

## **Impact and usage of PIWI grape varieties, recent introduction of PIWI varieties in European PDO wine**

This D7 dissertation has as main focus the introduction of hybrid disease resistant grape varieties known as PIWI, in commercial winemaking. Their usage on a large scale in winemaking would lead to a significant reduction of the environmental impact that viticulture has. Studies have shown that PIWI varieties can greatly reduce the need of phytosanitary product usage.

With climate change caused by pollution creeping up on our younger generation the only way forward is to make our need for agricultural products more sustainable; this way preserving biodiversity in our farmland, reducing incidence of chemical derived illnesses and preservation of clean water resources. Not only the environmental impact is analysed but also the economical savings the reduce need for sprayings leads to.

PIWI varieties are the solution and with further and more focused research they are now able to produce quality wines on par with *V. vinifera* grapevines.

This dissertation introduces the main threats to *V. vinifera* plantings introduced from the Americas in the late 19th century: powdery and downy mildew and the subsequent start of systemic fungicidal sprayings.

The first reasons for crossing *Vitis* of different species will be presented and how it was, at first, unsuccessful in Europe.

Once the *Vitis* genus has been explained an introduction to hybridization is explained. This will explicate how resistance from *Vitis* of American (or Asian) origin is selected and then passed on to hybrid offsprings.

An in depth explanation of the testing for disease resistance is carried out is presented. Starting from parental selection and crossing of two *Vitis* species, following though with the actual exposure to diseases to test the resistance ending with the planting in control plots in different areas to trial the potentially resistant varieties.

The main part of the dissertation concentrates on the introduction of PIWI varieties in commercial winemaking.

Starting from the EU changing the regulations and allowing the planting of hybrid varieties in PDO wine regions with the regulation (EU) 2021/2117 of the European Parliament and of the Council.

The first example proposed is probably the most important: the introduction of Voltis in the Champagne AOC following the changes reported in the cahier des charges. Rules for its plantings and usage in the final blend are displayed.

The characteristics of the Voltis variety are analyzed and how they are favourable to the production of a traditional method sparkling wine.

The VEVIR project carried out in Trentino will be cited; a study to determine which PIWI varieties are more suited to the region's climate and soils and the development of four new resistant varieties by the Fondazione Edmund Mach in San Michele all'Adige.

Two Italian wines made from PIWI varieties are presented: Pojer & Sandri's Zero Infinito made from Solaris and Terre di Ger's Feltro Bianco made from a Bronner and Solaris blend. The characteristics and parentage of Bronner and Solaris are explained as well.

Two main results of the implementation of PIWI varieties in commercial winemaking are drawn, the reduced environmental impact and reduced costs. A California study is cited to further support the financial advantage of resistant grape varieties.

The usage of PIWI varieties is just at its starting point in Europe's PDO wines, but with high profile cases, such as the one in Champagne, there is a solid base for their commercial success.

This is the first step towards the sustainability of viticulture and a possible reduction of costs of wine for the end consumer.