



## **INTERVIEW WITH MR BASILE PAUTHIER AT COMITÉ CHAMPAGNE - 07/01/2017**

**POSITION:** Terroir Project Manager

**INSTITUTION:** Comité champagne

The goal of this interview was to understand the main climate changes affecting the vineyard in France. We discussed about the dangers of cold temperature and also how winemakers can reduce the impact of frost with the help of particular devices.

### **WHAT ARE THE MOST SIGNIFICANT CLIMATE CHANGES AFFECTING VINEYARDS FOR THE MOMENT ?**

The frost touching the vines is the problem of the year. Global warming results in a trend with mild winters and therefore affects the annual growth cycle of grapevines. The time of vegetative stage on cepages is shorter resulting in a potential frost during or just after budburst. This year, the frost during the spring resulted in a loss of 70% of the grapevines in the region of Bordeaux and a loss of 25% in Champagne. These losses are catastrophic for Champagne winegrowers even if they have a stock of bottles allowing compensate a climate hazard.

For the hot temperatures all the plant needs to be protected from the heat and specifically the fruit ( difference with cold temperature). However the heat has been beneficial for the champagne region. It allowed to enhance the degree of alcohol without decreasing the acidity of the wine. The vines have a great capacity of adaptation, consequently they support well the strong heats. A long drought can cause a harvest earlier in the year but the case of heat damages on vines in Champagne are pretty rare . However, if the temperature continues to increase the variety of wine will need to be adapted to warmer temperatures in the different wine regions of France in the future years.

### **WHAT ARE THE DIFFERENT TYPES OF FROST ?**

There are two types of frost. The most relevant is the radiative frost causing the most damage on the grapevines during spring. It occurs during clear nights with little or no wind when the outgoing radiation is excessive and the air temperature is not necessarily at the freezing point.

The second is the advection frost. It occurs at any times ( day and night) regardless of cloud cover, when wind carry air from polar regions.



## WHAT ARE THE TECHNIQUES USED IN ORDER TO REDUCE THE FROST ?

Several techniques to counter these losses are used by professionals in this sector. These techniques are divided into different categories. The first one is to bring heat to the plant by heating the ambient air such as the use of candles. This technique is very expensive and time consuming. A unique candle costs 10 € and one hectare needs to have 500 candles per night in order to be effective against frost. So imagine if the winemakers has 10 night of frost during the spring, it will cost approximately 50 000 €. On top of that, there are existing fuels, air brewers or electric heating wires.

Different firms are working on the fight of frost using heat such as Agrofrost producing an anti frost solution or Technitrace producing electric heating wires in France. Technitrace is a company that specializes in the manufacturing of all type heating cables for electrical tracing. Its principle is the heating of the air by convection until the inversion process occurs on the plants.

One method widely used called "sprinkling", allow to maintain the plant at 0 ° C under a layer of permanently moistened ice. This method will be more efficient with a low wind and a homogeneous water supply. It is the safest technique to fight frost but it has some disadvantages such as the use of a huge quantity of water but also a risk of breaking branches under the weight of ice.

Another known method is called " air mixing". This technique allow to mix the layer of air near the soil surface with the layers a few metres above the soil and consequently reducing the risk of frost. The first way to do this is by the use of wind machines increasing the air temperature of 1 to 1.50 °C. Another way is by the use of helicopters. This method is too expensive and subject to considerable regulation.

Other techniques are being tested in order to reduce frost damages. Some studies are working on particular bacteria called *Pseudomonas syringae*. This bacteria has a particular membrane protein which had the ability to act as a nucleation site, called ice-nucleating proteins (INPs). The increase in number of nucleation sites promotes freezing at higher temperatures. With a genetic manipulation , bacteria which has a mutation in this particular protein resulted in a lower freezing temperature of water droplets on the surface of plants.



## **HOW CAN WE REDUCE OUR ENVIRONMENTAL IMPACT ?**

It is possible to reduce our environmental impact through the use of collector panels. These devices being tested by the company called TECNOMA will allow to catch and recycled the excess solution for the purpose of using it for another time. This technique, in the context of the project, would also prevent the unwanted dissemination of our bacteria into the environment.

## **CONCLUSION OF THIS INTERVIEW**

Mr Pauthier offers to us the possibility to do some experimentation in their institution. If the proof of concept is successful, a partnership will be done between the iGEM Paris IONIS team and the Comité Champagne in order to perform some test the field.