

Attack by *Pyemotes johnmoseri* (Acari: Pyemotidae) on *Hypoborus ficus* (Coleoptera: Scolytidae) in fig trees in Turkey

Tülin Akşit · Ibrahim Çakmak · John Moser

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Introduction

The Aegean Region of Turkey is one of the largest dried fig producers in the world. A Turkish cultivar sarilop (*Ficus carica* cv. Calimyrna L.) possesses good qualities for drying process, and has been grown extensively for many years in Turkey. *Hypoborus ficus* is the most common xylophagous insect attacking fig trees in Aydın (Akşit et al. 2003). This pest attacks weakened trees, accelerates withering, and can cause death of branches and trees if present in high numbers. Infestations occur throughout the entire year. *H. ficus* is widespread in the Mediterranean region (Talhouk 1969) and was first documented by Iyriboz (1940) at İzmir in the Aegean region of Turkey.

Pyemotes johnmoseri was first noted as a parasitoid of *H. ficus* in the Ukraine (Khaustov 1998). Populations of this mite were first found at Aydın, Turkey in 2003 and 2004 (Çakmak et al. 2006). *P. johnmoseri* belongs to the scolyti group of *Pyemotes*, and is most closely related to *Pyemotes scolyti* (Oudemans), an external parasitoid of *Scolytus* spp. Only the female is parasitoid, and the attack by a single female is sufficient to kill a host. Some pyemotid species, e.g. *Pyemotes tritici* (Lagrèze-Fossat and Montagné), have shown potential as biological control agents for a variety of insects (Bruce and Wrensch 1990). Although bites of *P. tritici* are toxic to man, those of the scolyti group are not (Moser 1975). This study evaluates the infestation of *P. johnmoseri* on *H. ficus* and population fluctuations in a fig orchard in Turkey between 2003 and 2004.

T. Akşit · I. Çakmak (✉)
Department of Plant Protection, Faculty of Agriculture, University of Adnan Menderes,
Aydın 09100, Turkey
e-mail: icakmak@adu.edu.tr

J. Moser
USDA Forest Service, Southern Research Station, 2500 Shreveport Hwy, Pineville, LA 71360, USA

Materials and methods

This study was conducted in a 20-year old fig orchard (sarilop) at 30 km from Aydin in Incirliova district (Isafakilar, altitude 600 m, 37°58'22" N, 27°41'50" E). Weakened (i.e. leafless and fruitless, but the tissue is alive) and dead shoots infested with *H. ficus* were selected from each one of four trees in the fig orchard. Weakened and dead shoots (length 30–40 cm, diameter 1–1.5 cm) were cut and placed in plastic bags, and taken to the laboratory in an ice-chest. After removal of the cortex *H. ficus* larvae, either infected or uninfected with *P. johnmoseri*, and *P. johnmoseri* adults and juveniles were counted under a stereo-binocular microscope (magnification 20x) in a 10-cm piece of shoot. Samples were taken from the fig orchard once or twice per month between November and February, and three or four times per month between March and October. In total 10 of the 40 trees in the fig orchard were sampled.

Results

Population fluctuations of *Hypoborus ficus* and *Pyemotes johnmoseri*

In 2003 the number of *H. ficus* larvae in weakened shoots reached a maximum in February (316 individuals/10 cm) (Fig. 1). Most *H. ficus* larvae on dead shoots were observed at the

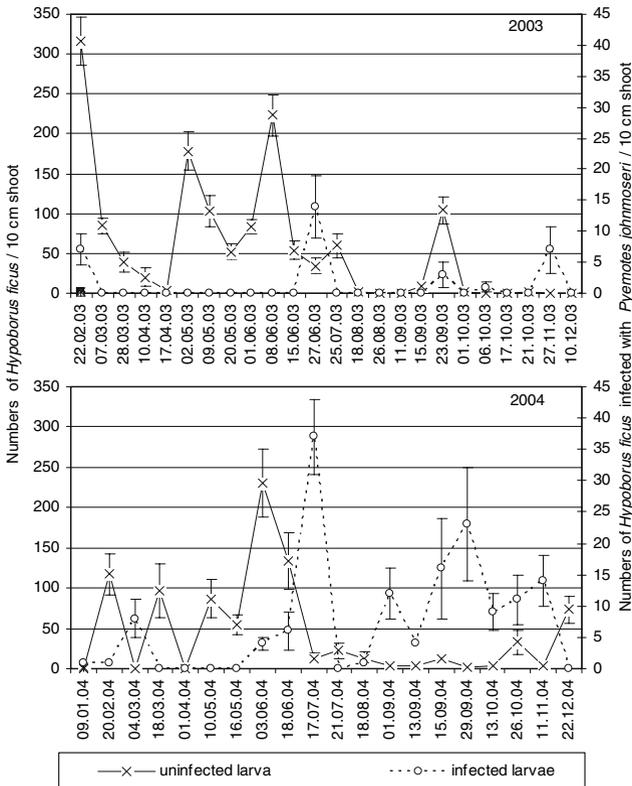


Fig. 1 The population density of *Hypoborus ficus* in weakened shoots

end of March (39 individuals/10 cm) (Fig. 2). The parasitoidation rate by *P. johnmoseri* on fig bark beetles in weakened and dead shoots was 1.8%, and 5.8%, respectively. Infested beetle larvae were seen throughout the year (Figs. 1 and 2). *Pyemotes johnmoseri* infestation rate on weakened shoots was highest in June (14 individuals/10 cm) and on dead shoots in October (8 individuals/10 cm).

In 2004, most larvae of *H. ficus* were found in June in weakened (231 individuals/10 cm) and dead shoots (114 individuals/10 cm) (Figs. 1 and 2). The parasitoidation rate by *P. johnmoseri* was 9.0% in weakened shoots, and 9.3% in dead shoots. *P. johnmoseri* infestation rate was highest in July on weakened shoots (37 individuals/10 cm) and in August on dead shoots (9 individuals/10 cm).

The infestation rate of *Pyemotes johnmoseri* on *Hypoborus ficus*

Based on the two years, a total of 933 females of *P. johnmoseri* were counted on *H. ficus*. The rate of *H. ficus* larva infestation with one, two, three or four mites was 87.7%, 10.5%, 1.4% and 2.1%, respectively. Of all *P. johnmoseri* infesting *H. ficus* stages, 90.5% were found on larvae, 3.7% on pupae, 5.5% on eggs and 0.4% on teneral adults. The mean number of swollen females found feeding on a larva or pupa of the host insect was 1 (max. 4). Swollen females produced on average 14 (4–52) offspring ($n = 52$).

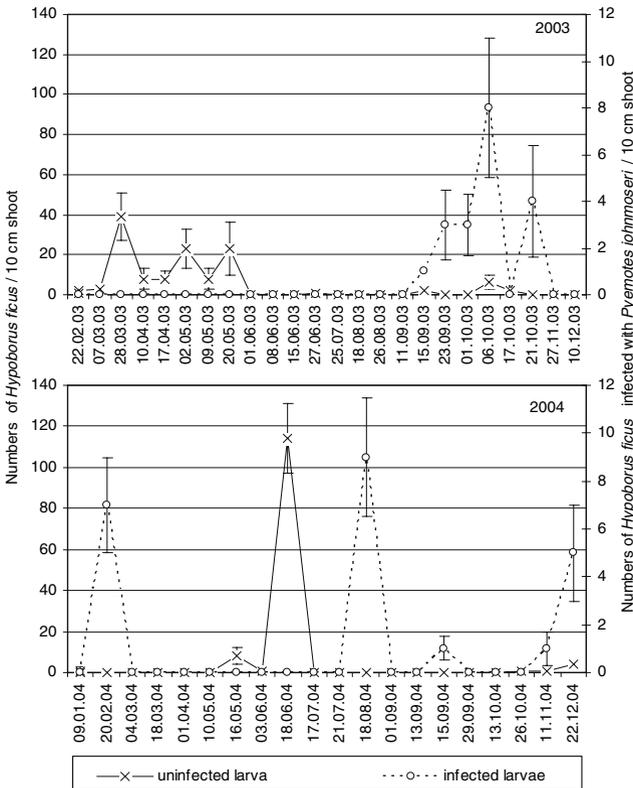


Fig. 2 The population density of *Hypoborus ficus* in dead shoots

Discussion

The highest population levels of *H. ficus* in both weakened and dead shoots were found between January and June. Bernabo (1993) also assessed that *H. ficus* was dominant in spring in Italy. *H. ficus* density was clearly higher in weakened than in dead shoots.

Pyemotes johnmoseri was abundant and widespread in the *H. ficus* galleries in Aydin province. Numbers were higher in 2004 than in 2003, and mites were present in every month of the year. Mite infestation rates were highest from July to December, when host numbers were lower.

This study showed that *P. johnmoseri* usually fed on larvae (90.5%), and occasionally on eggs or pupae of *H. ficus*. We also observed a physogastric female on a teneral adult of *H. ficus* in its pupal chamber. We have never observed phoretic females of this mite on flying adults of fig bark beetles ($n = 100$). Cross and Moser (1975) reported that *Pyemotes* spp. belonging to the scolyti group fed only on bark beetle brood or immature stages of other beetles; none fed on adults. The potential of *P. johnmoseri* to reduce populations of *H. ficus* should be tested in further studies.

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