

The challenges of genetics and digital in the vineyard on show in Paris

By Alessandra Biondi Bartolini

The perspectives of development and dissemination of the new vine varieties and the digital transition were the themes that animated the annual conference of Lien de la Vigne - Vinelink international, held in Paris on March 29th 2019 .

The speakers from the world of research and production presented the state of the art of ongoing projects and the future of innovation in the field to the public made up of professionals and researchers representing the main business realities of the whole wine world such as Moët Hennessy, Schenk Wine, Bodegas Torres, Ruffino, Zonin1821, Cantina Toblino, Sogrape Vinhos, Jas Hennessy, Bucher Vaslin, Gruppo Pellenc, Vivai Rauscedo, ITK Cap Alpha, Fruition Science, Geocarta, Oeneo, Amorim & Irmaos SA, Laboratoire Dubernet, Cea Tech, Global Vini Service, the main research centers that is INRA, IFV ENTAV, CNRS Paris Sud, Plumpton College, Bordeaux Science Agro, University of South Australia and the main inter-professional organizations namely CIVC Comité Champagne, BIVB Vin Bourgogne, Interloire, Consorzio Vini del Trentino.

"The conference focused on two of the most important transitions that the wine business is facing and that will shape the future of the sector", said Peter Hayes, Jean Pierre Megnin, Michel Boulay and Carlo De Biasi, administrators of Lien de la Vigne, "in the first half of the day the theme of ecological transition, adaptation to climate change and reduction of chemical inputs through genetic improvement and varietal innovation, highlighted how it is increasingly urgent to find a balance between production, the trade system and the needs of respect and conservation of the planet".

In the second half, the conference dealt with the theme of digital transition, presenting a series of concrete examples that demonstrate its great potential, highlighting its strategic advantages and innovation dynamics. "Indeed, we are entering a new and constantly evolving industrial era in which, to seize the opportunities offered by digital innovation integrated in the various business functions, from the fields of trade to marketing, it will be necessary to develop highly creative potential".

Resistance, hybridization and NBT in genetic improvement programs around the world

Speakers in Paris presented many of the ongoing short and long-term programs in European and non-European countries concerning the development of new varieties suitable for climate change and the objectives of sustainable viticulture.

The subject of the reports was the study of the characters and genes of the European varieties of *Vitis Vinifera* and the American and Asian species resistant to fungal diseases and carriers of other characters of agronomic interest, that regulate the techniques of traditional improvement and hybridization and the programs of New Breeding Technologies NBT such as genetic editing, the need for genetic improvement and expansion of the proposal of rootstocks suitable for the new environmental and genetic conditions. The concern of researchers, nurserymen and inter-professional organizations involved in the projects was leaked, due to the legislative limitations for the NBT, and for the misalignment between national and European regulations for the

authorization of the cultivation of resistant varieties obtained with techniques of traditional crossing.

At the end of the session, Laurent Audeguin of the IFV (Institute Francaise de la Vigne et du Vin), analyzing the improvement programs in other regions of the world, from the USA to Australia and even China, paid particular attention to some concepts arising from the numerous presentations translating them into useful elements for discussion.

It must first be recognized that within the natural variability of the genus *Vitis* the sources of resistance are limited and precious and the introduction of resistance genes within the plant material is a path that takes a long time.

In addition to resistance to oidium and downy mildew, on which most improvement programs are concentrated, attention must also be paid to genes resistant to other secondary or emerging pathologies, some of which have already been identified, others not yet described, such as those for Pierce's disease, Black Rot, excoriosis or premature wasting.

To encourage this development, the French researcher said, it would be necessary to facilitate the international exchange of pre-breeding plant material.

The resistance genes described so far for oidium and downy mildew are 21 for the first and 12 for the second. Some of these have a high level of total tolerance or resistance and are contained in the genome of *Vitis Romanetii* (REN4), *Vitis Piazeskii* (REN 6) and *Vitis Rotundifolia* (RUN1). Of all the resistance genes, currently only seven (four for downy mildew and three for oidium) are used in improvement programs and two of these resistances have been circumvented by pathogens.

This is one of the risks most feared by breeders around the world, the possibility that pathogenic fungi can develop evolutionary mechanisms capable of overcoming the resistance introduced, thus becoming more virulent.

The OIV Resolution of June 2013 in this regard recalls, among other things, that "break down" phenomena are known for some varieties such as Regent and Bianca, in which a single resistance gene was introduced whose mechanism was circumvented by pathogenic fungi, and consequently recommends to develop improvement strategies for genetic lines that contain at least two resistance genes for each specific pathogen and to protect the acquiring resistance with a minimum program of pesticide defence in the vineyard also for resistant varieties.

However, it is not only on the introduction of resistance that genetic improvement has concentrated in recent years. In *Vitis Vinifera* 24 genes have been identified responsible for the quality characteristics of the grapes and wines (8 for the anthocyanins, 4 for the organic acids, 4 for the volatile compounds with vegetable aroma, 7 for the sugars and the nitrogen assimilable by the yeasts and 1 for must proteins) and many improvement programs are also working on specific agronomic requirements imposed by new environmental conditions due to climate change. Among the latter, we can recall the needs of Champagne winemakers to have varieties with a late vegetative cycle to escape the risk of frost and to preserve the acidity in musts for the production of sparkling wine bases, or that of producers in Mediterranean countries to have plants resistant to water and thermal stress.

A ferment of innovation and knowledge matured in laboratories, experimental fields and nurseries all over the world that thanks to traditional techniques and, in the near future, to the new "sartorial" techniques of genomic editing (NBT), is progressively becoming an increasingly sustainable strategy practicable, which has, however, found in European norms and bureaucracy and of individual states the greatest brake for its diffusion.

Last July, the European Court of Justice expressed itself indicating that the plants obtained with genome editing techniques, which modify individual genes without the addition of genetic material from another species, should be considered as genetically modified organisms defined by Dir 2001/18 CE, effectively blocking research and development. Huge damage to the growth prospects offered by programs already underway such as the BIOTECH-VITECH project, mentioned by Gabriele Di Gaspero of the University of Udine, financed in Italy by MIPAAFT in 2016 with the aim of obtaining grape varieties and from wine as well as improved rootstocks with cisgenesis and genome editing techniques.

For the resistant varieties obtained by crossing, the limitations derive for the moment instead from what is reported by the Reg 1308 of 2013, which excludes the use for wines with denomination of origin as registered as hybrids, even if for them it appears to be horizon of 2022 a possible opening of the CAP and it will then be necessary that both the oenological quality as well as the viticulture the main eligibility criterion for the inclusion in the lists of the varieties authorized in DOP and IGP.

Digital and AI that integrate business functions

Why is digital transformation essential for the growth of a business and how should it happen in order to improve business processes or systems? This is the question that conference participants tried to answer in the second session of the Paris meeting. Successful examples speak for themselves, underlined Armando Corsi of the University of South Australia and Peter Hayes president of Lien de la Vigne: digital transformation brings competitive advantages, improves employee efficiency and user experience, allows getting to know their customers better, increasing brand diffusion and providing security for future developments. Digital technologies give the opportunity to anticipate business opportunities or to respond to existing needs, to internal ones as well as to B2B or B2C ones.

The choice of the most suitable tools for one's own organizational reality is fundamental, being present at present many advanced systems and technologies that are not always able to integrate with company systems and risk being redundant, requiring specific support and skills and in the end to be abandoned quickly.

In this process the involvement and feedback of the figures that use and measure themselves with the inclusion of digital innovations, is fundamental.

In the processes of innovation (not only in the case of digital technologies) has concluded Corsi does not exist the silver bullet, that of the good cowboy who does not miss the shot, it is necessary to consider innovation as a function in progress, looking more to the processes and to ideas rather than tools.

In the world of wine there are examples and cases of companies that have been able to exploit innovative ideas to generate successful business using the tools of new information and

communication technologies, in viticulture as well as in winery management or in marketing and supply chain. A case of disruptive innovation, which creates a break within the existing technologies (as opposed to what happens in the progressive innovation that aims instead to optimize the existing ones), is for example that of Naked Wines, the English start-up of Rowan Gormley who has replaced the principles of continuous support and crowdfunding with traditional B2C distribution. Others are those that, through the use of digital tools of the Internet of Things, integrate and innovate marketing services or distribution processes, bringing improvement and innovation in the guarantees of authenticity and traceability of bottles with the use of RFID and blockchain technologies, or by introducing new B2B or B2C digital marketplace platforms.

"The digital transformation as the rational use of genetic resources, the two issues addressed by the participants of the March meeting of Lien de la Vigne, are key changes that will have to be addressed in the coming years", notes Peter Hayes, Jean Pierre Megnin, Michel Boulay and Carlo De Biasi, considering what emerged from the conference, "To facilitate this transition not only must the international public research centers be activated, but also the private companies, with all their business functions including those of marketing and civil society must be involved. The spirit of the day was precisely that of the comparison necessary to offer an illuminating and at the same time corroborating point of view on the future of our sector".

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Lien de la Vigne is an independent association that unites public and private research centers, producers and inter-professional structures, dedicated to the collaboration, exchange and transfer of technological innovation for the wine sector. Conferences, surveys, the development of research partnerships and international collaborations between all the figures in the supply chain are the tools used by the Association, established in 1992 and based in Paris, to promote the development and dissemination of innovation in the wine sector.