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'Vitouska' is the progeny of 'Prosecco tondo' and 'Malvasia bianca lunga'

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Summary

'Vitouska' is a minor white wine grape variety, cultivated in the Kars region and recently recovered and reevaluated by local viticulturists. Its obscure origins, traditionally linked to this land, are now supported by the results obtained from the present research, which identified the two parents, 'Malvasia bianca lunga' alias 'Malvasia del Chianti' and 'Prosecco tondo'. The latter cultivar has an ancient and well-documented presence in the same growing region as 'Vitouska'. Molecular analyses have been performed with 37 nuclear microsatellite loci.

Key words: 'Vitouska', 'Garganija', parentage, SSR markers, minor cultivar.

Introduction

'Vitouska', known also as 'Vitovska', 'Vitovska-Garganija', 'Gargania', is a minor white wine grape cultivar. It is a vigorous and late-ripening variety, with compact cluster and big berries, which found an ideal environment in the red soils of the Kars region (North East Italy and West Slovenia). It proved to have an optimal equilibrium between vegetative and productive activity in this ferrous and poor fertile land, giving refined and sapid wines. Almost rustic, it can tolerate the cold winters with the strong Bora winds, as well as summer droughts; however, its medium-early shooting makes it susceptible to late frosts. 'Vitouska' sometimes shows the phenomenon of gigantism, as clusters can reach 1 kg in some cases; the mean weight is around 250–300 g. With the aim of recovering and promoting the most worthy local grapevines, 'Vitouska' was registered in the Italian Catalogue in 1990 (code no. 320) and it belongs to the few varieties selected for Kars D.O.C. (Controlled Denomination Origin). Although opinion is widespread that 'Vitouska' originated in the Kars area, there is little information to support the assertion that this cultivar is strictly localized in the region and there are no traces of its presence elsewhere (DEL ZAN *et al.* 2004). The comparison of 11 SSR data, obtained for 'Vitouska' molecular identification, with the Istituto Sperimentale per la Viticoltura database suggested that this variety could be an offspring of 'Malvasia bianca lunga' alias 'Malvasia del Chianti' and 'Prosecco tondo'. By extending molecular analysis to 37 nuclear SSR loci, we provided useful support to the knowledge on the origins of 'Vitouska', since the additional data confirmed the two putative parents indicated above.

Material and Methods

Plant material: 'Malvasia bianca lunga', 'Prosecco tondo' and 'Vitouska' samples came from the Istituto Sperimentale per la Viticoltura collections at Conegliano (Italy). Two additional 'Vitouska' samples were kindly provided by Augusto Fabbro (ERSA of Gorizia).

Microsatellite analysis: The thirty nuclear SSR used in CRESPLAN *et al.* (2006) were analysed, plus five additional ones from Vitis Microsatellite Consortium, UCH11 (LEFORT *et al.* 2002) and scu05 (SCOTT *et al.* 2000). Multiplex PCR of two or three SSR loci were suitably arranged based on expected allele lengths. Electrophoresis was performed on denaturing polyacrylamide gel and silver staining for signal revelation; alleles of reference varieties were used for unknown allele sizing and manual scoring, as reported in CRESPLAN and MILANI (2001).

Statistical analysis: Molecular data significance was estimated with the Identity1.0 program, freely available on <http://www.boku.ac.at/zag/forsch/MANUAL.rtf> using the molecular database of our centre.

Results and Discussion

The molecular profiles obtained for the three analysed varieties are reported in Tab. 1, along with a further three reference cultivars for easier data comparison. 'Vitouska' shows one allele derived from each of the presumed parents at all 37 nuclear SSR loci, strongly supporting the hypothesis that 'Vitouska' is truly an offspring of 'Prosecco tondo' and 'Malvasia bianca lunga'.

Cumulative likelihood ratios of 'Vitouska' being the progeny of 'Prosecco tondo' (1) and 'Malvasia bianca lunga' alias 'Malvasia del Chianti' (2), versus alternative parents, including close relatives, combined over 36 nuclear SSR loci are reported in Tab. 2. VVMD8 locus was excluded from computation, due to the known presence of null alleles. This estimate shows that the indicated parents are more highly probable than other presumable combinations (1.04×10^{15} with 95 % upper confidence limit).

'Prosecco tondo' takes its name from the village of Prosecco, in Trieste province, where it is also known as 'Glera'. The 'Glera's' are an ensemble of different ancient varieties cultivated in this province. Recent research has shown that the name Glera refers mostly to 'Prosecco lungo' and less frequently to 'Prosecco tondo' or other minor varieties (CRESPLAN *et al.* 2007).

'Malvasia bianca lunga' is usually grown in the Tre Venezie area, even if under a different name from the most common one: for example it is known as 'Prosecco nos-

Table 1

SSR data of 'Vitouska' and its proposed parents, plus three reference varieties. Allele lengths are in bp

Variety	Vitouska	Prosecco tondo	Malvasia bianca lunga	Cabernet Sauvignon	Moscato bianco	Sultana	Variety	Vitouska	Prosecco tondo	Malvasia bianca lunga	Cabernet Sauvignon	Moscato bianco	Sultana
VVS1	181	181	180	181	181	181	VrZAG79	242	248	242	246	250	246
	181	181	181	181	181	188		248	258	250	246	254	258
VVS2	133	133	145	139	133	145	VrZAG83	194	188	190	200	188	188
	145	143	145	151	133	151		194	194	194	200	188	194
VVS29	171	171	171	179	171	171	ISV2 (VMC6e1)	151	141	143	141	141	143
	171	171	171	181	171	179		165	151	165	165	143	143
VVMD5	226	226	226	232	228	234	ISV3 (VMC6f1)	133	133	133	133	133	133
	240	246	240	240	236	234		133	139	139	139	139	139
VVMD7	239	239	239	239	233	239	ISV4 (VMC6g1)	177	169	177	169	169	191
	247	247	253	239	249	253		197	197	177	191	187	193
VVMD8	147	143	147	143	141	145	VMC1e12	250	246	250	240	260	244
	147	147	157	157	141	157		260	250	260	250	260	260
VVMD17	222	221	221	221	220	222	VMCNG4b9	166	166	150	168	158	138
	222	222	222	222	222	222		176	176	176	176	166	158
VVMD21	243	243	249	249	249	249	VMC4g6	125	125	133	127	127	125
	249	249	249	258	266	256		133	143	143	133	143	129
VVMD24	210	214	210	210	214	210	VMC2h9	117	117	117	119	121	123
	214	218	210	219	219	219		117	123	117	123	123	123
VVMD25	243	243	243	243	245	243	VMC3d7	161	161	163	159	161	161
	245	247	245	253	253	253		171	163	171	161	163	163
VVMD26	249	249	249	249	251	249	VMC2g2	119	119	119	121	123	125
	251	251	251	251	251	251		119	125	119	125	125	125
VVMD27	179	179	179	175	179	181	VMC2h4	198	206	198	212	200	204
	194	194	179	189	194	194		214	214	200	220	214	214
VVMD28	239	239	251	237	249	221	VMC6e10	95	93	95	111	111	121
	257	247	257	239	271	247		119	119	97	121	113	127
VVMD31	214	212	212	206	212	212	VMC4h6	158	158	158	152	152	162
	216	216	214	210	216	212		158	158	158	162	162	164
VVMD32	253	263	253	241	265	251	VMC4c6	160	160	160	163	157	151
	263	265	257	241	273	251		163	163	163	175	157	157
VVMD36	254	252	254	254	244	250	UCH11	242	242	242	244	244	242
	254	254	254	264	264	268		246	246	262	262	248	244
VrZAG21	190	190	204	200	206	190	SCU05	165	169	163	165	160	165
	206	200	206	206	206	202		169	169	165	168	165	171
VrZAG62	195	187	195	187	185	187	VMC5g6.1	138	138	139	142	139	139
	203	203	199	193	195	187		139	142	165	155	151	139
VrZAG64	159	143	137	139	141	143							
	163	163	159	159	159	159							

Table 2

Cumulative likelihood ratios of 'Vitouska' being the progeny of 'Malvasia bianca lunga' *alias* 'Malvasia del Chianti' (1) and 'Prosecco tondo' (2), versus alternative parents, including close relatives, combined over 36 nuclear SSR loci. VVMD8 locus was excluded for null allele presence

Parents combinations	(1) x (2)	(1) x X	rel (2) x (1)	(2) x X	rel (1) x (2)
with observed allele frequencies	1.72×10^{24}	8.76×10^{13}	7.16×10^4	2.91×10^{15}	1.31×10^5
with 95 % upper confidence limit	4.51×10^{17}	6.13×10^{10}	8.58×10^3	1.57×10^{12}	1.74×10^4

trano of Conegliano' (CALÒ *et al.* 2000). We have no direct evidence of 'Malvasia bianca lunga' cultivation in Kars, but it is highly probable. The well-known and documented presence of at least one putative parent in the same cultivation region as 'Vitouska' is an important additional element in support of the indication came out from molecular data. It is therefore very likely that 'Vitouska' originated in the Kars area. A concise ampelographic description of 'Vitouska' is reported in DEL ZAN *et al.* (2004), with pictures of shoot, mature leaf and cluster. 'Vitouska' is quite distinct from 'Garganega' of the Veneto region. It is also morphologically different from another 'Gargania', cited and briefly described among the grapes grown in Friuli region in the first half of the 1800s, both in the "Catalogo delle varietà delle viti del Regno veneto" (Grape cultivar catalogue of Veneto Kingdom) written by P. DA MANIAGO in 1823 and in that of "Mostra delle uve dell'Associazione agraria friulana" (Grape exhibition of Friuli Agronomy Association) of 1863 (CALÒ and COSTACURTA 1991). This latter is described as a mediocre cultivar, for table and wine use, with very long cluster and highly sparse berries, yellow-red or yellow-pink coloured and with a thick skin.

Interest in 'Vitouska' has increased in recent years due to the ability and determination of some local viticulturists, who believe in this variety and are firmly resolved to recover it in culture, despite the difficulty linked to the need for careful canopy management to reach full berry ripening. 'Vitouska' grape vinification produces fresh, dry or slightly sweetish wines, characterized by flavours such as vegetable, hay, sage, with William pear and lemon aromas. The wine has a pale yellow colour, with a slightly sour and sapid taste and medium structure. Vinification in blends could prove an alternative and interesting use: tests are under way using local white varieties, such as 'Malvasia istriana'.

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