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NATIVE OR MIGRANT? CIRCULATION OF GRAPE VARIETIES IN THE MEDITERRANEAN BASIN

Abstract: An intense movement of varieties along the routes of population's migrations (settlers, traders, pilgrims, sailors and soldiers) took place since the olden times for *Vitis vinifera*, one of the most ancient European crop. Recently, the enhancement of varietal identification through DNA markers by genetic profile comparison, lead to the discovery of often unexpected synonyms even in distant regions, thus contributing to gain insight into grape variety circulation in the past. Yet, new questions arise on the movement routes and direction of some ancient grapes, questioning their likely native sites and origin.

Although varieties movement took place also inland (along the Balkan Peninsula, in Central Europe and across the Alps), most of the spreading of grape cultivars by human trades and migrations occurred in the Mediterranean Basin. Here some grape varieties show many synonyms (8–10 and even more), each of them used in a specific area where it was introduced and cultivated, often far from the other locations.

Between the two sides of Adriatic Sea, an intensive exchange of materials occurred from/to the Italian Peninsula and the western side of the Balkan area, indicating an intense trade activity in the past. Historical evidences, ampelographic information, pedigree reconstruction and genetic proximity of the involved grapes would all contribute to shed light on their migration events and/or their possible geographical origin.

Key words: *Vitis vinifera*, *authothonous*, *synonym*, *DNA markers*

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INTRODUCTION

Intense circulations of grape varieties occurred since the olden times involving all the European countries where viticulture developed. The varietal assortment of a certain region shows indeed a gradual, but continuous adjustment due to the rising of newly generated genotypes, the disappearing of others, but also the introduction of some others from abroad.

Grape varieties travelled along different routes together with humans: farmers settling in new areas, colonizers developing a new region, invader soldiers, religious pilgrims travelling across countries, traders and wine business owners, immigrant populations. This happened since thousand years ago, from the dawn of the European viticulture, to today, when we witness the spread of the international wine varieties (mainly traditional French cultivars) and newly bred table grapes. Leaving out the more recent events, we will focus in this work on grape variety migration occurred before the middle of 1900, i. e. before the emerging of modern viticulture.

Historical documents rarely report the precise event of a grape variety introduction into a new region. Therefore varietal movements are usually disclosed by the discovering of synonyms, different names for a single cultivar used in distinct places. Classical ampelography based on vine morphology established a great number of synonyms, especially through visual comparison of plants in field collections. Yet modern ampelography, by the use of reliable DNA typing and the comparison of genetic profiles, showed to be much more effective, leading to discover new and often unexpected identical genotypes even in distant regions [1, 2]. These findings paved the way to speculations on grape birthplaces and migrations. Questions arise on with whom, when, and in which directions grapes moved over.

Riesling Italico represents a significant example of an ancient “traveller” grape variety whose native location is still uncertain. Besides Italy, where it is cultivated on as much as 1,568 ha, and Spain — where as Borba blanca is present in a small spot [3], this variety is much popular and spread over Eastern Europe, especially in Austria (Welschriesling), Czech Republic (Rizling Vlašský), Hungary (Olasz Rizling), Slovenia (Laški Rizling), Romania (Rizling Italian), Croatia and Serbia (Graševina). The last country, with its 33,120 ha, leads the surface ranking [4], while the current total plantings in the Eastern European countries is around 40 times more than in Italy. Is Riesling Italico coming from Italy according to its name, or its origin has to be explored in the east of Europe?

This paper presents examples and considerations related to grape variety migrations and implications on their origin and history.

VARIETY MIGRATION ROUTES

A great amount of synonyms were disclosed on the two sides of Western Alps, between France, Switzerland and Piedmont (Table 1). This involves ancient cultivars, often minor or nearly threatened today. Their intense movement across the mountains show how the Alps in the past, the contrary to how they are perceived today, were not an insurmountable barrier for trade and cultural exchanges.

Table 1. Grapevine synonyms uncovered on the two sides of Western Alps (data from Schneider et al. [5] + further findings)

France/Switzerland	Italy
Bondola	Bundula
Chatus	Neiret/Brunetta
Gamay	Carcairone nero
Gouais blanc	Liseiret/Preveiral
Grec rouge	Grisa rossa
Hibou blanc	Carcairone bianco
Hibou noir	Avanà
Humagne rouge	Cornallin
Persan	Becuét
Rouge précoce	Bibiola
Verdesse	Bian ver

Even though land routes were important in the spreading of grape varieties in internal regions, the Mediterranean Basin played the main role in *Vitis* circulation, like a sort of highway of the olden times. Yet, before the development of motorboats, journeys were done by short legs, sailing along the coasts with many stop-overs, thus disseminating goods, products (and plant varieties) along the way. From this point of view, the Balkan and the Italian peninsulas have certainly had many opportunities for material exchange because of their great extent of coasts and of many sheltered ports.

A prime example of a seafarer grape variety is indeed Malvasia di Lipari: revealing its numerous synonyms, Crespan and collaborators [6] outlined the migrant character of this historical Malvasia, that limited its presence in the surroundings of the ports scattered along the ancient sailing routes from Eastern Mediterranean Sea to Atlantic Ocean (Fig. 1).

Another persisting sea traveller is the cultivar Tremani from Calabria (alias Agresta from Apulia), corresponding to the historical Trifera (= Bearing three times) described and beautifully depicted in the *Pomona Italiana* by Giorgio Gallesio [7]. Comparing the genetic profiles of this grape with other



Figure 1. The distribution of Malvasia di Lipari and its synonyms along ancient sailing routes from the Eastern Mediterranean Sea to the Atlantic Ocean

published profiles, we found out that it corresponded: a) in Greece to Heptakilo [8, 9]; b) in the Aeolian Islands to Trummana [10]; c) in Sardinia to Axina de tres bias [11]; d) in Tunisia to Boukhasla [12] and e) in Albania likely to Serina e zezë [13], different from the Serine e zeze by other authors. Moreover, Axina de tres bias was also identified in an unnamed accession from Malta [14], while we detected the same SSR pattern in a further unknown genotype examined in Palestine [15]. Tremani-Heptakilo is indeed an ancient cultivar spread all over Central and Eastern Mediterranean Basin, giving birth according to *Vitis* International Variety Catalogue [16] to several reputed traditional grapes among which notably Muscat of Alexandria.

Besides the well-known trio Primitivo-Crljenak-Kratošija, further synonyms were also uncovered on the two sides of the Adriatic Sea, linking Italian and Balkan Peninsula. Comparing molecular profiles of traditional grape cultivars from Apulia (South Eastern Italy) with published data, matching genotypes were discovered for Bombino bianco, Francavidda, Bianco d'Alessano, Baresana, Verdeca, Sgarraparete, Maresco either in other Italian regions or along the Balkan Adriatic coasts, notably in Slovenia, Croatia, Bosnia-Herzegovina, Montenegro, Greece (Table 2) ([17] and CNR-IPSP unpublished database).

Since most of these names are historically mentioned in the different regions, questions arise on who was responsible of their movement, when that happened and which was the site of origin (i. e. the native place) of each grape. In this specific example, intense exchange of materials could have taken place during the economic and political supremacy of the maritime Republic of Venice. From Middle ages to Renaissance, Venice developed an

Table 2. Synonyms of typical grape varieties from Apulia in other Italian and Balkan regions

Names in Apulia	Synonyms in other Italian regions	Synonyms in the Balkans
Baresana	Cessalà (Sicily)	Korithi lefko (Greece)
Bianco d'Alessano	Iuvarello (Calabria)	Topol, Beretinjok (Croatia)
Bombino bianco	Pagadebit (Emilia Romagna)	Trevolina (Slovenia)
	Passerina (Abruzzo, Molise)	Debit (Croatia)
Francavidda		Podbil (Bosnia-Herzegovina)
		Zlatarica vrgorska (Croatia)
Maruggio (Maresco)		Bratkovina bijela, Stradunska (Croatia)
		Popetre (Slovenia)
Santa Teresa		Frmentun (Croatia)
Sgarraparete		Japudžac (Montenegro)
		Karystino (Greece)
Verdeca	Nocellara (Calabria)	Lagorthi (Greece)
	Pampanuto (Apulia)	

extensive marine trade network above all in Central and Eastern Mediterranean between Europe, Africa and Asia, achieving territorial conquests along the Adriatic Sea, notably in Istria, Dalmatia (Zara and Dubrovnik), Apulia, Albania, Montenegro (Kotor), and Ionian Islands.

Some even claim grape introduction dates back to the time of the Greek colonies in Southern Italy (*Magna Graecia*) in VII–VI century B. C., although such a long life is unlikely for grape varieties.

VARIETY GEOGRAPHIC ORIGIN

How to solve the problem of the original homeland of these obstinate travellers? Besides historical documents, essential but often scarce or of ambiguous explanation, genetics could offer reliable proof about ancient variety pedigree and lineage, thus indirectly revealing their likely place of birth, often debated for long times. This has been the case of Blauer Portugieser, believed being introduced in Austria from Oporto (from which its name) in late 1700. Genetics identified in the ancient, endangered variety from Lower Styria Blauer Zimmettraube the partner of Sylvaner in giving rise to Blauer Portugieser, therefore suggesting its likely native region [18].

Not always, however, the “missing link” in a parentage or lineage is revealed. Often it remains hidden into the large quantity of local, endangered genetic resources unexplored, or it could be simply extinct, so that the clear evidence of a pedigree remains unsolved for long time.

The geographic origin of the renowned “Adriatic” grape Bombino bianco, alias Trevolina or Puljižanac, is presently unknown. Bombino bianco is a prolific variety indeed, giving rise to Ruževina, Nincuša and Kurtelaška in Dalmatia [9], and to Moscatello selvatico, Impigno [19], Uva di Troia and Bombino nero [20] in Apulia. It is also genetically related to other varieties from both side of the Adriatic Sea, being therefore an ancient “great genitor” in this area, whose true origin is still missed.

Yet this does not prevent us from unveiling hidden issues in the future. These studies progress step by step, suddenly advancing when a key information goes into the right place, like the piece of a jigsaw puzzle to which many researchers contribute. This is the case of Zinfandel-Primitivo-Crljenak-Tribidrag-Kratošija: the 50 years effort of scientists from different countries and fields depicted the exciting story of migrations and success of one of the most fascinating winegrape variety from the Balkan-Adriatic area. One of the steps in these achievements is shown in Figure 2.



Figure 2. Typing of DNA extracted from the herbarium by S. Bulić, allowed Malenica and collaborators [21] to demonstrate the current Crljenak K. was truly the ancient Tribidrag quoted since 1500

Yet the history of many ancient grapes remains enigmatic. *Malvasia bianca lunga* alias *Malvasia del Chianti* corresponds in the Balkans to *Maraština*, *Rukatac* and *Pavlos*. In Italy, where it is widely spread since long times from north to south, is also called *Menuetta*, *Malvasia trevigiana*, *Tundulillu*, *Fresia* or simply *Malvasia bianca* (White *Malvasia*) in the southern regions. It is genetically linked to many Italian varieties, and is the true parent of *Vitouska* [22] and *Malvasia nera di Lecce* [23], originated in different and distant

areas. From where this Malvasia does come and which are the likely directions of her journeys?

An even more enigmatic story is the one of Quagliano, grown in a small spot in Piedmont (Northwestern Italy), but also present as Bouteillan in Southern France [24]. Years ago we noticed for this variety an unexpected genetic affinity with grapes from Apulia. Then, we found Quagliano shows the same genetic profile of the accession Arciprete analysed by Nuzzo and collaborators [25] in Basilicata (Southern Italy). It was recently demonstrated that several Apulian cultivars (Bombino nero, Impigno and Uva di Troia) are Quagliano-Bouteillan's offsprings [20]. But at the same time, Bouteillan or its further synonyms in Midi France are genetically linked to other typical varieties from that area [9]. Therefore, did this variety travel from Southern Italy (*Magna Graecia?*) to the Mediterranean French coast, or did it take the opposite nomadic direction?

CONCLUSIONS

The great number of synonyms detected even in distant regions by comparison of DNA patterns, increases evidences on *Vinifera* cultivars migrations, intensely occurred in the Mediterranean Basin. Nomadic movements of varieties make it more difficult to shed light on their geographic origins and history. It is again "molecular ampelography" that contributes to unveil variety native events, proving their parentage and/or kinship. The knowledge process in this field proceeds on a step by step way, where scientist contribution and cooperation provide different pieces of a jigsaw puzzle, not important themselves but highly meaningful when combined together. On this respect marginal areas poorly explored for their local genetic resources as well as today minor, threatened, nearly extinct grape varieties could play a relevant role in profiling the complex outline of viticulture history and varietal assortment evolution.

The relevance of such information does not only concerns breeders and scientists on viticulture, grapevine genetics and genomics. It is also increasing under a wine marketing perception, since consumers are more and more culturally attracted by the stories behind varieties, and their links with specific *terroirs* of wine production. Indeed, grape varieties acquire an even stronger cultural value, besides their huge biological and scientific significance.

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DOMAĆA SORTA ILI MIGRANT? CIRKULACIJA SORTI VINOVE LOZE U MEDITERANSKOM BAZENU

Sažetak

Intenzivno kretanje putevima migracije stanovništva (naseljenici, trgovci, hodočasnici, pomorci i vojnici) odvijalo se od davnina za *Vitis vinifera* vrstu, jednu od najstarijih evropskih kultura. Nedavno je poboljšanje identifikacije sorti putem DNK markera, poređenjem genetskih profila, dovelo do otkrića često neočekivanih sinonima čak i u udaljenim regijama, doprinoseći time uvid u migracije sorte vinove loze u prošlosti. Ipak, pojavljuju se nova pitanja o putevima kretanja i pravcu nekih drevnih sorti vinove loze, otvarajući pitanje njihovog vjerovatnog porijekla i postojbine.

Iako se kretanje sorti odvijalo i u unutrašnjosti (duž Balkanskog poluostrva, u centralnoj Evropi i preko Alpa), najveći dio širenja sorti vinove loze, putem trgovine i migracijama, dogodio se u mediteranskom bazenu. Ovdje neke sorte vinove loze pokazuju mnogo sinonima (8–10, pa čak i više), od kojih se svaki upotrebljava na određenom području gdje je uvedena i kultivisana određena sorta, a koji je često jako daleko od drugih lokacija na kojima se sorta gaji.

Između dvije strane Jadranskog mora, intenzivna razmjena materijala se odvijala od i do Italijanskog poluostrva i zapadne strane Balkana, što ukazuje na intenzivnu trgovinsku aktivnost u prošlosti. Istorijski dokazi, ampelografske informacije, rekonstrukcija pedigreea i genetska blizina uključenih sorti doprinijeli bi rasvjetljavanju njihovih migracionih kretanja i/ili njihovog mogućeg geografskog porijekla.

Ključne riječi: *Vitis vinifera*, autohton, sinonim, DNA marker