



Future IPM 3.0 towards a sustainable agriculture

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Future IPM 3.0

BOOK OF ABSTRACTS



Grapevine protection: from proof of concepts to pre-industrial biofungicides

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Highlights

- New low-impact molecules or BCAs are continually analyzed, but only few of them can become registered bio-fungicides after a formulation study that promise a good efficacy over time
- Modus operandi with lab, greenhouse and field trials in order to validate a potential biofungicide

Introduction

The reduction of synthetic chemicals use in agriculture in favour of low-impact pesticides is a priority for the safeguard of the environment and the consumers. The increasing public awareness pushes to substitute the indicted chemicals, therefore the searching of new tools in the pests control aim to provide low-impact molecules having similar features and efficacy/price ratio.

Several plant and animal extracts, fungi, bacteria and others emerge from the research as novel possible bio-fungicides, but only few of them become an efficient product usable in professional agriculture. This transformation often requests a long and hidden process with the creation of a formulation that guarantee a good efficacy under field conditions.

In the last years our group followed the development of several plant and animal extracts, BCAs and natural molecule as biofungicide on grapevine with several test from the lab to the field, through the greenhouse until the pre-registration stage.

Material and methods

Lab proofs. Five leaf disks (283 mm²), placed in 90 mm-Petri dishes on four-layer wet absorbent paper were treated with the different products through Potter spray tower or manual sprayer (Cabús et al., 2017). After drying under chemical hood, the pathogen was inoculated in drop, in spray or only dry conidia.

An artificial rain through eyedroppers, located above the leaf disks, was applied before the inoculum in order to evaluate the rain fastness.

Greenhouse proofs. 2.5-liters potted grapevine plants with 12-15 leaves, grown in greenhouse conditions, were treated with 15 ml/plant through air compressed sprayer (0.4 Mpa). The products effectiveness was tested inoculating the pathogen on the plants when they were dry. Through the use of a rain simulator (53 mm/h), 20, 40, 60 mm of washoff rains was applied on treated plants and assay the formulations rain fastness. Moreover, increasing the period between treatment and inoculation (6, 3, 2, 1 days), it allowed to estimate the persistence of the products (Dagostin et al., 2010).

Field trials. In two experimental vineyards, sited in San Michele all'Adige (TN, Italy), randomised blocks (33 m², 8-9 plants) were treated with test and control products. Each treatment



was composed by four replicates (blocks). According to weather forecast, the probable pathogen infections were identified and treatments were applied. Products were sprayed with a motorised backpack mistblower (Solo 450, Germany) using a spray volume of 550 l/ha.

Results and discussion

The main requested features of an active ingredient or a formulated biofungicide are the direct or indirect activity against the target disease (effectiveness trial), the efficacy over the time (persistence trial) and the ability to persist on the tissues after a rain (rainfastness trial).

Starting from a natural molecule or BCA, we developed several products/formulations in order to individuate the most effective. The screening of them and the identification of the minimum effective concentration was carried out under laboratory conditions with a bio-assay on grapevine leaf disks. The disease severity was assessed when the sporulation was developed and it was used to discern the efficacy of the product in comparison with the controls.

The satisfactory formulations were tested in planta under greenhouse conditions and disease incidence and severity were assessed after the incubation period. This kind of test allowed understanding the behaviour of the products on plant, approaching the field concept in controlled conditions.

The last step was the proof of the resulting good formulations of greenhouse proofs under field conditions. In according to EPPO Standards, the activity against the pathogens was assessed based on the presence of disease symptoms on leaves (oil spots or sporulation) and bunches (sporulation or necrosis). Disease severity and incidence was evaluated at intervals of 7-12 days in each replicate on 60 leaves and 40 bunches in each plot. (Giovannini and Pertot, 2016). The phytotoxicity assessment, by checking for discoloration of leaf or berry and necrosis on leaves and bunches, was another important evaluation. In the case of BCAs, the cultivable microorganism population was assessed on grapevine leaves, bunches and soil collected from each replicate of all treatments (Segarra et al., 2015). All data are necessary to complete a pre-registration dossier of the product.

In the last years, using this procedure, our group tested more than 200 formulations coming from internal lines of research, European and Italian projects, companies etc. and four of them are become commercial products.

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