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CAN THE RETURN TO THE NATURAL CONDITIONS OF *IN VIVO* PARASITIZATION INCREASE THE INFECTIVITY PERFORMANCE OF EPNS?

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El Khoury Y., Bari G., Grujić N., Poliseno M., Germinara G.S., Pistillo M., D'Isita I., Tarasco E.- Can the return to the natural conditions of *in vivo* parasitization increase the infectivity performance of EPNs?

Experiments are in progress in Apulian asparagus fields for the control of *Parahypopta caestrum* (Hübner) (Lepidoptera, Cossidae) with microbial control agents (MCAs), mainly entomopathogenic nematodes and fungi. Different bioassays were carried out in laboratory and field conditions to prove the efficacy of native and commercial strains of the EPNs *Steinernema feltiae* (Filipijev), *S. carpocapsae* (Rhabditida, Steinernematidae) and *Heterorhanditis bacteriophora* Poinar (Rhabditida, Heterorhabditidae), and EPF *Beauveria bassiana* (Bals.-Criv.) Vuill. (Hypocreales, Cordycipitaceae). Among the field experiments, one was planned with the release of *Galleria mellonella* (L.) (Lepidoptera, Pyralidae) cadavers previously infected with native strains of EPN *Steinernema feltiae* and the comparison was carried out with a commercial strain of the same nematode species.

Key Words: *Parahypopta caestrum, Beauveria, Heterorhanditis, Steinernema*

INTRODUCTION

Asparagus spp. is a high-value, labour-intensive specialty crop. In Italy the most vocated areas are located in Veneto region, immediately followed by Emilia-Romagna and Apulia. In Apulia, the Asparagus cultivations are concentrated in the North of the region, in the province of Foggia, which contributes with its 20.6% to the Italian Asparagus production (ISTAT, 2012). *Parahypopta caestrum* (Hübner) (Lepidoptera, Cossidae) is a highly destructive pest of *Asparagus* spp. in Europe. The soil-borne larvae bore mines into the roots and the shoots, causing the destruction of plantations after 2-3 years. Due to its high destructiveness and the lack of available effective control options available, *P. caestrum* can be considered the key pest of *Asparagus* spp. in the Apulia Region, where its presence has been recorded since the 1992 (Fig. I). The lack of expert knowledge regarding the biology of *P. caestrum* and the limited range of available pesticides have contributed to the increase and the spread of the pest populations in the last years. Few data are available about the biology and the ecology of this pest, while control options such as microbial control have never been studied so far. Experiments are in progress in Apulian asparagus fields for the control of *P. caestrum* with microbial control agents (MCAs), mainly entomopathogenic nematodes and fungi (Tarasco, 2002).

MATERIALS AND METHODS

Different bioassays were carried out in laboratory and field conditions to prove the efficacy of native and commercial strains of the EPNs *Steinernema feltiae* (Filipijev), *S. carpocapsae* Weiser (Rhabditida, Steinernematidae) and *Heterorhabditis bacteriophora* Poinar (Rhabditida, Heterorhabditidae), and EPF *Beauveria bassiana* (Bals.-Criv.) Vuill. (Hypocreales, Cordycipitaceae).

Infectivity assays: The effect of 6 entomopathogenic nematodes strains (Steinernematidae and Heterorhabditidae) and 3 entomopathogenic fungal isolates (*Beauveria bassiana*) were evaluated in laboratory assay against III instar larvae of the *Asparagus* moth, using 8 insects per treatment, 100 IJs/larva EPN or 4.10^4 spores/mL EPF (both water suspensions); the mortality was checked after 5 days.

Among the field experiments, one was planned with the release of *Galleria mellonella* (L.) (Lepidoptera, Pyralidae) cadavers previously infected with native strains of EPN *Steinernema feltiae* and the comparison was carried out with a commercial strain of the same nematode species (Ansari *et al*, 2008; Butt *et al*., 2001; Choo *et*

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Fig. I - Field images, pupal exuviae, adult female just emerged and eggs of the *Asparagus* moth *Parahypopta caestrum*

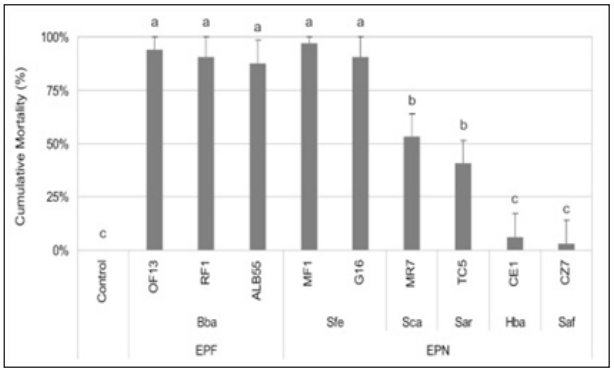

Fig. II - The effect of entomopathogenic nematodes and fungi on mortality of the III instar larvae of the *Asparagus* moth.

al., 2002; Dembilio *et al*., 2010; Georgis *et al*., 2006; Kreutz *et al*., 2004; Oreste *et al*., 2012, 2015a, 2015b; Tarasco, 2002; Tarasco *et al*., 2015a, 2015b, 2016).

At the moment in progress:

- Trials with commercial strains of the EPNs *Steinernema feltiae* and *S. carpocapsae* (the next treatment, based on *Parahypopta* bioethological data, is scheduled for June 24, 2023)

- Among the field experiments, one was planned with the release of *Galleria mellonella* (L.) (Lepidoptera, Pyralidae) cadavers previously infected with native strains of EPN *Steinernema feltiae* and the comparison was carried out with a commercial strain of the same nematode species.

RESULTS AND DISCUSSION

Infectivity assays. Results showed that all the nematodes and fungal strains affected the *Asparagus* moth survival except the *S. affine* and *H. bacteriophora* strains. *Steinernema feltiae* and *B. bassiana* showed the best performances, killing on average 90% of the *P. caestrum* larvae (Fig. II).The evaluation of the infectivity of the nematodes was carried out by placing, one week after the treatment, tea filters with 5 healthy larvae of *Galleria*. The soil was kept moist, irrigating every two days, to allow the mobility of the nematodes and filters with larvae were taken after two more weeks (Gumus et al., 2015) (Fig. III).

All the *Galleria* larvae in the filters were dead and infected (even with ant's contribution), revealing no differences between commercial strains and native strain coming from infected *Galleria.* The return to the natural conditions of *in vivo* parasitization have no effect on the

Fig. III - Tea filters with 5 healthy *Galleria* larvae (A), used to evaluate the EPN infectivity in the field (B)

infectivity performance of EPNs. Considering the lack of effective options for the chemical control of this pest, the microbial control of the *Asparagus* moth by EPNs (and EPF also) with mass trapping reveals promising perspectives as an efficient Integrated Pest Management tool of the *Parahypopta caestrum*.

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