



INTERVIEW WITH DR. CAMILLE LENOIR

POSITION: PhD in Plant Pathology and Agronomy, formerly project manager for the Wheat Initiative, currently process engineer for Syngenta

INSTITUTION: INRA

RESEARCH SUBJECT: Role of two protein effectors produced by aphids in their survival on plants

Camille Lenoir was one of the first external persons we talked to about Softer Shock. At this time, the project was still at an early stage as we had just begun the bibliographic work about plant protection. This interview allowed us to have a first expert insight on this idea, in order to assess if this application could be feasible and how the scientific community would react.

KNOWING THAT A SAFETY STRATEGY HAS BEEN DEVELOPED AROUND THE PROJECT, DO YOU THINK FARMERS WOULD BE WILLING TO USE GENETICALLY MODIFIED MICROORGANISMS TO PROTECT THEIR PLANTS?

→ Beyond the fact that this is a good idea, European safety standards towards GMOs are very high. You will have to get well informed about regulations in different countries in order to know which barriers could compromise this project. Especially, you will have to be very careful about the surrounding environment, including the possible effects on the root microbiota. Theoretically, developing such a solution would require lots of laboratory tests to be considered safe.

WOULD YOU FIND IT MORE RELEVANT TO MAINTAIN THE PROTEINS AT THE LEAVE SURFACE BY FORMING A BIOFILM IN WHICH THEY WOULD BE EMBEDDED ?

→ With a biofilm, there is a risk to block the plant respiration process. According to me, it would be preferable to keep the bacteria free in their medium, maybe added with an adjuvant to maximize their adhesion. It would be interesting for you to contact an expert in this domain to get more precise information.

SO YOU WOULD RECOMMEND US TO MAKE THE MICROORGANISM EXPRESS THE PROTEIN OF INTEREST DIRECTLY IN ITS MEDIUM ?

→ The problem is that the compounds produced will not necessarily be active and functional alone in the medium or on the plant surface, except if they directly bind to external elements directly present on the plant surface (like it is the case for antifreeze proteins that bind ice crystals). You can look for which proteins compose the plant cuticle. It may also be interesting to integrate additional synthesis elements that would contain the bacteria with the proteins produced, like micro or nano beads.



WHAT WOULD BE THE PRINCIPAL CRITERIA TO TAKE INTO ACCOUNT IN THE MICROORGANISM CHOICE AS WELL AS THE MEDIUM COMPONENTS?

→ The solution will have to bring the optimal growth conditions for your microorganism, without compromising the plant microenvironment (be careful about the pH for example). Concerning the microorganism choice, it would be interesting to look for symbiotic bacteria to allow a good integration into the plant microbiota. You also have to be careful that the microorganism you choose does not enter the plant through stomata. Those elements constitute the entry point of many disease inductors.

WHAT IS YOUR GLOBAL OPINION ABOUT THE USE OF CASEINS AGAINST INTENSE HEAT DAMAGES ?

→ You have to check that the compound produced does not have any influence on the plant yield nor other agronomic traits. It is also necessary that there is no toxicity for the plant as well as for humans and animals. Concerning the efficiency of the casein to reduce the surface temperature, it would be interesting to test the strategy on real leaves in a laboratory if you have the time. Some plants are commonly used as their growth rate is very fast. It is notably the case of *Brachypodium distachyon* (2 weeks in average to perform significant tests), or Nicotiana.

WE WANT OUR MICROORGANISM TO REMAIN AT THE PLANT SURFACE. IF WE CHOOSE A BACTERIA, WHICH CHARACTERISTICS OUR CHASSIS SHOULD HAVE NOT TO PENETRATE THE PLANT THROUGH STOMATA NOR TRIGGER AN IMMUNE RESPONSE FROM THE PLANT ?

→ The bacterial flagellum is the first component recognized by the plant and susceptible to trigger an immune response. Once a potentially deleterious component is detected, a reaction cascade is activated and can lead to the appearance of a resistance. It will be necessary for you to neutralize this cascade. Your bacteria will also be exposed to the pesticides and other chemical products applied on the plant at the same time.