

The first results of *Trichoderma asperellum* treatment in production of organic sour cherries

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Abstract

The experiment was conducted in orchard of sour cherries, var. Łutówka in summer 2009. This variety is very difficult for organic growing because of its high susceptibility to diseases that cause high losses in the yield. Unfortunately, this cultivar is very popular in Polish orchards. The microbial plant growth promoter based on fungus *Trichoderma asperellum* was applied in three treatments. One gram of the product contained 5×10^8 of conidium, isolate T1 (NCAIM 68/2006). In several countries *Trichoderma* spp. is used as an antagonistic fungal agent against several pests as well as a plant growth enhancer. In Poland the current research with this microorganism is in the initial stage but investigating the possibility of using this enhancer in the organic growing is very interesting. The product with *T. asperellum* was applied at a concentration rate of 5%. The first treatment was applied at full bloom stage of the sour cherries trees. Next two applications were made in the shuck and shuck split stage. Observations were done to assess the symptoms of *Monilinia laxa* and the presence of *Myzus cerasi* colony on the branch. The obtained yield was estimated, too. The first results were very promising. Roughly a 50 % reduction of monilinia symptoms was observed on treated trees. It was additionally noted that the aphids avoided to colonize the treated branches contrary to the untreated. The obtained yield was threefold increased in comparison with the untreated plots. Therefore, it is worthwhile to continue the experimenst next year.

Keywords: *Trichoderma asperellum*, *Monilinia laxa*, *Myzus cerasi*, organic sour cherries, protection

Introduction

Monilia laxa (Aderh. et Ruhl.) Honey is a casual agent against brown rot disease (monilia) which is the most important disease of sour cherries and cherries trees, causing economic losses in many production areas. In organic system it poses an important problem, because of the lack of fungicides permitted to use. The aphid (*Myzus cerasi* F.) has been recognized for some years as a serious pest in organic fruit growing, where they may cause severe economic damage due to a lack of control strategies.

The microorganism *Trichoderma* spp. is able to control several fungal pathogens and can be used as a biocontrol agent. The mechanism of activity of *Trichoderma* is related to the mode of application; generally it is applied to the soil. An enhancement in the crop productivity as well as beneficial effects on plant morphology and physiology were also emphasized (Harman *et al.*, 2004). In some trials, formulations based on *T. harzianum* showed a slight reduction of levels of esca pathogens and of leaf necroses due to *Botrytis cinerea* (Di Marco & Osti, 2007). This paper reports the results obtained in one year study carried out in a conventional orchard being in the first year of conversion to organic production. The potential of applications of *Trichoderma* to prevent or reduce infections of *M. laxa* and aphids was investigated.

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Material and Methods

Field trials were carried out in 2009 growing seasons in orchard of sour cherries, var. Łutówka. This variety is very difficult for organic growing, because of high susceptibility to diseases which causes high losses in the yield. This variety is very popular in the Polish orchards. During the season, the commercial formulation Trifender® was applied as the microbial plant growth promoter, one gram of this product contents 5×10^8 of conidium, isolate T1 (NCAIM 68/2006). The suspension of *Trichoderma* formulations at the concentrations at $10 \text{ g} \cdot \text{l}^{-1}$ was applied as the foliar spraying with a hand- sprayer. In this trial the product was used at a very high dose. The first treatment was applied at full bloom stage of the sour cherries trees. Next two applications were made during the shuck and shuck split stage. The treatment in 4 replicates was set up in each plot containing 3 trees. There were two boundary trees between the plots. The distance between the trees was $4,0 \times 2,0 \text{ m}$. The incidence of monilia and aphid colonies has been determined 10 days after 3rd treatment. Next, the final effect of application was assessed based on the obtained yield. Results were subjected to statistical analysis using Tukey's range test, $P=0.05$.

Results

In the test, the *Trichoderma* – based product was used in the plantation of sour cherries, which was in the first year of conversion to organic system. Until, 2009 many chemical treatments with fungicides against *M. laxa* were made there. Nevertheless, some monilia symptoms on the branches were observed. After a one year experiment with *Trichoderma* product, the obtained results showed high efficacy. Our observation on the mean number of infected branches by *M. laxa* and the colony of *M. cerasi* showed very good effect comparing with the untreated trees (table 1)

Table1. Efficacy of *Trichoderma* product (10 g l^{-1}) on the presence of symptoms of disease and aphids on the branches of sour cherries trees after three applications.

| Observation | Treated trees | Untreated trees | Efficacy (Abbott in %) |
|---|---------------|-----------------|-----------------------------|
| Mean number of branches infected by monilia | 4,05 b | 9,65 a | 58,0 |
| Mean number of branches infected by aphids | 0 b | 8,25 a | 100 |
| Yield (kg) | 65,4 | 25,1 | threefold increase of yield |

Mean from 12 trees, 3 trees in 4 replicates. Within each row, means followed by the same letter are not significantly different (Tukey's test $P < 0,05$)

Abbott formula – $X - Y / X \times 100\%$, where X – number of pest on untreated branches, Y - number of pest on treated branches.

Conclusions

The obtained results were found very promising and surprising but conclusions should be made carefully, since the results of one single trial cannot be fully convincing, and follow-up research is needed. However, the results appear to provide a very good option for the efficient protection of sour cherry trees in organic orchards in Poland.

For the activity of *Trichoderma*, the mode and timing of application are very important factors (Di Marco & Osti 2008). Our results indicated that the mode (strain) used for the

tested trade product showed high activity in practice. In the paper presented by Tondje *et al.* (2006) data are included on *T. asperellum* which had been isolated from the forest natural reserve and from farmer's fields in Cameroon. All the tested strains of *T. asperellum* showed high necrotrophic mycoparasitism on plate towards *Phytophthora megakarya* expressed earlier necrotrophic mycoparasitism on the cacao black pod disease pathogen. During 3 years of field observations, plots treated with *T. asperellum* (PR11) yielded a higher number of mature and healthy cacao pods in locations under different ecological conditions, and were ranked second after the metalaxyl treated plots. Others isolates gave much more variable results. There was found also that some environmental factors (humidity, temperature) were responsible for variable action of these *T. asperellum* isolates (Tondje *et al.*, 2006). In our test timing of spraying was noted to be very favoured. In the paper by Hidalgo & Suárez-Capello (2006), data showing that *Trichoderma* (*T. koningiopsis* and *T. stromaticum*) have the possibility to suppress monilia (*Moniliophthora roreri*) and Witches' broom (*Crinipellis pernicioso*) are presented. Some other results from field screening trials also clearly show the potential of *T. asperellum* isolates for suppression of black pod and increasing harvestable pods. Although not as effective for pod protection as chemical fungicides, the use of these isolates can be seen as a way of reduction the application rates of copper; especially in low input cacao. *T. asperellum* is able to persist for more than 3 months after application and can reduce wilting of young pods (Todje *et al.*, 2007).

Additionally, the number of beneficial insects such as *Coccinella septempunctata* L. (larval stages and imagoes) was assessed during our experiments. The presence of aphids and spores of *Trichoderma* was noted to be a factor influencing the presence or abundance of lady-birds. The presence of aphids should be an attractive factor for lady-birds. While the mean number of these insects was lower (0,5) on the branches with the aphids compared with the branches treated with *Trichoderma* (1,0) - where aphids were not observed. This fact is also very surprising, but reason can be related to wellness of trees and attractiveness of fungus spores for lady-birds. Confirmation of this evidence could we found in very few papers (Ganassi *et al.*, 2000).

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