



SHEDDING MORE LIGHT ON THE BACTERICIDAL ACTIVITY OF ALIETTE® AND PHOSPHITES

THE USEFULNESS AND MODE OF ACTION OF ALIETTE® ARE OFTEN CALLED INTO QUESTION. WORK DONE BY CRA-W HAS DEMONSTRATED ITS DIRECT ANTIBACTERIAL ACTIVITY.

Lack of available active substances is a problem in controlling plant bacterial diseases. The European Union banned the agricultural use of streptomycin back in 2004, fearing antibiotic multi-resistant strains. Copper promotes resistance in *Pseudomonas* (orchard pathogens) and adversely affects the plant and the soil. For the last few years Aliette® has therefore sometimes been advocated for control of bacterial diseases. The active substance is aluminium monoethyl-phosphite, called fosetyl-Al, which has been used since the late seventies as a phycomycetes fungicide. However, its mode of action remains controversial, giving rise to speculation.

This is due to the diversity and complexity of fosetyl-Al's assumed modes of action. When solubilized in water it lowers the pH and releases Al³⁺ aluminium ions, which can have a superficial antimicrobial activity on plants. Ethyl phosphite is broken down

into phosphite and ethanol by the plant or the microorganisms. These phosphites could stimulate the plant's defences or perhaps trigger them, making it subsequently more resistant to a pathogen, or act as growth stimulators. Lastly, the similarity between phosphite and phosphate may inhibit certain enzymes or deceive the external phosphate concentration sensor systems, prevent the induction of specific genes in low phosphate conditions, and cause a phosphorus deficiency in the plant or the microorganism.

We studied the effects of Aliette® on populations of *Pseudomonas syringae* developing on pear tree and cherry tree leaves and *in vitro*. The results point very clearly towards direct inhibition of bacterial pathogen growth. The effect is almost total in acid conditions and still very significant in neutral pH conditions. The ability of ethyl phosphite and phosphite to inhibit bacterial growth

has been shown. Two mechanisms appear to be at work here: probable enzyme inhibition and induced phosphorus deficiency.

The results demonstrate the potential of Aliette® as a direct-action antibacterial agent, but its application must be managed because of the phytotoxicity risk. As Aliette® controls the problem of pear tree winter flower bud death, the results open up new prospects for understanding the origin of the problem. Observing that phosphite has an antibacterial effect also throws new light on the benefits of phosphite-based treatments in situations where bacterial disease problems might be poorly understood or unsuspected.

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LABELLED WALLOON PIG PRODUCTION CAN MAKE IT WITHOUT SOYA!

IN COOPERATION WITH ORFFA BELGIUM, SCAR (HERVE) AND PQA (MALMÉDY), CRA-W IS REDUCING THE PLANT PROTEIN DEFICIT IN WALLONIA PIGS.

Large-scale European imports of soya have dreadful consequences: pauperization, health damage, deforestation of South American producing countries, climate change, etc. Those are of increasing concern to European agriculture. The relevance of self-sufficient production models at farm level suggests



that innovative approaches should be tried out. This development is obvious in productions involving ruminants as it can be easily achieved by increasing the proportion of fodder, but it is more difficult when it comes to non-ruminants like pigs.

To that purpose, an experiment involving 168 pigs (21 stalls) was conducted at CRA-W's experimental pig farm, in order to confirm the hypothesis that it is possible to do without soya in fattening pigs' feed. The production was taking place within the framework of the 'Le Porc Fermier de Wallonie' assurance scheme. The carcass quality and zootechnical performance at the pre-fattening stage (20-40 kg live weight) and at the fattening stage (40-125 kg live weight) were compared between pigs fed a soya and a non-soya diet (soybean meal, seeds, oil). No specific reduction in the protein content was included in the feed formulation.

The experiment showed that the pigs' zootechnical performance was as good on a soya-free diet. The growth rate and feed conversion ratio at the pre-fattening stage were better. There was no significant effect at the fattening stage. Nor was there any impact on the feed cost or carcass quality. Provided that the raw materials that compose the feed are correctly characterised and that the feed meets the recommended formulation and manufacturing requirements, it is possible to do without soya for fattening pigs. By lowering the raw protein content and maintaining the essential amino acid levels, reducing feed costs might even be possible.

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RESEARCH INTO ALTERNATIVE PROTECTION METHODS IN ORGANIC FRUIT GROWING

BITTER ROT IS THE MAIN FUNGAL DISEASE OCCURRING IN STORED APPLES AND PEARS IN WESTERN EUROPE, ABOVE ALL IN ORGANIC FARMING WHERE THERE IS CURRENTLY NO PRODUCT OF ACKNOWLEDGED EFFICACY AVAILABLE. CRA-W HAS THEREFORE CARRIED OUT SOME ORCHARD TRIALS TO ASSESS THE EFFECTIVENESS OF TWO NEW TREATMENTS.

The study consisted of measuring, over two harvest seasons, the impact of several applications in the orchard of a calcined clay-based formulation (Myco-Sin) and a natural defence stimulant (Vacciplant) on bitter rot development during the post-harvest cold storage period ($\pm 2^{\circ}\text{C}$).

The trials were conducted during the 2013/2014 season on three apple tree varieties susceptible to bitter rot from CRA-W's experimental orchards. A validation phase then followed during the 2014/2015 season at an organic fruit farm growing the Jonagold variety. This trial, in response to a specific request from the industry, was carried out in cooperation with GAWI.

These trials at the CRA-W orchards showed that Myco-Sin (six pre-harvest applications) reduced the incidence of the disease by 50%. In contrast, Vacciplant (two pre-harvest applications) had no significant impact. The trial at the grower's did not show either treatment to have any significant effect on the fruit.

From the trials it was concluded that applying Myco-Sin in the orchard can delay development of the disease in certain conditions. The application rate and treatment frequency appear to influence the impact on disease reduction. Three Myco-Sin treatments were found to be insufficient in our experimental conditions. In view of the product's partial effectiveness, this method should be considered complementary to other means of protection. Vacciplant did not demonstrate any significant effect in any of the trials. Both products are authorized in other European countries for control of other diseases in organic farming. Vacciplant is a protection product authorized for use in Belgium and in organic farming, unlike Myco-Sin which has not been approved for use in Belgium.

Other methods investigated by CRA-W aimed at improving fruit storage offer good prospects. One of these is the Janny MT (Mat Tiempo) fruit storage module, which incorporates semi-permeable membranes. These are individual modules that can store approx.



300 kg of fruit. The oxygen and carbon dioxide levels are regulated naturally to improve the storage conditions.

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ARE ENDOCRINE DISRUPTORS IN WATER HARMFUL TO HEALTH AND THE ENVIRONMENT?

THE WHO DEFINES ENDOCRINE DISRUPTING CHEMICALS (EDCS) AS EXOGENOUS SUBSTANCES THAT ALTER FUNCTIONS OF THE ENDOCRINE SYSTEM AND CONSEQUENTLY CAUSE ADVERSE HEALTH EFFECTS IN ORGANISMS OR POPULATIONS. THEY REPRESENT A MAJOR CHALLENGE FOR BOTH HUMAN HEALTH AND THE ENVIRONMENT.



EDCs are included in the European list of priority substances for surface water and they are on the European watch list. They are a special class of emerging pollutants that are considered especially concerning and knowledge of which in terms of environmental presence and effects on health and/or the environment is still relatively limited.

Launched at the instigation of SPW-DG03, the BIODIEN project aims to carry out initial screening for EDCs in Wallonia's water by bringing together three Walloon public laboratories (ISSeP, CRA-W and SWDE) formed into the scientific interest group GISREAU (Walloon reference scientific interest group for water quality). Industrial substances (alkyl phenols, phthalates, perfluorinated compounds, chlorophenols, etc.) and pesticides (pyrethrinoids, carbamates, imidazols, etc.) are both being targeted.

250 samples, considered representative, will be used to complete the inventory of Wallonia's water quality, assess the level of (anti-)oestrogenic and (anti-)androgenic activity, evaluate the potential of bio assays as screening tools, and compare their efficiency with other types of test.

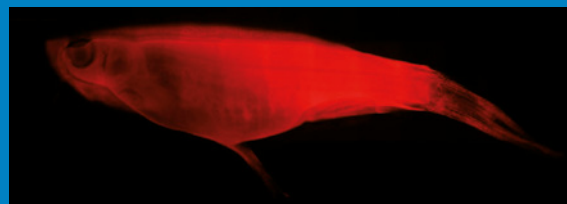
In this context CRA-W has developed and validated UHPLC-MS/MS and GC-MS/MS multi-residue analytical methods for determining 75 pesticides. EDC screening covers a representative selection of groundwater, bottled water, surface and runoff water and treatment station discharges.

The project will enable tools to be made available for showing the presence of endocrine disruptors in the water cycle in Wallonia and Brussels.

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IS MY FISH TRANSGENIC?

TRANSGENESIS IS NOT CONFINED TO PLANTS, AND DEVELOPMENTS IN THE ANIMAL KINGDOM HAVE ALSO RESULTED IN ACTUAL CASES. THE MOST SUCCESSFUL DEVELOPMENTS CONCERN FISH, EITHER FOR FOOD OR FOR AQUARIUMS. CRA-W HAS DETECTION METHODS READY.



In the context of the SPF UGM Monitor project, CRA-W has developed methods for detecting a transgenic salmon called AquAdvantage, a growth hormone production modified salmon that can reach market size in 16 months instead of three years. Now it has received its marketing authorisation in the US, this fish could flood the world market and end up by mistake on the plates of European consumers.

But transgenic fish are also sneaking in via aquariums. At the request of FASFC, the possibilities of illegal imports of genetically modified tropical fish have been investigated and detection methods have been developed for fluorescent fish. These fish produce proteins that give them a red, yellow or green fluorescent colour under the aquarium lights. New colours regularly appear on the market.

The detection methods developed by CRA-W have already been used in cooperation with the Belgian Ministry of Public Health, Food Chain Safety and the Environment to identify suspicious consignments of fish arriving at customs at Brussels airport. Batches of red and yellow coloured fluorescent fish have thus been positively identified as transgenic by real-time PCR. In the wake of this finding the Ministry of Public Health issued a circular pointing out that no transgenic fish have been authorised for marketing or for keeping in Belgium. This was widely relayed by the press. CRA-W is also working on other fluorescence detection methods to enable consignments of non-transgenic fish to be released as quickly as possible.

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INSTITUT PHYTOFAR SCIENCE PRIZE 2015



ON 5 NOVEMBER THIS YEAR THE INSTITUT PHYTOFAR SCIENCE PRIZE 2015 WAS PRESENTED BY THE MINISTER, WILLY BORSUS, FOR A NICE COOPERATIVE LINK-UP BETWEEN TEAMS FROM CRA-W AND ULG AGRO-BIO TECH.

The story began the day after the violent thunderstorms of 14 July 2010 which flooded Gembloux, when some CRA-W staff were surprised to find large numbers of red larvae, identified as the saddle gall midge *Haplodiplosis marginata* (von Roser), in a wheat trial. An examination of the stems revealed the presence of the infamous saddle gall midges, so characteristic but well concealed under the leaf sheath. So here was this odd pest back in Belgium again after nearly 40 years without reporting, having caused considerable damage in the late sixties.

Immediate reaction: various cereal-growing areas were surveyed (80 fields, 100 stems per field, 8,000 stems stripped of their leaves). This made it possible to count the galls and get an idea of the location and level of infestation.

The following year, the focus was on urgency: quantifying the damage, developing insecticidal protection methods, providing information and advice to cereal growers via warnings and informal meetings. The work would later be extended to varieties and parasitoids. In short, the occurrence of this little phantom pest was seized as an opportunity to learn as much as possible about it before it disappeared again, perhaps for a long time.

With funding from FRIA, Florence Censier started a doctoral thesis in 2011. She established useful links between the disciplines and teams at CRA-W and ULG-Gbx Agro-Bio Tech. In the end, with Christophe Fischer, she identified the main component of the insect's sexual pheromone.

Back to the field, and conclusive results right from the first tests: the traps equipped with a pheromone dispenser captured a thousand times as many saddle gall midges! At last, here is a tool with sufficient sensitivity to keep in touch with the insect, even in endemic periods.

Emergence forecasting model, monitoring and predicting infestations, tolerance threshold, etc. – there is plenty of work in prospect! The discovery of the pheromone by Florence and Christophe has broken down a barrier on the path of progress in plant protection.

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CLES DE SOLS: TOWARDS HARMONY BETWEEN AGRICULTURAL PRACTICES AND MAINTAINING FERTILITY



AS PART OF 2015 INTERNATIONAL YEAR OF SOILS, CRA-W HELD A DAY OF CONFERENCES AND WORKSHOPS AT GEMBLoux ON 10 NOVEMBER 2015.

Around one hundred participants attended: farmers, technicians, researchers, advisors and manufacturers. By taking part the Wallonian authorities showed their interest in this non-renewable natural asset and demonstrated their will to work towards more sustainable soil management.

The morning was devoted to a review of the state of Wallonia's soils, looking at the three aspects of soil fertility (biological, chemical and physical) and showing how agricultural practices can influence the functions performed by soils. Each of the presentations endeavoured to develop concrete examples drawn from studies and research carried out at CRA-W. The speakers stressed the need to 'think outside the box' in terms of both soil life and tillage. Whereas some agricultural practices can affect soil life more than others, no soil can be regarded as dead. Better knowledge of soil life and a clearer understanding of the factors that determine

its activity are the keys to integrated and profitable management of practices.

As regards tillage, skilfully alternating techniques (tilling, reduced tillage practices, decompacting) often enables the benefits of the different techniques to be better exploited: protecting the environment and maintaining biological activity to promote soil function.

In terms of the threat posed by soil contamination, some new approaches based on certain plants' ability to fix metal trace elements were illustrated. An innovative approach to plant protection products was presented which assesses the risks of groundwater or surface water pollution at plot level. This method could become a useful management tool for limiting environmental impacts without at the same time writing off certain crops or huge areas of the country.

The afternoon was divided into four field workshops: organic matter management, through an ongoing trial set up in 1959; monitoring nitrogen dynamics in grassland; intercrop selection criteria; and, lastly, presentation of six different sets of equipment for managing plant cover in the context of conservation farming (in cooperation with the GREENOTEC Association).

In view of the success of the topics covered and the interest generated, this work will remain topical well after 2015.

For more information visit:
<http://www.cra.wallonie.be/fr/conferences>

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