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Development of a biotechnological plant protection agent for control of oomycetes

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Question: Biotechnological fungicides based on antagonistic bacteria or yeast with known activity against oomycetes are developed in a project, supported by funds of the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) based on a decision of the Parliament of the Federal Republic of Germany via the Federal Office for Agriculture and Food (BLE) under the innovation support programme. *Phytophthora infestans* infections on tomato leaves were used as a test system during the developing process. In addition, tests were done in cucumber to control *Pseudoperonospara cubensis* at Julius Kühn-Institut (JKI) to compare the formulated test preparations for efficacy against both pathogens.
Methods: Six bacterial and two yeast strains with known antagonistic effect were selected for the trials in the project. Besides the efficacy in *in vivo* test systems, toxicity and pathogenicity data from the literature were considered during the selection process. Also data for economical producibility (fermentation, downstream processing) and suitable formulations were elevated. Each step in the production process was investigated for determination of general and/or strain specific factors responsible for improving the efficacy against *P. infestans* on tomato leave disks. In addition, promising test preparations were also tested for their efficacy against downy mildew on grape vine and cucumber on potted plants and late blight on potato in field trials.
Results: In this presentation we will focus on the cucumber trials done in climate rooms at the JKI in Darmstadt. Besides an untreated control, a chemical standard and a copper standard, the antagonists were tested in different formulations and in combination with copper. Based on the preceding experiments, formulations were adapted and improved. Selected formulations controlled *P. cubensis* comparable to the chemical standard and copper - microorganism combinations allowed a copper reduction to a tenth of the recommended dose for copper standalone treatments.
Conclusion: Production procedures and formulations were developed for antagonistic bacterial and yeast strains yielding in biotechnological fungicides with high efficacy against *P. cubensis* on potted cucumber.

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Efficacy of Velum Prime® SC 400 in cucumber and tomatoes against *Meloidogyne incognita* in Turkey

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In this study nematicidal effect of commercial new generation nematicidal chemical product *Velum Prime® SC400* containing 400 gr/L Fluopyram active ingredient was investigated to control *Meloidogyne incognita* in two cucumber and two tomato greenhouses in Antalya, Turkey. Experiments were conducted in a completely randomized block design with four replicates in the four greenhouses. There was heavy infestation with *M. incognita* at all trial sites.
Velum Prime® SC400 was applied with drip irrigation system at three different doses (400+400, 500+500, 600+600 ml/ha) at 1-3 days after planting and two weeks later. Iprodione SC 500 and Fosthiazate EC 150 were used as comparison chemical compounds for the experiments. Moreover, untreated control plots were included in the experiment for positive nematode control plots. Approximately 10 weeks later experiments were ceased and 20 plants in each plot were harvested and evaluated by using 0-10 scale of root galling index (Zeck, 1971).
Velum Prime® SC400 600+600 ml/ha had the highest biological effect for both cucumber greenhouses. Root galling indices were extremely low level in the roots and ranged from 0.5 to 0.6 in the *Velum Prime® SC400* 600+600 ml/ha ($P<0.05$). However, root galling indices were 3.8 in Iprodione SC 500 plots in both cucumber experiments. *Meloidogyne incognita* severely galled on cucumber roots in untreated control plots, root galling indices were 7.9 and 8.3 in cucumber 1 and cucumber 2 experiments respectively ($P<0.05$).
Similarly, *Velum Prime® SC400* 600+600 ml/ha doses extremely reduced root galling on tomato roots in both experiments ($P<0.05$), and the highest biological effect was observed on this treatment in the two tomato greenhouses (0.4 root galling indices / $P<0.05$). Biological effect of Fosthiazate EC 150 was found close to *Velum Prime® SC400* 600+600 ml/ha doses and there was no significant differences between *Velum Prime® SC400* 600+600 ml/ha and Fosthiazate EC 150. Root galling indices were found 3.7 in tomato roots in Iprodione SC 500 plots. However, tomato roots in untreated control plots had 8.2 scale of root galling indices in both tomato experiments ($P<0.05$).
Velum Prime® SC400 600+600 ml/ha significantly reduced the galling index in tomato and cucumber, and has provided the best control of *Meloidogyne incognita*.