ROSE SOFT SCALE (*HEMIPTERA: COCCIDAE*) AND ITS PARASITOID IN ISPARTA PROVINCE (TURKEY)

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Abstract

*Microtectria balsae* Triapitzin (Hymenoptera: Encyrtidae), a parasitoid of Rose Soft Scale, *Rhodococcus perornatus* (Cockerell & Parrott) (Hemiptera: Coccidae) has been found in Turkey for the first time. As the same characters of *Microtectria balsae* was given unclear a detailed description and illustrations are provided. Observations on its dynamic relationships and effectiveness as a natural enemy of Rose Soft Scale also are made for the first time.

Key words: *Rhodococcus perornatus*, *Microtectria balsae*, Turkey

Introduction

Rose oil is one of the most important agricultural exports from Turkey. Several pests and diseases cause economic losses in oil roses (*Rosa damascena* L.) and *Rhodococcus perornatus* (Cockerell & Parrott) (Hemiptera: Coccidae) (Rose Soft Scale) is a key pest of this crop in Turkey. The *Rhodococcus perornatus* infest the branches and trunks of its host plants, particularly oil roses, which can be seriously damaged and may even die. More often, however, the plants become defoliated due to the accumulation of sooty moulds growing on the honeydew [1]. It has been recorded in the Palaeartic region from Austria, Bulgaria, Hungary, Italy, Moldova and some parts of Russia [2, 3]. It was first reported from Turkey in 1999 [4] and its distribution and economic impact have been increasing steadily; however, no detailed study of this pest in Turkey has been made.

There are some reports on the natural enemies of Rose Soft Scale [1, 6, 7, 8], but no detailed study has been made of their effectiveness or on their use to regulate Rose Soft Scale populations. The aims of this study were to identify the parasitoids of *R. perornatus* on oil rose in Turkey, and to investigate the population development of the scale and its parasitoids, and the efficacy of these parasitoids in Isparta province. The effectiveness of *Microtectria balsae* Triapitzin (Hymenoptera: Encyrtidae) as a regulator of Rose Soft Scale populations had not been investigated prior.

Materials and methods

Oil rose areas in Turkey were regularly surveyed during the 2001 growing season to document the distribution of rose soft scale. Population fluctuations of the scale insect and its parasitoid were investigated by taking samples from 3 fields every 15 days. From each field, 50 oil rose twigs were taken for laboratory examination. The material was collected in each site from 10 bushes, which were chosen randomly. The number of Rose Soft Scales on 10 cm of each branch were counted. Each sample was examined under a
stereomicroscope and the rate of parasitism was determined as a percentage of the sample with emergence holes on them. Some samples were kept in boxes in order to obtain the emerging parasitoids for identification.

The phenology of the scale was studied by recording the average proportion of each sample of 200 scale insects at each developmental stage. Scale population density was recorded as the mean number of scales per 10 cm of branch. The percentage of scale insect damage was established using the formula \( P = \frac{B}{a} \times 100\% \), where \( P \) - percentage of damage, \( B \) - proportion of damaged plants in the samples, and \( a \) - total number of scale specimens [9]. This formula was also used to determine the role of parasitoids in the regulation of numbers of sap-sucking insects. The rearing of the parasitoids from coccids was conducted by generally accepted methods [10,11].

**Results and Discussion**

Rose Soft Scale was found in almost every field examined in the survey area. There was one generation per year, with overwintering as second stage nymphs on branches or in other covert places; development resumed in March. Fecundity was high, with each female producing 500 - 800 eggs. Larvae hatched from the eggs in June-July and crawled over the plants to find feeding sites on the branches. Saprophytic fungus (sooty mould) developed on sugary excreta (honeydew) fouling the plant surfaces, blackening the green parts of the plants and significantly decreasing plant quality and may even kill.

The phenology studied since 2001-2002 was slightly different from the phenology documented by other authors [1]. The development and population dynamics of Rose Soft Scale in Isparta province in 2002 is given in Fig. 1.

![Fig.1 The development of Rose Soft Scales (Rhodococcus perornatus) since 2002.](image)

Heavy infestations were observed prior to the end of 2001. Infestation and parasitisation rates for 2001 in the field are given in Table 1. In 2002 parasitoid was not registered.

Table 1. Infestation rates of *Rhodococcus perornatus* on oil rose, and *Microtrya bella* in Rose Soft Scale, in the field in southwest Turkey.

<table>
<thead>
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<th>Gölcük</th>
<th>Kuleova</th>
<th>Isparta</th>
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<tr>
<td>Percentage of rose plants damaged</td>
<td>98%</td>
<td>98%</td>
<td>96%</td>
</tr>
<tr>
<td>Average no. of ovipositing female scales per 10cm of stem</td>
<td>48 (range 1-110)</td>
<td>35 (range 1-88)</td>
<td>26 (range 1-41)</td>
</tr>
<tr>
<td>Percentage of female scales parasitized</td>
<td>0.9% (9 out of 985)</td>
<td>1.96% (12 out of 612)</td>
<td>0% (0 out of 7)</td>
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</table>
Our observations showed that the cause of the pest outbreak was the arrival of *R. perornatus* in Isparta province without its natural enemies. The local enemies have not adapted to the feeding on Rose Soft Scale yet. During the study only one parasitoid species was found on Rose Soft Scale; this was identified as *Microterys bellae*, a new addition to Turkey's fauna. Previously, this parasitoid was known only from a small part of the North Caucasus (Kabardino-Balkaria) from the same species of scale insect host [7, 12].

![Fig. 2. Microterys bellae, ♀; a) right antenna; b) right forewing; c) ovipositor; d) mandible; e) ninth tergite; f) left antenna; g) right forewing](image)

**Description of Microterys bellae Trjapitzin.** Female: Frons and vertex twice as long as wide. Ocellar triangle 60°. Cheeks approximately as long as eyes [¼ units]. Distance between antennal toruli twice as long as distance from antennal toruli to mouth margin. An antenna is illustrated in Fig. 2a. Scutellum with a slight projection, more or less as wide as long (13:14) or a little shorter. Mesoscutum almost as long as scutellum, slightly short, wider than long (5:3). Forewing width is almost twice shorter than width (Fig. 2b). Mid-tibial spur slightly shorter than first tarsal segment (6:5:5). Inner plate of ovipositor 43.5 times longer than its width at the narrowest point, and 25 times longer than its width at the widest place. Length of outer plates of ovipositor about 3.6-3.7 times longer than wide (Fig. 2c). Mandible three dentate (Fig. 2d). Angle of ninth tergite 90° (Fig. 2e). Frons and vertex dark yellow. Entire body dark and yellowish. Antenna also dark yellow. Fourth segment of funicle slightly pale, then segments 1-3 and 5-6 white. Antennal club dark brown.
Mesoscutum, scutellum and axilla with dark green-silver lustre. Tegulae and sides of axilla slightly yellowish. Metanotum and propodeum dark black, with blue-green lustre. Pronotum dark blackish or brownish, without lustre. Forewings dusky, with one slightly curved, light line in the front one-third part. This line 3.75 times shorter than length of fore wings. Dorsum of abdomen with black-violet-silverish lustre, venter with goldish lustre and white bristles; legs dark yellow; middle coxa dark brown; hind coxa darker than middle coxa; middle coxa, hind femur and hind tibia are equally dark. Mesoscutum, scutellum and axilla with same structure; Mesopleura dark yellow; Mesoscutum and scutellum covered by short, black bristles. Body length: 1.8-2.4 mm.

Male: Frons and vertex as wide as long. Ocelli create an equilateral triangle. Antenna and forewings are illustrated (Fig. 2f-g). Head and thorax green with metallic lustre. Scape yellow; pedicel dark; segments of funicle dark yellow. Mesopleura, middle and hind coxae dark yellow. Fore legs yellow, hind legs with dark tibia and femora. Abdomen with goldish-violet lustre. Body length: 1.75-1.9 mm.


Growers commonly use broad-spectrum insecticides (e.g. methidathion) against Rose Soft Scale, which are harmful to its natural enemies. However, insecticides are effective only against the immature scales, which are covered by only a thin scale-like cover; each adult female is completely enclosed in a thick, sclerotized "puparium" that is impenetrable to insecticides. In Isparta province, the effectiveness of parasitoids in the suppression of pests is decreased by the used agricultural methods, which minimize the parasitoid population. In the longer term it often causes recurrent pest outbreaks due to the buildup of pesticide resistance and decimation of beneficial natural enemy population. We think that it would be useful to create several refuges to promote the natural development of host-parasitoid relations and effectiveness of parasitoid. The ideal solution to the pest problem is to conserve natural host-parasitoid relations and avoid any disruption of these processes. Pesticide use is also expensive, hazardous to humans and wildlife, and is a major cause of environmental pollution. Alternatives to chemical control, such as biological control are urgently needed [5] and can play an important role. Our studies on the solution of this problem will continue to provide more complete data resources. We hope that M. bellae can be an effective natural enemy of R. perornatus, and that it should be used in the biocontrol of Rose Soft Scale in Turkey.

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