country. We identified the full pedigree for the Hungarian cultivar 'Koevidinka' ('Braghina Rosie' × 'Ohridsko Blanc'), and for a non-identified Serbian genetic profile (Unknown SRB #07 = 'Braghina Rosie' × 'Lisztes Feher'). Likewise, several new duos were found, some of them between a local cultivar and a non-identified genetic profile. On the other hand, our results invalidated the pedigree proposed for 'Kadarka Feher' ('Bayator Belyi' × 'Kadarka'), as well as the parent-offspring relationship previously indicated between 'Lisztes Feher' and 'Kadarka Kek'.

FUTURE WORK

- The 60 non-redundant genetic profiles obtained will be genotyped with an additional set of 192 SNP markers to deepen in their genetic diversity and parentage relationships.
- The Serbian genetic profiles identified in this work will be studied with those from other Balkan countries and other viticulture regions, to analyze their genetic structure in a wider context.
- In parallel, we are working on the genetic analysis of more than 100 grapevine samples from an herbarium found in the Serbian town of Sremski Karlovci, dated between 1812 and 1824. The comparative analyses of the results obtained in both works will be useful to evaluate how the local varietal assortment changed in the last 200 years.

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