

Proposal for the wild grapevine (*Vitis vinifera* L. subsp. *sylvestris* (Gmelin) Hegi) conservation in the European countries

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Introduction

In Eurasia (Europe and Western Asia), oppositely to geographical areas from North America and Eastern Asia where there are several wild grapevine species, there is only one native grapevine, *Vitis vinifera* L. (ZOHARY and SPIEGEL-ROY 1975). The Eurasian wild grapevine belongs to *Vitis vinifera* L. subspecies *sylvestris* (Gmelin) Hegi taxon. Their populations spread out from the Iberian peninsula to the Hindu Kush mountain range, including some areas of the African Maghreb. This subspecies reproduces by seeds mainly, but sometimes also asexually (ARNOLD *et al.* 1998, OCETE *et al.* 2007).

This is a dioecious subspecies and constitutes the ancestor of the grapevine cultivars, belonging to subspecies *sativa* which remarkably are mostly hermaphrodite. Within wild grapevine populations only a small percentage of hermaphrodite plants appeared by mutation of male exemplars. Some of them were selected by man due to their self-pollinating capacity (FORNI 2006). However seeds of wild and cultivated grapevines have different morphologies (RIVERA and WALKER 1987, TERRAL *et al.* 2011). So, according to existing archaeological data, the first place where domestication took place was in the Shulavry Culture (Republic of Georgia, Transcaucasia) about 8,000 years B.P. (MC GOVERN 2003 and 2004).

In the Transcaucasian region, Chlorotypes C and D are the most frequent in wild grapevines and autochthonous cultivars, meanwhile A constitutes the main percentage found in wild and autochthonous varieties in Western Europe. It could indicate that, probably, the Iberian peninsula could be considered as a secondary domestication center (ARROYO-GARCÍA *et al.* 2006, DE ANDRÉS *et al.* 2012.).

The main habitats of wild grapevine are gallery forests growing on alluvial soils along rivers and creeks. Some populations can be found on colluvial positions of rainy areas, coastal cliffs and arenosols also. In all the cases, grapevine lianas climb using tendrils on bushes and trees of the accompanying vegetation to get an adequate intensity of sun light (ARNOLD 2002).

In the Spanish territories for example according to archaeological findings and old documents from 2,400 years B.P. to the 19th century, their berries were used as food and to produce must and wine. Several medicines were elaborated with these products and also with sap and leaves. Their canes were used to produce mooring ropes and fishing traps. On the other hand, bunches were used as offering in burial ceremonies from different cultures between the Bronze age to Roman period (OCETE *et al.* 2011a).

The Eurasian wild grapevine is the basis, throughout the domestication process, for the development of the vine and wine cultural heritage (SCIENZA 2004).

The wild grapevine as a phylogenetic resource

Grapevine constitutes the most widely cultivated and economically important fruit crop in the world (VIVIER and PRETORIUS 2002). Recent studies based on molecular markers reveal that wild grapevine populations conserve a wide genetic pool meanwhile vineyards are immersed in a worry lose of biodiversity, known as genetic erosion (ESQUINAS-ALCÁZAR 2005, THIS *et al.* 2006, DE MATTIA *et al.* 2008). This process was accelerated by the global use of international varieties and the plantation of a short number of commercial clones in vineyards. So, wild grapevine can be used in breeding of cultivars and rootstocks (RIVES 1974). In this way, it is necessary to remark that microvinifications of wild bunches show a high intensity of color and high acidity even in warm climates. They are two very important characteristics to obtain new cultivars to produce red wines of higher quality in Mediterranean areas (OCETE *et al.* 2011b).

Roots of wild grapevine can be infested by phylloxera according to several laboratory tests carried out in pots. In opposite way, their populations in natural habitats are free of the presence of this aphid imported from North America, due to the edaphic conditions, such as soil moisture or sandy texture, which prevent the colonization by the insect, root-knot nematodes and root-rot fungi. Wild grapevines show a great resistance to flood and active limestone (some plants can tolerate up to a 60 % under *in vitro* conditions). Due to both facts, they could be used for breeding by hybridization with commercial rootstocks (OCETE *et al.* 2007 and 2011c).

Conservation threats

Old references from different countries show that the presence of wild grapevine was very frequent in Europe up to the second part of the 19th century, when the parasitic species such as powdery and downy mildews arrived from North America. These fungal species reduced the number of individuals of the different populations. Several levels of symptoms caused by both fungal diseases can be observed on the individuals belonging to each population due to its intrinsic genetic biodiversity at present. Probably,

those with less tolerance to these imported parasitic species disappeared.

Agricultural and wood exploitation of river-bank forests provoked a reduction of the wild grapevine populations, but the heaviest negative impact is caused by public works. Channeling and cleaning of water courses, dam constructions and the improvement of road nets could be considered the most damaging for the conservation of natural habitats of wild grapevine.

On the other hand, the expansion of rootstocks (hybrids between North American species and European cultivars or pure American species, such as *Vitis riparia* and *Vitis rupestris*) and direct producer hybrids, like Isabella for example, which constitute invasive plants resistant to phylloxera and downy and powdery mildews are moving the the wild native grapevine from their natural habitats (ARRIGO and ARNOLD 2007).

All the cited causes had provoked the extinction of several populations and the reduction in the number of plants of each relic population in a very alarming way (ISSLER 1938, HAEUPLER and SCHÖNFELDER 1988, DI VECCHI-STARAZ *et al.* 2009). The Eurasian wild grapevine is considered a threatened taxon by IUCN (WALTER and GILLET 1998).

Need for legal measures of preservation in the European countries

Only some states of the EU, such as France, Germany, Austria and Hungary have developed legal measures for the preservation of these vines. There is a lack of legislation in the rest for *in situ* conservation of the vines, where they are free of anthropic threats only in protected areas.

The aim of this document elaborated during the development of the COST Action FA1003 "East-West Collaboration for Grapevine Diversity Exploration and Mobilization of Adaptative Traits for Breeding" is to get a legal figure of preservation of this phylogenetic resource, linked to man along millennia, for all the European countries and to activate the sharing of their multidisciplinary knowledge.

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