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Dissemination strategies of the entomopathogenic fungus *Lecanicillium muscarium* ZARE, GAMS 2000 in the host population of *Frankliniella occidentalis* PERGANDE 1895

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Introduction

The entomopathogenic fungus *Lecanicillium muscarium* syn. *Verticillium lecanii* can be used to control populations of the western flower thrips *F. occidentalis.* In laboratory, semi-field, and greenhouse trials, the infection and mortality of this host population were recorded. At the end of the disease process, the fungus grew and sporulated very well on the cadavers of *F. occidentalis* (fig. 1, 2). These sporulating cadavers were an effective inoculum source and therefore a centre of infection for the host population. Now, trials were conducted, to describe the possibilities of fungal dissemination and the efficiency in this host-pathogen-relationship.

Fig. 1: healthy larvae of *F. occidentalis*

Fig. 2: Mycelial growth of *L. muscarium* on a cadaver of *F. occidentalis*

Material and Methods

The standard method of trials was conducted on bean plants *Phaseolus vulgaris* L. in climatic chambers. At first, 20 larvae (1st stadium) were dipped in a suspension (1,5 x 10^8 conidia/ml) of *L. muscarium* strain V24. Five days later, one infected, dead, and not yet moulded larvae was put on one of the 2 primary leaves together with 10 untreated larvae (2nd stage) of the host. The incubation occurred with 20 °C, light regime L/D 16:8, humidity 65% and 95%). The degree of coverage on the sporulating cadavers were determined and the number of dead and moulded individuals of test population were counted. The dissemination of spores on plants should be provided by impressing the leaves on agar plates and counting the colony forming units.

Results

- The sporulating cadavers on leaves were effective inoculum sources, and they provided the spores for the dissemination of *L.* muscarium. As expected, the mycelia grew very well at 95% humidity. Remarkably a successful development of the fungus on the cadavers were recorded at 65% humidity, too. The differences were that the sporulation was faster and the hyphae length significantly increased at 95% humidity (fig 3).

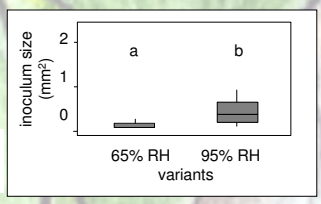


Fig. 3: Size of the mycelia growth on the cadavers by 65% und 95% RH, 14 days after put on the leaves results with variant letters are significantly different

- The most important way to disperse the fungus in the examined host-pathogen-relationship is the dissemination in consequence of behaviour and movement of the thrips. This contains:

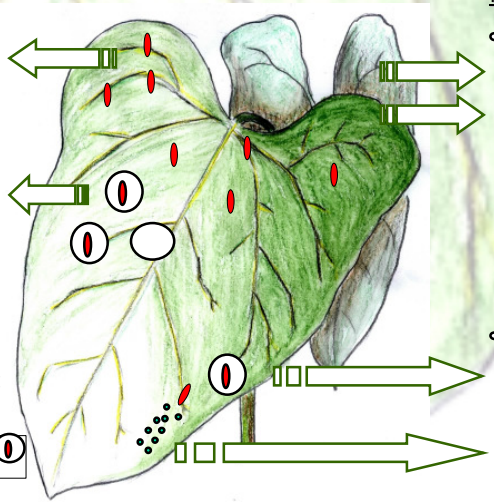
1. Dissemination within the population

It was found:

- infected hosts in the parental generation at 65% and 95% RH and additionally up to the offspring at 95% RH
- dead and mouldy hosts in the parental generation and the offspring at 95% RH (fig 4)

Fig. 4.: bean leaf with mouldy cadaver (A) and dead thrips from the host population with mycelial growth and sporulation of *L. muscarium*

- 100 % mortality and moulding of the test population at 95% RH



2. Contamination of the insect's habitat

It was found:

- contamination of the insect's habitat with *L.* muscarium on the upper and lower surface of the leaves with and without the inoculum put on

Tab. 1: Size ot the area, contaminated with *L. muscarium,* on agar plates after impressing of the leaves

	leaf with cadaver				leaf without cadaver	
	upper surface area size (mm^2)		lower surface area size (mm^2)		upper surface area size (mm^2)	
65% RH	0,02	**a**	1,52	**a**	0,36	**a**
95% RH	10,7	**b**	7,47	**b**	1,03	**a**

- contamination of the insect's habitat by:

  sporulation of infectious stages
  - on casted off exuvia during moulting
  - on cadavers after death of the host

  by the loss of spores during the movement of contaminated insects

Conclusion

This investigation showed that in this host-pathogen-relationship, humidity and movement of the hosts are very important for the dissemination of the fungus. Higher humidity increases the developmental rate, mycelial growth of the sporulating cadavers, and the number of infectious stages in the host habitat. However, 65% RH fulfills the humidity requirements for successful infection of the host population on the sporulating cadavers, possibly leading to epidemics in thrips populations. The lack of moulding at 65% RH, as seen in the test population during the trial period, could be the result of slower fungal development (HSIAO et al. 1992).
During their movement, thrips can individually collect spores from any moulding cadaver and disperse conidia over the entire plant. Secondary mortality and moulding of the insects constitute new inoculum sources and increase the infection possibilities.

References

Hsiao, W. F.; Bidochka, M. J.; Khachatourians, G. G. (1992): Effect of Temperatur and relative Humidity on the virulence of the Entomopathogenic Fungus, Verticillium Lecanii, Toward the Oat-Bird Berry Aphid, Rhopalosiphum Padi (Hom, Aphididae). Journal for Applied Entomology 114(5), S. 484 – 490