

SWISS PROGRAM FOR THE CREATION OF FUNGAL DISEASE RESISTANT GRAPE VARIETIES IN SWITZERLAND

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Abstract:

Grapevine breeding is part of the research program of Agroscope in Switzerland since 1965. From 1965 to 1995, the aim of the *Vitis vinifera* crosses was to obtain a high resistance to grey rot (*Botrytis cinerea*), one of the most virulent fungal pathogens in the Swiss vineyard. In 2021, the grape varieties released from this first breeding program covered 936 ha of the 15'000 ha of the Swiss vineyard.

In 1996, a second breeding program aimed at obtaining, by classical interspecific hybridization, grape varieties resistant to downy mildew (*Plasmopara viticola*) and powdery mildew (*Erysiphe necator*) and less sensitive to grey rot (*Botrytis cinerea*). In order to accelerate and make the selection process more reliable, an early biochemical test was developed based on the natural defense mechanisms of the vine against downy mildew (stilbene phytoalexins). The synthesis of stilbenes (i.e., resveratrol and its oxidized dimers ϵ - and δ -viniférine) and pterostilbenes (methylated derivative) is among the most efficient induced defense mechanisms of grapevine against fungal pathogens on both the leaves and the clusters.

In 2013, Divico was the first grape variety from this program to be released. It is a crossbreed made in 1997 between Gamaret and Bronner. Its resistance to downy and powdery mildews is high. The Divico variety has the quantitative trait loci (QTLs) Rpv10 and Rpv 3.3 against downy mildew and Ren3 and Ren9 against powdery mildew. Divico also has the QTL Rgb1, associated with a partial resistance to black rot (*Phyllosticta ampellicida*). Like its parent variety (Bronner), the level of resistance to downy and powdery mildews observed at all Agroscope experimental sites for this variety has been stable for more than ten years. Depending on the site and the pressure of the diseases, one to three fungicide treatments per year are sufficient for an effective protection, even in the most favorable situations for fungal diseases. Divico has a very high resistance to *Botrytis cinerea* inherited from Gamaret and a relatively low sensitivity to black rot. The wines of Divico are characterized by a very high content of phenolic compounds and a very deep color with violet nuances, rich in piceid, resveratrol and viniferins (more than 30 mg/liter). The organoleptic profile of Divico wines is very similar to those made with Gamaret: structured, rich in tannins with little astringency. The aromas evoke both fruity and spicy notes. These very interesting characteristics explain the strong interest aroused by this new variety in Switzerland, which has become the most planted disease-resistant grape variety in Switzerland.

A second white variety named Divona from the same cross was released in 2018. It has the same QTLs and levels of disease resistance as Divico. It is an early maturing variety with high quality potential (structured and aromatic wines) that is already attracting a lot of interest from producers in Switzerland and abroad.

Keywords: grape breeding, pyramiding, stacking