

Efficiency of entomopathogenic fungi against the black locust leaf mining moth *Phyllonorycter robinella*

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Introduction

Along with 7 other leaf mining moth species, the introduced *Phyllonorycter robinella* expands its area of distribution within Europe. It is a pest species with increasing importance on black locust *Robinia pseudoacacia*. Depending on environmental conditions, the insects cause remarkable leaf damages with white and brown spots at the surface of the leaves. High infestations cause and increase the premature leaf drop (fig.1).

In former investigations the effectiveness of several entomopathogenic fungi against different pests were proved. They has shown that the fungi are suppressive agents. Therefore the tests were expended to *Ph. robinella*.



Fig. 1: Infestation of *R. pseudoacacia* by *Ph. robinella* in summer 2003

Materials and methods

In field-tests (June 2003) each 10 ml of a conidial suspension of *Beauveria bassiana* (strain B412), *Lecanicillium muscarium* (strain V24 K2) and *Paecilomyces fumosoroseus* (strain P6) were sprayed (1×10^9 sp/ml) on the lower surface of 10-15 leaves per twig of *R. pseudoacacia*, containing eggs and larvae (L1-L3) of *Ph. robinella*. After a short drying period, every twig was enclosed in a mesh. At the first microscopic examination, 15dpa, on 220 mines/fungus the number of the larvae with external mycelial growth was recorded.

Afterwards the leaflets were transferred into wet chambers at 25°C and 98% RH. In a second examination, 21 dpa, the number of insects showing an external mycelial growth was noted and the developed fungi determined.



Fig. 1: *R. pseudoacacia* twigs after fungi treatment covered with a mesh

Results

- At the first counting (15 dpa) no external mycelial growth on larvae as a visual sign of infection could be noticed. However 6 days later, after the incubation in wet chambers, the dead individuals showed the typical mycelium of the fungi species (fig. 2).
- All stages found on the leaves, eggs, larval stages and pupae are susceptible to infect by the applied fungi. The small larval stages (L1-L3) were most delicate. *L. muscarium* showed the highest efficacy, *B. bassiana* also has reached a moderate result. However *P. fumosoroseus* could not convince (fig.3).
- In the fungal variants the larval stages as well as pupae were infected with secondary fungi like *Cladosporium herbarum*, *Penicillium* ssp., *Trichothecium* ssp. and *Alternaria* ssp. also. In all treated variants and the untreated control, the highest rates occurred at the elder larvae (L4-L5). Contaminated eggs were not found. The application of *L. muscarium* and *P. fumosoroseus* suppressed the occurrence of the naturally appearing fungi (tab. 1).

Tab. 1: Occurrence of secondary fungi on stages of *Ph. robinella* after fungi application after incubation in wet chambers (25°C, 98% RH), n=891

variants	infected and moulded host stages in (%)				
	eggs	L1 – L3	L4 – L5	pupae	total
control	0	2,7	25	0	27,7
<i>B. bassiana</i>	0	4,2	23	10,5	37,3
<i>L. muscarium</i>	0	0	15,2	4,9	20,1
<i>P. fumosoroseus</i>	0	3,8	5,8	4,1	13,7

Fig. 2: Growth of *L. muscarium* mycelium on a larval cadaver of *Ph. robinella* L3 (25°C, 98% RH).

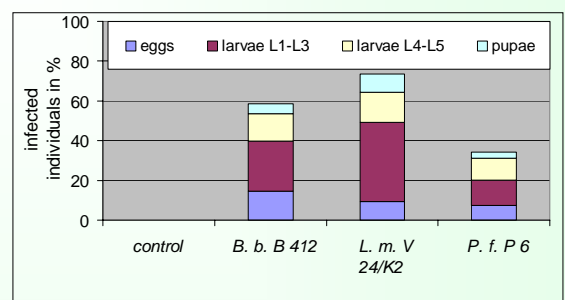
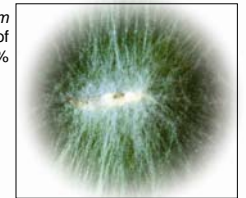


Fig. 3: Efficacy of the entomopathogenic fungi against stages of *Ph. robinella* after field application of spore suspension (1×10^9 con./ml) and incubation at 25°C, 98% RH, n=891

Discussion

After the application of the entomopathogenic fungi on the twigs of *R. pseudoacacia* in the field, a visible sign of sickness of the larvae and pupae (dead and mouldy) were missed. This could be traced back on the high temperature (>30°C) and the low humidity (50 – 70%). If the leaflets were incubated in wet chambers, the larvae and pupae died and moulded. It is to be gone out from that the infection of the larvae resulted from hyphae, since no spores were found in the mines after application. The relatively high mortality of the larvae in the variant of *L. muscarium* is caused by the faster development of the fungus. It secured the fungus a special advantage in regard to the difficult climatic conditions in summer 2003. Naturally occurring fungi on the larvae and pupae were founded more frequent as by the chestnut leaf miner *Cameraria ohridella*. The fungi are promoted by the contact of the social living larvae in the mines.