

Recovering old grapevine varieties

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Summary

In this work we report new findings related to the recovery of old vines in The Comunitat Valenciana (Spain), where great diversity of grapevines varieties was present prior the phylloxera arrival. New accessions of old varieties previously recovered by our group and in risk of disappearance were located. Accessions with new SSR profiles were also found and, in some cases, could be ascribed to old grapevine ampelonyms; new synonymies were also detected. Chlorotypes were determined in the recovered germplasm. Several actions for the preservation of the recovered accessions have been initiated.

Key words: 'Bobal Blanco', 'Botó de Gall', 'Brustiano Faux', 'Cor d'Angel', Direct producer hybrids, 'Ferrandella', 'Grumer Moscatell', 'Morenillo'.

Introduction

In Spain, the Comunitat Valenciana (CV), situated on the Eastern Mediterranean Coast has been an important viticulture area from prehistoric times to the present day. It has a much-appreciated richness of grapevine variability that was assessed in pre-phylloxera works (DGAIC 1891; JCA 1909). In 1889 more than one hundred grapevine varieties were mentioned as cultured in this area (JIMÉNEZ *et al.* 2019). However, a great genetic erosion was produced after the phylloxera arrival. Therefore, some varieties that were common like 'Morenillo', 'Forcallat', 'Pampolat', 'Planta de Mula', 'Arcos', 'Valenci negre', 'Valenci blanc', 'Planta nova', 'Planta Fina de Pedralba', 'Botó de Gall', 'Corinto rojo', 'Planta de Elda', 'Rojal', 'Roget de Chella', among others, have virtually disappeared or are minor varieties. We report the first findings of the surveys carried out at CV to recover old varieties in JIMÉNEZ *et al.* (2019). In brief, a cultivar thought to have disappeared was located, the variety 'Morsi' (EVN 1978, JCA 1909). This variety resulted to be a synonym of the minor Algerian variety 'Sbaa Tolba'. The old variety 'Botó

de Gall' was also found as a synonym of another Algerian variety, 'Ahmeur bou Ahmeur'. A local synonym, 'Camera', was found for 'Crujidera' (syn. 'Marufo') and new SSR profiles were reported for six varieties ('Arcos', 'Mamella de Vaca', 'Macabeo negro', 'Montalbana', 'Raïm del Clotet' and 'Trepadell'). In addition, some chlorotypes were assigned and some pedigree relationships were proposed. This research has been continued to contribute getting knowledge about grapevine varieties and their recovering. In this work we report on new findings.

Material and Methods

A total of 100 accessions were assessed. Supplementary data S1 shows information about them (included location) as well as for the eight samples included as controls (S2). The commercial DNeasy Plant Mini Kit (Qiagen) was used for DNA extractions. Fifteen nuclear SSR markers (VVS2, VVMD5, VVMD6, VVMD7, VVMD21, VVMD24, VVMD25, VVMD27, VVMD28, VVMD32, VrZAG62, VrZAG64, VrZAG79, VrZAG83, and VMC1b11) were analyzed using two sets of multiplex PCR reactions as described by PEIRÓ *et al.* (2018). Chlorotypes were determined using five SSRs (CCMP3, CCMP5, CCMP10, ccSSR9 and ccSSR14) as described by ARROYO-GARCÍA *et al.* (2006) in new accessions as well as in those without information in the *ITVC* database.

Results and Discussion

Among the surveyed germplasm new accessions of 'Arcos', 'Mamella de Vaca' and 'Trepadell', which SSR profiles were firstly reported in JIMÉNEZ *et al.* (2019), were found in several villages in the Alicante province. Also an accession of 'Morsi', firstly localized in JIMÉNEZ *et al.* (2019), was found in another field of Monforte del Cid and two accessions of 'Esclafagerres', another variety in risk of disappearance (GISBERT *et al.* 2018) were identified at Hondón de las Nieves (suppl. Tab. S1). On the other hand, two other accessions

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of 'Grumer Moscatell' (syn. 'Muscat of Istanbul'), variety which resulted from the cross of 'Valenci blanc' x 'Muscat of Alexandria' (MENA *et al.* 2014, JIMÉNEZ *et al.* 2019) were found. One sample was collected as 'Gustet d'Elx' equal to 'Gustico de Elche' (Valencian vs. Spanish names) and the other as 'Moscatellet'. An accession surveyed as 'Gustico de Elche' was also analyzed in PEIRÓ *et al.* (2018) whereas 'Moscatellet' is new putative synonym to be added to all reported previously.

Some confusion is common in this area for the varieties 'Arcos' and 'Forcallat' as previously observed. In addition, one of the accessions identifies as 'Arcos' is also known by the name of 'Montalbà'. Also, the variety whose profile we reported as 'Mamella de Vaca' is named 'Cambriil' and 'Raïm de Tots Sants'. The first name appeared in old documents for a grapevine variety present at the CV but this variety is not considered a late ripening variety (FAVÀ-AGUD, 2001) whereas the name 'Raïm de Tots Sants' (valencian for The Day of All Saints' festivity on 1st november) is. Also, we have identified one unknown sample (S73) as 'Mamella de Vaca'. The number of accessions for the minor variety 'Botó de Gall' (syn. 'Ahmeur bou Ahmeur') has been increased and all were confirmed except for one that had the SSR profile of 'Mamella de Vaca'. Also, a plant collected as 'Encarnat/' 'Flor de Baladre' and another with the name 'Roget tardà' resulted to be 'Ahmeur bou Ahmeur' and should be regarded as synonyms for 'Botó de Gall'. In addition, other accession surveyed as 'Botó de Gall', showed a new SSR profile (NI-4) (suppl. Tab. S3). In the previous work (Jiménez *et al.* 2019), three accessions were unidentified (NI-1, NI-2 and NI-3) but new information in *VIVC* database permitted the identification of NI-2 as the variety 'Siria'. New SSR profiles

were also found for other accessions (Table and suppl. Tab. S3). A plant of the old variety 'Cor d'Angel' present in this area (DGAIC 1891) and considered a synonym for 'Valenci blanc' (*VIVC* 22710) in CABELLO *et al.* (2011) was located at La Pobla del Duc (Valencia). However, a different SSR profile and chlorotype was obtained in the present assay. This variety is described as an appreciated table red grapevine (DGAIC 1891, FAVÀ-AGUD 2001). An accession acquired as 'Morenillo', whose profile differed from that of the 'Morenillo' in *VIVC* (25054), was found in the Hoya de Bunyol area (Valencia) and was named 'Morenillo de la Hoya'. The variety 'Crujidera' (syn. 'Marufo') could be involved in its pedigree as both share at least one allele for each SSR locus (suppl. Tab. S3). References for this old variety indicate the existence of two varieties of 'Morenillo' (DGAI 1891). In addition, three accessions formed, two in Bicip (Valencia) area, and another in a field of Xert (Castellón) had the same SSR profile (NI-5), which did not correspond to any in *VIVC*. One of this accession has been collected under with the name 'Gancha arroba', not previously reported in any document.

The historical variety 'Ferrandella' (CLEMENTE Y RUBIO 1807) that nowadays in Spain is only found on the Balearic Islands (CABELLO *et al.* 2011) but which was present in the CV (DGAIC 1891) was found. Another interesting old variety, not reported before at the CV, was 'Brustiano Faux' which was involved in the pedigree of the varieties 'Macabeo' and 'Xarello' (*VIVC* 13117 and 13270, respectively), both present in this area.

In the prospected old vineyards at the Utiel-Requena plateau, where the variety 'Bobal' replaced other historic varieties, we looked for accessions of 'Bobal blanco', a name assigned to the variety 'Tortosí' which is a rustic variety pres-

Table

New profiles, synonymies, and/or chlorotype in grapevine accessions

Cultivar name ¹⁾	Identification name ²⁾	Chlorotype
Cor d'Angel	<i>Cor d'Angel</i>	D
Morenillo de la Hoya	<i>Morenillo de la Hoya</i>	D
Botó de Gall	<i>NI-4</i>	A
Gancha Arroba	<i>NI-5</i>	A
Señorito	<i>NI-6</i>	B
Directe blanc	Villard blanc	C
Txarpa	Varousset	C
Unkown (S70)	Jaquez	G
<u>Encarnat/Flor de Baladre</u>	<u>Ahmeur bou Ahmeur (syn. Botó de Gall)</u>	C
<u>Roget tardà</u>	<u>Ahmeur bou Ahmeur (syn. Botó de Gall)</u>	C
<u>Montalbà</u>	<u>Arcos</u>	A
<u>Cambriil</u>	<u>Mamella de vaca</u>	D
<u>Raïm de Tots Sants</u>	<u>Mamella de vaca</u>	D
<u>Del Perrillo</u>	<u>Pardillo (syn. Mari Sancho)</u>	A

¹⁾ Name given by grower.

²⁾ The SSRs profiles were compared with those in *VIVC* (2019). Names in italics refer to new profiles firstly reported in this work; underlined names referred to putative new synonymies. In bold new chlorotypes.

ent in this area previously to the phylloxera arrival. Among 10 samples collected as 'Bobal blanco', one half resulted to be 'Tortosí' whereas three were assigned to 'Airen', one to 'Italia' and another to 'Valenci blanc' (syn. 'Beba'). We have also recovered some accessions of old varieties used previously in this area: 'Crujidera' (syn. 'Marufo'), 'MariSancho' (syn. 'Pardillo'), 'Planta Nova', 'Rojal', 'Moravia Dulce' and 'Moravia Agría'. In addition, a plant was identified as 'Rojal Fusca' (ITVC 25069). One accession with this profile was found at Castilla la Mancha and so named by MENA *et al.* (2014).

Some varieties which were not expected in the surveyed region were also found, among from the Argentinian cultivar 'Cereza' stands out. 'Cereza' (ITVC 2390) is an intraspecific hybrid derived from 'Muscat of Alexandria' x 'Mission' which is commonly used in Mendoza (Argentina). This plant found in a field near Xaló (Alicante) from where many people migrated to Argentina in the mid-XXth century, some of them eventually returning and carrying cuttings with them.

Finally, several accessions of direct producer's hybrids (DPH) were sampled. Two of them belong to the grape named 'Señorito', which dominated vineyards in Castellón province since the onset of the phylloxera attack to the late XXth century. In this case, the SSR profile did not match any of those in the ITVC database (NI-6). Another sample recovered also in Castellón (Benlloch) with the name 'Txarpa' matched the profile of 'Varousset' (ITVC 12909), and another recovered as 'Directe blanc' (from Benisuera) matched 'Villard Blanc' (ITVC 13081). A fourth DPH, Jaquez, was found in an old vineyard in Xàbia (S74).

Chlorotypes were assigned for varieties with new SSR profiles ('Cor D'Angel', 'Morenillo de la Hoya', 'NI-4', 'NI-5', 'Señorito') and for 'Varousset' 'Villard Blanc' and 'Jaquez' because they are not available in the ITVC database (suppl. Tab. S2). 'Jaquez' which is the result of an interspecific crossing of *V. aestivalis* x *V. vinifera* showed the G profile. Excluding DPH, 40 different grapevine varieties were found (suppl. Tab. S1) having the chlorotype A as the most common (57,5 %) as it is reported in other works (ARROYO-GARCÍA *et al.* 2006, GARCÍA-MUÑOZ *et al.* 2012). According to the first, Iberian wild vines have provided the chlorotype A to autochthonous cultivars.

We are performing different actions which include *in situ* and *ex situ* conservation of this local germplasm

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