

## ***Rhodococcus perornatus* (Cockerell & Parrott) (Hemiptera: Coccidae) and its natural enemies in Isparta Province, Turkey**

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**Abstract:** Rose Soft Scale, *Rhodococcus perornatus* (Cockerell & Parrott) (Hemiptera: Coccidae), is the most important pest on oil-bearing roses in Isparta, Turkey. Rose Soft Scale and its natural enemies were studied during 2006 and 2007 in Isparta. According to our observations, substantially all oil-bearing rose orchards in the region were infested by *R. perornatus*. During this study, two predators (*Anthrribus fasciatus* Forster (Col.: Anthribidae) and *Exochomus quadripustulatus* L. (Col.: Coccinellidae)) and three parasitoids (Hym.: Encyrtidae) (*Metaphycus melanostomatus* Timberlake, *M. silvestrii* Sugonjaev and *Microterys bellae*) were identified.

**Key words:** rose soft scale, natural enemy, predators, parasitoid.

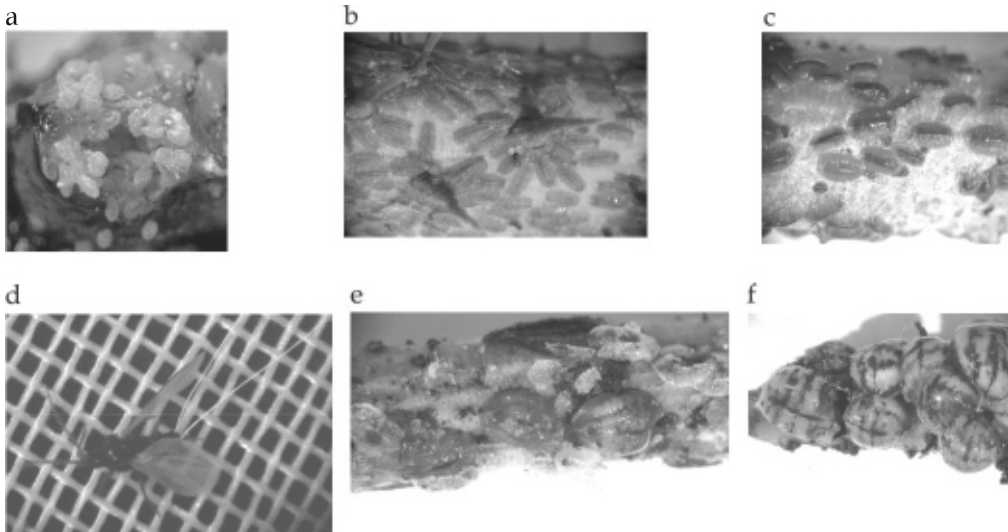
### **Introduction**

Essential oils are aromatics or odorous oily liquids extracted from plant material. Rose oil is an important component of essential oils and is extracted from flowers of *Rosa damascena* Miller in Isparta, Turkey. Rose oil is of great economic importance and is one of the most important agricultural products in this region. It is mainly used in cosmetics and pharmaceuticals. The majority of the plantations are located in the center of Isparta: Keçiborlu, Gönen, Atabey, Egirdir and Aksu districts (Altýnok & Ulusoy, 2004). Rose soft scale *Rhodococcus perornatus* (Cockerell & Parrott) is the main pest of *R. damascena* (Fig. 1) and is widely distributed in the province. *R. perornatus* has one generation per year in Isparta and overwinters as the 2<sup>nd</sup>-instar nymph (Altýnok, 2004). This scale can completely destroy a plantation in four years (Acatay, 1970), although, more often, the plants become defoliated due to the accumulation of sooty moulds growing on the honeydew (Kosztarab & Kozár, 1988).

*R. perornatus* was originally described as *Lecanium (Eulecanium) perornatum* (Cockerell & Parrot, 1899). Tuatay (1962) gave some information about a *Lecanium* sp. on *R. damascena*, and this was later identified as *R. perornatus* by Ülgentürk *et al.* (2001). *R. perornatus* has been previously reported on *Rosa* spp. (Kozár & Sugonjaev, 1979; Kozár & Ostafichuk, 1987; Ördögh, 1995), *Rosa acicularis* (Danzig, 1980), *Rosa canina* (Cockerell & Parrot, 1899; Kozár *et al.*, 1977; Marotta, 1987; Ülgentürk *et al.*; 2001), *Rosa damascena* (Tsalev, 1966; Ülgentürk *et al.*, 2001) and *Rosa pimpinethifolia* (Marotta, 1987).

There are also some records of natural enemies of *R. perornatus* (Kosztarab & Kozár, 1988; Kozár & Sugonjaev, 1979; Trjapitzin, 1989; Tsalev, 1966; Ülgentürk *et al.*, 2001; Karaca *et al.*, 2003; Altýnok, 2004).

The aim of this study was to survey and identify the natural enemies of *R. perornatus* on *Rosa damascena* in Isparta, Turkey.



**Figure 1.** *Rhodococcus perornatus* (Cockerell & Parrott). a) Eggs; b) Newly-settled nymphs; c) Second-instar nymphs; d) Adult male; e) Young females, and f) Adult females.

### Materials and methods

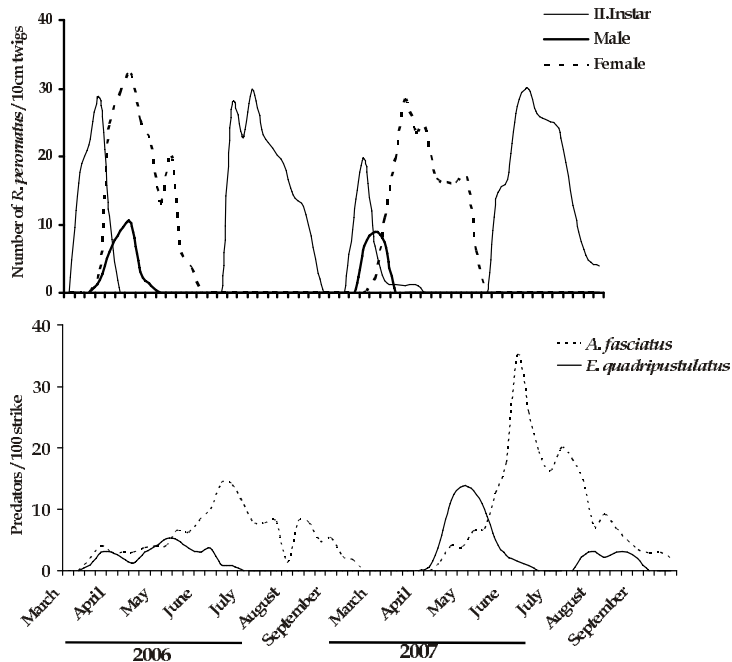
Observations on *R. perornatus* and its natural enemies were carried out between March, 2006, and September, 2007. Population fluctuation of the *R. perornatus* and its natural enemies were determined biweekly in five oil rose orchards of central district of Isparta. Twigs were randomly collected from non-sprayed oil rose orchards at Yakaören and Gölcük district. In addition, every ten days different locations of Isparta were investigated. From each field, 50 *R. damascena* twigs (10 cm long) were taken for laboratory examination. Each sample was examined under a stereomicroscope for *R. perornatus* and for signs of emergence holes. Some samples were kept in boxes in order to obtain emerging parasitoids for identification and counting. Parasitoid specimens were then fixed in warm 75% ethyl alcohol. The predatory insects were collected by the strike method of Steiner (1962) and their population sampled by 100 strikes on each date at each site. Sampled predators were killed using ethyl acetate, counted, pinned and kept in the Entomological Museum of Isparta (EMIT). In addition, the reared parasitoids and predator specimens were also sent to suitable authorities for identification.

### Results and discussion

As a result of this study, *R. perornatus* was found to be present in almost all areas of Isparta province. The districts of Atabey, Keçiborlu, Central district and Gönen were found to have the highest infestation levels. Two coleopteran predators were found to prey on *R. perornatus*: *Anthribus fasciatus* (Forster) (Anthribidae) and *Exochomus quadripustulatus* (L.) (Coccinellidae) and three hymenopterous parasitoids (all belonging to Encyrtidae), namely, *Metaphycus melanostomathus* (Timberlake), *M. silvestrii* (Sugonjaev) and *Microterys bellae* (Trjapitzin)

Population fluctuations of *R. perornatus* and its natural enemies were studied in five non-sprayed orchards at Gölcük and Yakaören located in the mountains at an altitude between

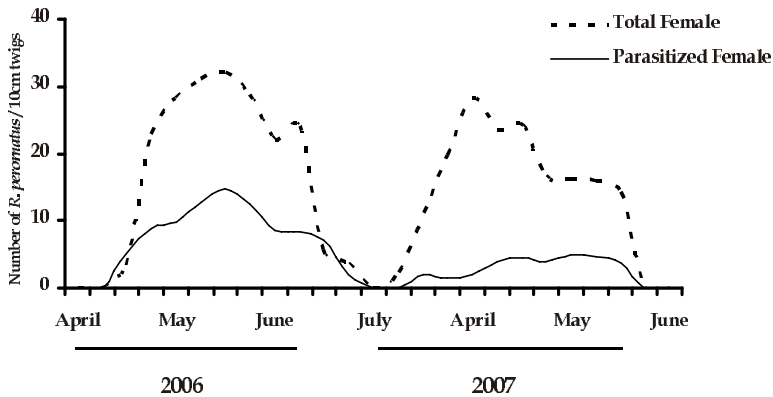
1000 and 1150m (37° 52' 34N) (Fig. 2). According to the field monitoring study, the second-instar nymphs of *R. perornatus* were present at the end of March and *E. quadripustulatus* and *A. fasciatus* were also collected at the same time. Adult males and females were observed after April 20. Egg-laying commenced during the first week of May and continued until mid June. Ördögh (1995), in Hungary, and Altýnok (2004), in Turkey, observed these stages at similar periods. Hatching of the eggs started on June 18 and the first-instar nymphs then settled on the branches, twigs and leaves. During the first week of August, second-instar nymphs started to migrate to the twigs to overwintering.



**Figure 2.** Population fluctuations of *Rhodococcus perornatus* (top graph) and its predators in Isparta province (lower graph).

Although *E. quadripustulatus* is a common predator of Rose soft scale (Altýnok, 2004), it was not effective. However, *A. fasciatus* was found to be more effective (Fig. 3) although it is likely that *A. fasciatus* has alternative preys. Our observations show that *A. fasciatus* preyed on primarily on ovipositing females. *A. fasciatus* has also been observed to prey on ovipositing females of *Eulecanium tiliae* (L.) by Ülgentürk & Toros (1996).

Figure 3 shows the fluctuations of the *R. perornatus* populations and those of *Metaphycus melanostomathus*, *M. silvestrii* and *Microterys bellae*. The first parasitoid, namely *Metaphycus melanostomathus*, was observed on April 14 emerging from second-instar nymphs of *R. perornatus*. *Metaphycus silvestrii* and *Microterys bellae* were obtained from ovipositing females consecutively from the beginning of May (Fig. 4). During the peak population peak of the adult females, the percentage parasitization was 34.8 in 2006 but only 9.4 in 2007.



**Figure 3.** Population fluctuations of parasitized *Rhodococcus perornatus* females in Isparta province.

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