

## **WG4 iPlanta Meeting**

**In collaboration with**



## **MINUTE**

**SEPTEMBER 10-12, 2019**



The WG4 organized a COST-iPlanta event joint with the CIR conference 2019 "Crop Innovations and Regulations" the 10 - 12 September 2019 in Barcelona, Spain. iPlanta contributed in the organization, with the support of different speakers, of one session dedicated to RNAi and also other sessions dedicated to biotechnologies by bringing specific contributions on RNAi technologies and applications. The iPlanta activities have been included in the program of CIR conference.

The meeting lasted one and a half days from the morning of Wednesday 11 to the morning of Thursday 12 september.



### **MORNING SESSION - Wednesday 11<sup>st</sup>**

The meeting was opened by a welcome and short introduction on the aims of iPLANTA Action and of the meeting by Prof. Bruno Mezzetti, Chair of the Action. Prof. Mezzetti also took the first speech entitled "RNAi offers unique benefits and opportunities to sustainable crop production: case studies of horticultural crops". He showed some results of recent studies indicating that RNAi is an efficient technology to successfully induce pathogen resistance in fruit and woody species. He also introduced some hot issues regarding the formulation of RNAi based products, the Increase in the stability of sprayed RNAs with different formulations and their costs, which is one of the most critical aspects still to be optimised. Moreover, he proposed some highlights on the regulatory framework,

proposing that RNAi, being a RNAi natural small molecule, can fall under the category “biopesticide” in the existing EU regulation.



The second intervention was by Dr. Lorenzo Aluisa, who presented “how to Design New and Effective Bio Solutions for the Ag Market”. He showed the case study of Green Light Biosciences™, a US biotech company that successfully produce large quantities of RNAi and is going to release the first commercial product. He provided some highlights on Formulation Design, dsRNA “Stability” and “Persistence” on the Leaf, giving evidence that RNAi can open new and interesting Scenarios for agbiotech market. Dr. Geert Plaetinck from Syngenta had a speech titled “RNA based biocontrols: the bio delivery challenges”, showing that RNAi is Highly selective for a target pest and therefore presents low risk for other non target organisms. Dr. Nikoletta Papadopoulou presented the “EFSA’s activities on the risk assessment of RNAi based GM crops”. She reported that EFSA organised a workshop in 2014 on the risk assessment of RNAi GM crops, focused on Off target effects in the RNAi based GM plant, the Processing of ingested RNAi molecules, the Ingestion of RNAi based GM plants by humans and livestock and Off target effects on non target arthropods of ingested RNAi based GM material. She also presented some highlights on the risk assessment of RNAi based GM maize. Dr. Caroline Drummond spoke about “Assessing adoption hurdles of biocontrol with farmers”. She presented the main activities of Leaf, an association aimed at facilitating sustainable farming knowledge and generation exchange, developing market opportunities, educating and engaging the public in sustainable food and farming. She suggested that the most efficient way to facilitate innovation adoption within farmers is considering that farmers value knowledge delivered by people rather than roles, they privilege farming experience, and develop knowledge with empiricist rather than rationalist techniques. This supports the importance of building on existing networks, community engagement, training, working with government and measuring impacts. The morning session ended with a round table discussing the

trends of agriculture- the future of farming with Prof. Bruno Mezzetti, Dr. Luc Peeters (COPA-COGECA) and Dr. Lorenzo Aluisa (Greenlight Biosciences). Bruno Mezzetti introduced stating that RNAi can have fast easy applications in different context, especially in Europe, the feeling is that there are different techniques at different costs and RNAi based new products can probably have fast future if technical problems in terms of formulation, cost reduction and maybe easier acceptance by growers and consumers. He also added that more research and field trials are needed, demonstrating what can be the benefits. Dr. Luc Peeters said that the quality will change very rapidly in terms of inputs, also the suppliers have to change. We need more technology, to see how to deal with social pressure, since in the most recent period US consumers are moving into the European position. Another theme is the speed of transition, problem for the farmers as long as you clearly demonstrate the benefit for the farmers, what about the benefit for the farmers? Dr. Lorenzo Aluisa: there will be a change, growth of traditional pesticides at 5%, biological pesticides 50%, not only because people are changing their mind, also because they are more efficacious for some biological problems. Delivery is a key point, we have to look in different ways, and water is becoming an issue. Mezzetti: science will keep going, the weak point is that some technologies are not going to be accepted, need to work on better science communication. Aluisa: the work of scientist is becoming tougher, finding new molecules is becoming a challenge, selectivity is very important. Nevertheless, science is making great progress, today is easier to fight agricultural pest.

### **AFTERNOON SESSION - WEDNESDAY 11<sup>st</sup>**

The first afternoon session (14.00-15.30) focused on the biosafety aspects of RNAi technology.

Olivier Christiaens, Postdoctoral Researcher at UGent University had a speech on “RNA based biocontrol products: biosafety considerations”. In his presentation, he showed an overview on biosafety considerations regarding this technology, with a focus on insects. First, an introduction on the mechanism, including factors affecting RNAi efficacy in insects and remaining knowledge gaps. The potential for high species-selectivity and possible adverse effects on non-target organisms, and the potential role of bioinformatics in predicting these. Finally, he gave some insights on the current knowledge regarding environmental fate of dsRNA in the environment. Then, Kalle Kogel, Professor at University Gießen presented “Plant Protection by non-coding RNAs: Promises and setbacks”. The advantages and disadvantages of using dsRNA to control plant-damaging insects and pathogens in direct applications ("environmental RNAi") or as a plant-generated transgene (host-induced gene silencing, HIGS) have been discussed. While the strategy has a high potential, it is necessary to continue looking for ways to improve the practical application of RNAi and to consider risk and safety aspects in sufficient detail. Marko Vinceković from the Faculty of Agriculture, University of Zagreb spoke about “Alginate microcapsules/microparticles loaded with biological agent (biofertilizers) and chemical agents (macro- or micronutrients) for agroecological production”. He said that efficient formulation demands a carrier material which must preserve or maintain living organisms in a viable condition during storage and transport as well as must keep its functional properties after application. Encapsulation in microparticles (microspheres/microcapsules) is an advanced technology which is superior to other formulations in terms of living organism protection from the environment, improvement of their viability and possibility of controlled release into the

field. Clauvis Nji Tizi Taning Postdoctoral Researcher at Ghent University had a speech on “Virus-based dsRNA delivery systems for use in crop protection”. He stated that while most beetles seem to be more sensitive to dsRNA delivered through the oral route, this appears to not be the case for many other insect species. A great amount of research is being conducted to develop efficacious dsRNA delivery strategies in an attempt to overcome some of the barriers which have been identified to impede RNAi efficiency in these insects. One of these delivery approaches is viral delivery of dsRNA. Viruses can be modified to express insect-specific dsRNA, either in plants or in the insect itself. This approach has several benefits which allow a more efficient control of the target pest or disease.

The second afternoon session (16.00-18.00) focused on “New technology-Public opinion on GM”. Vera Ventura from the department of Environmental Science and Policy, Università degli Studi di Milano evaluated the global landscape of RNAi innovation by analysing patent data as indicators of innovation output. Results revealed that RNAi is a technique with promising future applications, able to provide solutions to a great variety of agricultural issues and principally developed by US and Chinese applicant, whereas European innovation capacity in this field appears to be limited.



Prof. Joost Dessein Associate Professor at UGent, presented “Dancing with the devil? Reflections on communication in the GM arena”. He stated that the present non GM crop regime can be classified as a “wicked” problem: Difficult to clearly define, Have a multi level actor involvement, with many interdependencies, No clear solution, Attempts to address them often have unforeseen consequences. Do we need more debate? No, he said that we need ANOTHER KIND of debate, suggesting to broaden the curriculum of bio scientists, invest research money to investigate how such processes can be organised, invest in asking the right questions and work inter/transdisciplinary from the start. Hans De Steur Phd Post-doctoral Lecturer and Researcher at

UGent, spoke about “Public acceptance of CRISPR tech”. He presented the acceptance among consumers regarding NPBTs such as CRISPR/Cas9 in Belgium and the Netherlands with a primary focus on the European regulatory framework and consumer opinions on EU labeling practices and particularly focusing at social trust and food neophobia. The results highlight the need for consumer research on this specific technology to better understand and explain consumer perceptions and preferences in the debate on new GM technologies.

### **MORNING SESSION – Thursday 12<sup>th</sup>**

The morning session was titled “RNAi Genetically Modified Plum Resistant to Plum Pox Virus” and started with Michel Ravelonandro, Director of Research at INRA. He stated that beyond economic losses due to sharka disease, silencing is a square-edged approach to degrade plum pox virus genome. Either researchers developed varied approaches (aphid vector control, mineral oil...) or they shared different concepts applicable (identification of natural gene resistance, tolerant cultivars...). Having addressed a common challenge with PPV, and identified different phenotypes varying from resistant to tolerant, the technology transfer to professional in stone-fruit industry is still pended. Arguing that European regulators and pathologists are controversially preoccupied with the expanded growth of tolerant cultivars that represent virus reservoirs in central Europe and Balkan, fighting against PPV remains challenging. HoneySweet plum showed a stable and durable resistance phenotype, conversely RNAi, spread in HoneySweet plants, interact with PPV genome in order to degrade it. Silencing technologies are ahead of new and efficient solutions pushing away any experimental attempts to tackle PPV. Overall, these experiments provided academic credit towards HoneySweet plum that efficiently fought against PPV through a square-edged approach that makes a laboratory findings exhaustive. Then, Ioan Zagrai, senior scientist and head of Research Department of Fruit Research&Development provided an “Overview on long term field trials of the first RNAi genetically modified plum resistant to plum pox virus in Romania”. Finally, Ralph Scorza, Supervisory Research Horticulturist at USDA had a presentation on RNA Profiling and Compositional studies of HoneySweet Plum for Regulatory Approvals. Honeysweet’ has been approved for cultivation in the US but not in European countries where PPV is endemic. Proximate analysis of ‘HoneySweet’ fruit was carried out on fruit harvested in Europe utilizing a wide variety of comparators and different collection years to evaluate year-to-year and location variability. The results revealed that plums have a wide variation in composition and that variation among locations was greater than variation among cultivars. This was also the case for different years at one location. The results of these studies demonstrate that the transgene and insertion event had no significant effect on the composition of ‘HoneySweet’ fruit even under virus pressure, and that it fell in the normal range of composition of commercially grown plums. Collectively, the data confirm that RNAi provides a highly effective, stable, and safe strategy to combat virus diseases in crop plants.



The second morning session focused on the application of RNAi in Fruit production.

Anna Aldrighetti, Technical Manager in Pest Management Sant'Orsola S.C.A spoke about "Fruit berries production needs solutions to prevent pest and disease dissemination: can RNAi technology be helpful?" he outlined the current scenario of fruit production, with consumers requiring transparency, healthy product and sustainability, a lack of effective biorationals, strict phytosanitary regulations, the existence of some forms of pest resistance, changing climatic conditions. she added that current strategies include preventive practices, new disease forecasting models' design, the use of hydroponic system, the use of predators, parasitoids, plant products and ecologically safer chemicals forms and physical barriers. So far, nets are the most effective solution. She concluded that RNAi can be helpful in fruit production, adding some concerns about Non target organisms and on public opinion.

Jacopo Diamanti had a speech on Fruit Nursery Industry Needs Solutions To Prevent Pest And Disease Dissemination: Can RNAi Technology Be Helpful? He said that In these past years Nursery Industry and consequently the fruit Industry had faced a great number of new pests, most of them coming from other continents, and the estimation of economic damage of alien species for the European agriculture was estimated to be approximately of 12,5 billion of €/ year. the constant reduction of active compounds that could be used in agriculture together with tiredness of soil and the lack of knowledge regards alien pest species have brought to an irreversible condition: growers are leaving the crops . therefore he concluded saying that RNAi technology, which is able to interfere

with ubiquitous fungi that nowadays are becoming a menace, reduce the use of pesticides or support the use of allowed pesticides can be a strategy to be ready to face new alien pests.

