SETTING UP NEW TOOLS TO REDUCE THE DURATION OF THE GRAPEVINE BREEDING PROCESS: MERCIER EXPERIENCE

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SÉLECTION - ANALYSES - RECHERCHE

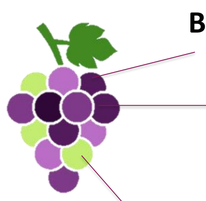
C. Mietton, O. Zekri, A. Marcadet, P. Videau, M. Sineux, V. Blattner, G. Mercier

Olivier.zekri@mercier-groupe.com Camille.mietton@mercier-groupe.com

Mercier DEPUIS 1890
Pépiniériste viticole expert

The context

Since many years, French wine sector faces strategical challenges, all linked to climate changes. Multiple issues have been observed like **disease development**, early frost, hailstorms, drought, change in the precocity and maturity of grapes, each one **resulting in loss of productivity and yield**. In France, the varieties proposed today by nurseries are historical varieties that are not well adapted to those changes.



Big fongicide user *(25% of uses / 5% of agriculture surface*)

Anual yield losses = 20 to 25% losses in 2021 in France

Vineyard projection→ 99,5% of vineyard planted with *vitis vinifera*

**Source Vitisphere, 2021*

Ambition

BREEDING PROCESS GOAL FOR A NEW VARIETY
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Years		
1	Breeding	
2	Sowing and Selection	Resistance genes
3	Wood production in greenhouse	
4 – 10	Field testing Registration process	Phenology Field Resistance Yield Wine profile …
	New variety	

Common grape breeding programs takes at least **20 to 25 years** to develop a new variety.

The ambition of the NATHY program is to accelerate the breeding process and spend only **10 years** from the seed to the registration of the variety on the catalogue.

Differences from a classical breeding program are the **use of new technologies** to accelerate each step, and the **simultaneous evaluation and registration** of the genotype.

NATHY breeding program aims to accelerate the path of impact between research and the market

Genetic BackGround

Original Partnership. Mercier took genetic background thanks to many partnership with private and public institution. The main genetic ressources are based on a common work between Valentin Blattner and Novatech to develop specific genetic lines.
Mercier offer aim to be complementary of the national and regional offer developped with INRAE and IFV in France**.**

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NATHY Focus

1- Product Quality: varieties selected in the last step of our NATHY program for catalog registration should be as good as and as similar as traditional varieties, able to be vinified with blend**.**
2- Durable resistance: varieties selected in the last step of our NATHY program for catalog registration should have at least 2 genes associated with Powdery milew and Downy Mildew resistances.
3- Good Yield: varieties are selected in the program if they are able to provide at least 90hl/ha of wine.

Objectives of « NATHY » project

To limit effects of climate change and to fight against fungi diseases, it is therefore necessary **to improve the grapevine breeding process,** in order to provide, as quick as possible, and as strong as possible, great new genetic alternatives… from seed… to market.

3 key steps

Genotyping

Since the discovery of the reference genome (*Jaillon et al, 2007*) the development of **MAS (Marker Assisted Selection)** have been an effective way to decrease selection duration in grapevine.

Using published genetic markers, we are able to detect a panel of 10 genes **from the 4th week of life** of our new genotypes.

This allows us to rapidly **exclude genotypes** that doesn't have enough genetic resistance, or not strong enough, but also genotypes that are not hermaphrodites.

It also allows us to **decrease the size of the pool** that we are going to work with for the next selection steps. Each genotype that doesn't fit our selection standard won't be part of the rest of the process.

Powdery mildew	Downy mildew	Others
Run1	Rpv1	Sexe
Ren1	Rpv3.1	
Ren3	Rpv3.2	
Ren9	Rpv10	
	Rpv12	

Table - Genes selected during the NATHY M.A.S. process

Phenotyping

The 1st plantlet coming from the seed **are tested with artificial inoculation for Downy and Powdery mildew** directly after 3 months of growth in Petri dishes in culture chamber in order to evaluate *in planta* the resistance suspected by M.A.S.

Vinification from **the harvest of 1 to 2 two years old plants are done on « micro tank »** in order to evaluate the first basic information for wine production (acidity, pH, alcohol, anthocyanin and polyphenol contains)… Wine from 250 mL to 1L is tasted and evaluated.

Based on those preliminary criteria, selection is made for « **quick wood production protocole** » to prepare plants for official phenotyping evaluation on field.

Production

Production of grafting material is a critical step in the breeding process
1 - To **increase the quantity** available for official evaluation
2 - To **have enough plants** directly after the registration to match the market needs.

In 2020, Mercier Frères has build a 4ha greenhouse to speed up the production process. We are now able to **multiply by 100 to 200 the start quantity** of material in **one year.**

In 2022 and for the first time, **22 new grapevine genotypes** are evaluated and registrated simultaneously following the NATHY breeding process discussed here, hoping to propose a new resistant genotype by 2028.

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