

## Innovative methods for controlling the fungus gnat using beneficial species

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Fungus gnats (Sciaridae) are among the most important pests in greenhouse cultivation and can lead to considerable crop losses. They are a significant problem especially in organic cultivation of potted plants, particularly potted herbs, since peat-reduced, organically fertilized growing media are much more attractive to fungus gnats and provide them with much better living conditions. Previous methods to reduce the mass reproduction of fungus gnats in organic farming have proven insufficient. The development of innovative biological methods using beneficial species is a cornerstone for the future of organic agriculture.

The studies in this project aim to evaluate the efficacy of the fungus gnat antagonists *Steinernema feltiae* and *Hypoaspis miles*, which are well established in practice, and to optimize their use through new research. Another aspect is to investigate the efficacy of new beneficial species from the orders Geophilomorpha and Lithobiomorpha and the genera *Coenosia* and *Atheta*. To achieve the objectives, two basic research approaches were chosen: Laboratory experiments and field experiments.

In the first phase of the project, laboratory experiments were conducted in climate chambers at Julius Kühn-Institute in Kleinmachnow. The beneficial insect species *Steinernema feltiae* and *Hypoaspis miles* were tested for their efficacy against *Bradysia difformis* larvae. In addition, it was investigated whether a higher efficacy could be achieved by combining *Steinernema feltiae* and *Hypoaspis miles*. Preliminary results showed that both beneficial species resulted in a significant reduction in the hatching rate of *Bradysia difformis*. Treatment with *Steinernema feltiae* reduced the hatching rate by 70%, while treatment with *Hypoaspis miles* reduced it by 65%. The combination of the two beneficial species almost eliminated the larvae. Only isolated larvae hatched. Extensive synergistic effects of the beneficial species need to be investigated in further trials.

In the second phase, field trials were conducted in the Hirschgarten greenhouse. The aim was to evaluate the interactions between fungus gnats and the *Coenosia* population. *Coenosia spec.* is considered a promising fungus gnat antagonist. Yellow pan traps and counts of single individuals were conducted at weekly intervals. Preliminary results from 2022 indicate a decrease in fungus gnats that correlates with an increase in the *Coenosia* population. The results will be validated by repeating the monitoring next year.

In a further experimental phase, non-established beneficial species of the orders Geophilomorpha and Lithobiomorpha (centipedes) as well as of the genus *Atheta* will be included in the trials. In addition to basic questions on breeding, feeding behavior and prey spectrum, commercial implementation will also be investigated.