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Detection of grapevine synonyms in Lombardy and Piedmont regions (northern Italy)

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Summary

The Italian viticulture is characterized by a high number of autochthonous varieties (about 1700), some of them renowned throughout the Country, some other only of local importance. Nevertheless, the real estimation of this biodiversity is made difficult due to the great amount of synonyms, homonyms and misnomers. The aim of this work was to undertake a comparison for varietal identity of minor, lesser cultivars in two field collections of neighboring regions (Lombardy and Piedmont) located in northern Italy, verifying synonyms in different areas. Forty-seven accessions were described by morphological (OIV descriptors) and genetic (microsatellites) characteristics. Thirty-eight varieties were identified belonging to three categories: varieties of great importance in Italy and locally misnamed, varieties important in the region of Piedmont and misnamed in Lombardy, and currently minor grapes but of historical significance in both Piedmont and Lombardy regions.

Key words: autochthonous; identification; SSR; *Vitis vinifera*.

Introduction

Richness in grape varieties is an undeniable opportunity for the Italian viticulture, but it is also a source of errors in naming and identifying cultivars. An estimate of this richness in terms of number of distinct Italian cultivars is a long term objective. Although certainly incomplete, an estimate is nevertheless possible thanks to the recent upload of passport data of many cultivars in on-line databases. From one of the most complete and up to date (IVVC: www.vivc.de), it has been possible to estimate that the size of Italian grape germplasm is about 1750 varieties, referring only to *V. vinifera* subsp. *sativa* (SCHNEIDER and RAIMONDI 2014). Although constantly subject to genetic erosion, this number likely underestimates the total amount of varieties (major and lesser cultivated) actually present in the country. Viticulture was in fact spread almost all over the Italian Peninsula, so that in the only Piedmont, one of the 20 Italian regions, hundreds grape varieties almost disappeared were recovered in the last few decades. In addition, the presence of many synonyms makes it difficult to estimate correctly the grapevine varietal diversity.

In the past years grapevine was widespread cultivated in Piedmont and Lombardy, two regions located in north-

west and north of the country, respectively. Also single rows of vines planted along the field edges were diffused. Since the second half of the 19th century, the two regions underwent a different evolution in grapevine landscape: Piedmont, almost entirely hilly or mountainous, showed a gradual reduction in grape acreage all over, maintaining everywhere at least a minimal presence of viticulture linked to traditional varieties, while, in Lombardy's widely spread lowland areas, grape cultivation disappeared, because of some areas (primarily the Brianza near Milan) have been heavily affected by urbanization due to industry growth. Otherwise, in the sites at the foot of the Alps, characterized by higher rainfall and, therefore, greater pressure of fungal pathogens, a severe reduction of viticulture along with local traditional varieties occurred. Nowadays, in Lombardy, one of the most industrially developed Italian regions, viticulture was maintained or even expanded only in few demarcated areas: Valtellina (Sondrio province), Franciacorta (Brescia province) and Oltrepò pavese (the hilly part of Pavia province). 'Nebbiolo' (locally 'Chiavennasca') and 'Pignola' are traditional varieties almost exclusively cultivated in the typical highland of Valtellina, while in Oltrepò pavese the dominant varieties are the autochthonous 'Barbera' and 'Croatina' for red wines and the foreign 'Pinot', 'Chardonnay' and 'Welschriesling' for white and sparkling wines. Likewise, in Franciacorta, where the most planted varieties are 'Chardonnay' and 'Pinot', the decline of local and traditional varieties occurred.

Since the 80s of the last century, the efforts of many contributors, achieved by Dipartimento di Scienze Agrarie ed Ambientali - Università di Milano, led to collect and preserve, in Lombardy, several grapevine accessions that represent valuable resources being found in very few specimens, as relics of a viticulture disappeared. The recovered accessions were propagated and planted in a specific collection in order to be described and preserved (SCIENZA *et al.* 1999). Further characterizations were carried out in the following years (ROSSONI *et al.* 2001). The aim of this study was to correctly identify the recovered grapevine accessions in Lombardy by the morphological and genetic point of view, ascertaining their synonymy with autochthonous varieties coming from neighboring regions, as Piedmont.

Material and Methods

Plant material: Forty-seven accessions from Lombardy, recovered in Oltrepò pavese and Brescia areas, and planted in the experimental germplasm collection of

University of Milano, located in Torrazza Coste (Pavia province, Lombardy) were taken into account (Tab. 1). 'Sangiovese' was included as reference variety.

Ampelographic description: Morphological description of shoot tip, leaves and bunches has been carried out during the growing season, following the 48 OIV

Table 1

List of the investigated grapevine accessions recovered in Lombardy and maintained in the field collection of University of Milano located in Torrazza Coste (Pavia province), their collecting site and historical references/recovery information

Accession name	Berry color	Collection site	Historical references/recovery information
Barberone	N	Oltrepò pavese	No reference. Single vine grown in an old vineyard.
Basgano (di Moline)	N	Oltrepò pavese, Zavattarello municipality, locality Le Moline	Basgano grape varieties were spread through all Oltrepò pavese in single vines as table grapes.
Basgano (di Oliva G.)	N	Oltrepò pavese, Oliva Gessi municipality	
Bianca Botticina	B	Brescia Province, Botticino municipality	Grapes locally grown in single vines in old vineyards locally named Bianca (White).
Bianca Egabana	B	Brescia Province, Botticino municipality	Grapes locally grown in single vines in old vineyards.
Bonarda	N	Oltrepò pavese	Bonarda is the local name of cv Croatina (local synonym).
Brugnera	N	Brescia province	Locally considered a synonym of cv Fortana
Ciliegiolo	N	Oltrepò pavese	No reference. Single vine collected in an old vineyard.
Colombaia bianca	B	Oltrepò pavese	No reference as Colombaia bianca. Locally Colombana bianca was cited in the end of 19 th century as seldom grown in one village.
Colombaia nera	N	Oltrepò pavese	No reference as Colombaia nera. Locally Colombana nera was cited in the end of 19 th century as grown in several villages of Oltrepò pavese.
Croà acino grande	N	Oltrepò pavese	Croà grapes were spread through all Oltrepò pavese until the end of 19 th century
Croà acino piccolo	N	Oltrepò pavese	
Croà rosso	N	Oltrepò pavese	
Croatina bianca	B	Oltrepò pavese	No reference. Single vine collected in an old vineyard.
Duragusa	N	Oltrepò pavese	No reference as Duragusa. Single vine collected in an old vineyard. Locally Duraguscia grapes was cited in the end of 19 th century as seldom grown in just one village of Oltrepò pavese.
Erbamat	B	Brescia province, Garda Lake district	Locally Albamate grapes were cited from the 16 th century. Now Erbammat is present as single vines in old vineyards.
Erbanno	N	Brescia province, Erbanno municipality	No reference. Grape variety locally grown in single vines in old vineyards.
Freisa	N	Oltrepò pavese	Freisa was cited in Lombardy by the end of 19 th century as grown in more than one village of Oltrepò pavese.
Freisa I	N	Oltrepò pavese	
Invernenga	B	Brescia province, Brescia municipality	Invernenga or Invernasca grapes are cited as spread in Brescia province from the end of 19 th century
Maiolina	N	Brescia province, Franciacorta district	No reference. Variety locally grown in single vines in old vineyards.
Malvasia	B	Brescia province	No reference. Single vine grown in an old vineyard.
Marzemino bianco	B	Brescia province	No reference. Single vine grown in an old vineyard.
Moradella	N	Oltrepò pavese	Moradella was the most frequently grown variety in Oltrepò pavese until the end of 19 th century.
Moradella (di Montalto)	N	Oltrepò pavese	
Moretto	N	Oltrepò pavese	Moretto, as known synonym of Lambrusca di Alessandria, was one of the most commonly grown varieties in Oltrepò pavese until the end of 19 th century.
Moretto I	N	Oltrepò pavese	
Moscato nero	N	Oltrepò pavese	Moscato nero was spread, even if fairly grown, through all Oltrepò pavese until the end of 19 th century.
Moscato rosa antico	N	Oltrepò pavese	No reference. Single vine grown in an old vineyard.
Negrara	N	Brescia province	No reference. Single vine grown in an old vineyard.
Nibiö	N	Oltrepò pavese	Locally considered a synonym of Dolcetto, Nibiö was one of the most frequently grown varieties in Oltrepò pavese until the end of 19 th century.
Pignola	N	Oltrepò pavese	Pignola grapes were cited in 16 th century as most commonly grown in Pavia province. The same was for Pignolo in late 19 th century
Pollini bianca	B	Oltrepò pavese	No reference. Single vine collected in an old vineyard.
Pulitana	Rg	Oltrepò pavese	Cited as grown in the village of Valenza (Alessandria province, Piedmont) in 19 th century.
Rossarone chiusa	N	Oltrepò pavese	Rossarone grapes were spread through all Oltrepò pavese until the end of 19 th century.
Rossarone gentile	N	Oltrepò pavese	
Rossarone grande	N	Oltrepò pavese	
Sangallina	N	Brescia province, Garda Lake district	No reference. Grapes locally grown in single vines in old vineyards.
Sebin	N	Brescia province, Franciacorta district	No reference. Grapes locally grown in single vines in old vineyards.
Uva bianca dura invernale	B	Oltrepò pavese	No reference. Single vine grown in an old vineyard.

Tab. 1 continued

Accession name	Berry color	Collection site	Historical references/recovery information
Uva Crova	N	Oltrepò pavese	Crova grapes were spread through all Oltrepò pavese until the end of 19 th century.
Uva della Cascina	N	Oltrepò pavese	No reference as Uva della Cascina. Single vine collected in an old vineyard. However, the grape variety Cassina was cited in late 19 th century as grown in just two villages of Oltrepò pavese.
Uva di Mornico	N	Oltrepò pavese, Mornico municipality	Locally considered a synonym of Ugone. The variety Ugone in late 19 th century was grown in three villages of Oltrepò pavese, including Mornico.
Uva di Nigazzo	N	Oltrepò pavese, Montalto pavese municipality	No reference. Single vine grown in an old vineyard (Cascina Nigazzo).
Uva dura antica	N	Oltrepò pavese	No reference. Single vine grown in an old vineyard.
Vermei	N	Oltrepò pavese	Vermei or Vermiglio grapes were one of the most spread grapes through all Oltrepò pavese until the end of 19 th century.
Vernassa	B	Oltrepò pavese	Vernasso, Vernassino and Vernassone were cited at the end of 19 th century as fairly grown in a small number of villages.

descriptors recommended by the European *Vitis* database characterization protocols (MAUL *et al.* 2012). Plant morphological traits were compared with the cultivars from the nearby regions maintained in the germplasm collection of Grinzane Cavour (Cuneo province, Piedmont), where varieties from north-western Italy are planted. A comparison of morphological traits from *in vivo* samples and published descriptions was also carried out.

Genotyping: In order to confirm identities assumed through morphological observations and to search for new identification, the microsatellite (SSR) profiles of 43 accessions (four synonyms established morphologically were excluded) were obtained and compared with those reported in SSR genetic databases. Genomic DNA was extracted by young leaves (1-2 cm in length) using the Qiagen DNeasy Plant Mini Kit (Qiagen – Courtaboeuf, France), starting to 20 mg of dry tissue. After DNA extraction, the samples were genotyped by 9 nuclear SSR loci, developed as common markers for international use (GrapeGen06 project: <http://www1.montpellier.inra.fr/grapegen06/technical/index.html>; THIS *et al.* 2004). The loci were amplified following the protocol suggested by THIS *et al.* (2004) and amplification products were solved on an ABI 3130 sequencer (Applied Biosystems, Foster City, Calif., USA). The results of the runs were then analyzed with GeneMapper 4.0 software (Applied Biosystems) and alleles were designated by their size in bp. The SSR profiles obtained, after allele size standardization using common true-to-type cultivars, were compared with those provided by the following public databases: the European *Vitis* Database (www.eu-vitis.de/index.php), the nuclear microsatellite Greek *Vitis* Database (gvd.biology.uoc.gr/gvd/), Pl@nt Grape (from France, plantgrape.plantnet-project.org), as well as the 775 unique *Vitis vinifera* subsp. *sativa* allelic patterns developed by the CNR - Institute of Sustainable Plant Protection (CNR-IPSP, unpublished data). Bibliographic sources presenting nuclear microsatellite profiles of traditional grapes from other Italian and European regions were also used for genetic data comparison. The comparison included from 6 to 9 SSR loci. After the identification process, the trueness-to-type of any accessions has been designated referring to the accession name (true name/misnomer/synonym) as established under GrapeGen06 project and adopted in the European *Vitis* Database (MAUL *et al.* 2012).

Results and Discussion

Morphological characterization based on 48 OIV descriptors of 47 accessions held in the Lombard collection (data not shown) allowed the identification of 38 accessions (Tab. 2). Molecular data, obtained by the amplification of 9 SSR loci, confirmed such varietal identifications and provided the identity of further five accessions by the comparison with SSR databases (Tab. 2). *Via* combination of morphology and SSR-marker data, 43 out of the 47 investigated accessions were identified, with four accessions remaining without any reference. The 47 accessions were found belonging to 29 grape varieties (Tab. 2).

More than half of the accession names can be likely considered true names (17 %) or correct synonyms (36 %), but the remaining are misnomers (32 %), homonyms (11 %) or confusing names (4 %).

It was possible to establish three groups of identified varieties. The first consisted of varieties that have an important role in Italy in regions different than Lombardy, and were likely introduced here essentially for their good quality and/or productivity ('Vermentino' and 'Trebiano toscano').

Other grapes, such as 'Freisa', 'Grignolino' and 'Erbaluce', were major varieties in the nearby region of Piedmont and their presence in Lombardy may be justified by different reasons. 'Grignolino', currently grown only in Monferrato (Alessandria and Asti provinces), was once widespread in a wider area including surrounding areas (DEMARIA and LEARDI 1875). 'Freisa' had a period of great expansion at the end of XIX century because of its advocated tolerance to fungal diseases. 'Erbaluce', currently fairly grown in northern Piedmont, was once highly widespread throughout the foothills of Piedmont and Lombardy, as demonstrated by its presence, although under other names, in north-eastern Lombardy.

A third group of identified varieties (such as 'Neretto duro', 'Moradella' and 'Ammacafferro') belong to minor varieties typical of south-eastern Piedmont and the nearby south-western Lombardy. As already mentioned for 'Grignolino', it should be emphasized that the extreme south-eastern area of Piedmont (Colli Tortonesi) was for several centuries an integral part of the territories subject to the Duchy of Milan, thus creating a unique district and

Table 2
Identification results and SSR profiles of the 47 investigated grapevine accessions from Lombardy

Accession name	Remarks to the Accession name ¹⁾	Identification by morphology/ fingerprint	Variety name ^{2),3)}	Other synonyms (misnomers in <i>italic</i>)	SSR profile																	
					VMD5	VMD7	VMD25	VMD27	VMD28	VMD32	VVS2	VZag62	VZag79									
Barberone	mis	+ / +	Grignolino N		225	245	247	255	241	257	180	188	260	260	241	265	133	135	194	204	250	258
Bianca Botticina	syn	+ / +	Trebbiano toscano B	Ugni blanc B (FRA139-EVDB)	225	231	249	253	243	257	178	182	246	250	251	273	133	143	194	200	244	250
Croatina Bianca	mis	+ / +		Greco (novarese)	225	227	247	253	243	269	178	184	246	270	241	253	145	151	194	200	242	254
Bianca Egabana	syn	+ / +	Erbaluce B		233	239	247	249	257	257	180	184	236	262	253	273	143	143	196	204	242	258
Bonarda	mis	+ / +	Uva delle Cascine																			
Uva della cascina	true	+ / +																				
Brugnara	syn	+ / +	Brugnara, Parmesana	<i>Barberone</i> , <i>Rossara (di Reggio Emilia)</i>	235	239	243	247	243	257	184	184	248	262	253	273	133	143	188	192	242	250
Cilioglio	mis	+ / +																				
Duragusa	syn	+ / +	Mornasca N; Ammaccaferro	<i>Barbacarlo</i> , Duragussa	225	227	239	247	243	251	180	180	236	238	251	273	133	151	194	204	250	258
Uva di Mornico	syn	+ / +																				
Colombaia nera	syn	+ / +	Neretto duro	Balau; Baiò; Uva d Galvan; <i>Dolcetto (di Boca)</i> ; <i>Freisone</i>	225	235	247	247	243	257	184	193	236	236	241	253	133	135	194	196	250	258
Moradella	mis	+ / +																				
Croà acino piccolo	hom	+ / +																				
Moradella (di Montalto)	true	+ / +	Moradella N	Vermeju	235	239	247	249	257	257	184	188	260	262	253	273	143	143	196	196	242	244
Uva dura antica	mis	+ / +																				
Croà rosso	hom	+ / -																				
Rossarone chiusa	syn	+ / +																				
Rossarone gentile	syn	+ / -	Rossarone; Crovato		225	239	247	253	241	257	184	184	238	260	253	263	135	139	192	204	242	242
Uva di Nigazzo	syn	+ / -																				
Vermei	hom	+ / +																				
Erbamat	syn	- / +	Verdealbara B; Erbamat B		231	245	243	253	257	259	180	188	260	260	241	263	135	143	188	200	238	250
Erbanno	syn	+ / +	Rossara N; Schiava N; Erbanno N	Bregiola; Varenzasca; Faraudin; Uvana	225	233	239	253	241	257	178	184	246	248	251	273	133	143	194	196	236	250
Freisa	true	+ / +																				
Freisa I	true	+ / +	Freisa N	Munfrin-na; Spanin	225	231	247	249	241	243	184	188	246	270	241	273	133	155	194	200	250	250
Pignola	mis	+ / +																				
Invernenga	true	+ / +	Invernenga B	Uva rugra	225	233	239	243	257	257	182	188	236	260	259	273	135	147	188	194	242	246
Uva bianca dura invernale	syn	+ / +																				
Maiolina	true	- / +	Maiolina N		225	231	247	253	257	259	180	184	230	246	263	273	135	155	194	194	250	258
Sangallina	syn	- / +																				
Malvasia	mis	+ / +	Cortese B	Bianca Fernanda	225	235	249	249	243	251	178	182	236	250	253	253	133	151	200	202	246	250
Marzemino bianco	mis	+ / +	Favorita B; Vermentino B; Pigato B	Rolle B	233	237	249	249	243	251	178	180	238	246	251	257	133	151	200	204	248	258
Moretto	syn	+ / +	Lambrusca di	Moretto; <i>Brachetto</i>	225	239	253	255	251	257	178	193	230	270	265	273	143	151	200	204	250	250
Moretto I	syn	+ / +	Alessandria N	(<i>di Susa</i>); Pezzè	225	245	239	249	241	257	184	193	238	270	257	263	133	135	196	200	238	248
Negrara	hom	- / +		Maren (L'ACOMBE <i>et al.</i> 2013)	225	245	247	255	241	241	178	193	230	236	263	273	139	143	204	248	250	250
Nibió	mis	+ / +	Dolcetto N	Ormeasco	233	245	247	255	241	241	178	193	230	236	263	273	139	143	204	248	250	250

Tab. 2 continued

Accession name	Remarks to the Accession name ¹⁾	Identification by morphology/ ²⁾	Variety name ^{2), 3)}	Other synonyms (misnomers in <i>italic</i>)	SSR profile																	
					VVMD5	VVMD7	VVMD25	VVMD27	VVMD28	VVMD32	VVS2	VtZag62	VtZag79									
Sebin	mis	+ / +	Corbeau N; Turca N; Serbina N	Sgurbà; Douce noir; Charbono	227	237	249	263	251	265	188	188	230	246	241	273	151	151	194	200	250	258
Vernassa	syn	+ / +	Vernassa bianca; Bonommu		225	225	239	249	243	251	178	188	246	246	251	263	133	143	188	204	250	258
Basgano (di Moline)	true	+ / +	Basgano nero		227	239	233	247	251	257	184	193	236	260	251	273	135	151	196	204	250	250
Basgano (di Oliva G.)	mis	- / +	Danugue		227	233	233	239	243	257	193	193	238	246	263	273	137	145	188	204	256	256
Rossarone grande	mis	- / +	(MARXX01-EVDB)																			
Colombaia bianca	conf	- / -		<i>Colombaia nera/faux</i> (FRA139-EVDB)	225	225	247	253	241	257	188	193	246	260	251	263	139	143	200	204	238	242
Croà acino grande	hom	- / -			235	239	239	247	241	241	184	188	238	270	241	273	133	155	196	196	244	250
Moscato nero	true	+ / +			225	235	247	249	251	257	178	184	248	260	253	265	133	135	186	196	242	254
Moscato rosa antico	mis	+ / -	Moscato nero di Acqui N	<i>Maliga; Malaga</i>	221	239	239	239	257	257	178	178	256	280	257	273	143	143	188	188	236	254
Pollini bianca	mis	+ / +	Malvasia istriana B		227	235	247	253	243	257	184	184	238	260	257	263	133	143	188	194	238	250
Pulitana	syn	+ / +	Grèc rouge (FRA139-EVDB)	Grisa rossa; Cipar	225	235	247	247	243	257	184	184	236	260	241	253	135	145	192	196	242	250
Uva Crova	conf	- / -		<i>Corvina veronese</i> (DEU098-EVDB)	225	235	239	263	243	243	178	184	236	246	253	257	133	133	194	196	242	258
			Sangiovese N (reference variety for SSR)		225	235	239	263	243	243	178	184	236	246	253	257	133	133	194	196	242	258

¹⁾ mis = misnomer, syn = synonym, true = true name, hom = homonym, conf = confusing name.

²⁾ The variety names and synonyms without specifications in brackets are from IPSP-CNR SSR-database.

³⁾ The variety names followed by the initial of berry color (N = black or B = white) are those included in the national Registers of grape varieties ("Varieties registered in Europe" at <http://www.eu-vitis.de/>) and therefore allowed to be grown in commercial vineyards.

geo-morphological area with the nearby Lombardy province of Pavia (Oltrepò pavese).

Homonym accessions such as those characterized by the names 'Basgano', 'Croà', 'Moradella' and 'Rossarone' were also highlighted. The comparison with accessions preserved in the Piedmontese collection and with published genetic data allowed to understand which of the homonyms was referring to the correct variety and which can be attributed instead to misnaming (Tab. 2).

In the cases of the cultivars identified as 'Moradella N.' and 'Crovaro-Rossarone', the identification was made possible thanks to the existence of an *in vivo* "historical" reference: in fact, two accessions collected in Pavia province almost 150 years ago by the eminent ampelographer Giuseppe Di Rovasenda and named respectively 'Moradella' and 'Rossarone' are still preserved in the Piedmontese collection. In this respect, it is worthwhile to remark the true-to-type, historical 'Moradella' does not match to that entered in the National Register of grape varieties and preserved in the collections of Centro di Ricerca per la Viticoltura in Conegliano Veneto (Treviso province) (catalogoviti.politicheagricole.it/catalogo.php).

By the analysis of microsatellite markers, the ampelographic identifications were confirmed and new identity hypothesis for five additional accessions ('Erbamat', 'Maiolina', 'Sangallina', 'Basgano (di Oliva G.)', and 'Rossarone grande') were assumed, referring to three unique genotypes. In the latter group of varieties, the two accessions 'Basgano (di Oliva G.)' and 'Rossarone grande' corresponded to the French variety 'Danugue', never reported before in Italy: it could have been introduced in fairly recent times, due to its features of high productivity and very high bunch weight. 'Erbamat B.', recently entered in the National register of grape varieties, corresponded to 'Verdealbara B.', a cultivar formerly ruled in the Register. Thus, 'Erbamat B.' results as a Register duplicate. The same was highlighted for 'Erbanno N.' and 'Serbina N.', matching respectively with 'Schiava N.' and 'Turca N.'. The last variety is synonymous of 'Corbeau', a French variety, alias Argentinian 'Bonarda' and Californian 'Charbono' (MARTINEZ *et al.* 2008). All these duplicates indicate that the Italian Register needs a revision.

Other three accessions ('Negrara', 'Colombaia bianca' and 'Uva Crova') showed an allelic profile identical to that of Italian cultivars preserved in French and German collections, but without a true name for reference. The case of the 'Colombaia bianca' (White Colombaia) led to highlight the problem of errors in material transferring between collections: the accession had been transferred to the French collection of Vassal with the name 'Colombaia nera' (Black Colombaia), which became 'Colombaia nera faux' (false) because of the inconsistency of berry color.

Conclusions

The approach used to investigate the correspondence of varieties coming from neighboring areas, based on morphological descriptions and comparison of genetic data, allowed to deep the insight about their cultivation in the past and today. Moreover, unique endangered accessions have

been highlighted, allowing a better conservation policy. Following the workflow of collection, preservation and identification of rare grapevine varieties, a realistic estimation of grape varietal diversity over all the Italian territory could be obtained, in order to optimize the resources allocated to study, conservation and development of such great biological heritage.

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