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Biological Properties and Pest Status of *Megamecus shevketi* Marshall (Coleoptera: Curculionidae) at Vineyards

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Abstract: In this study, the distribution, density and pest status of *Megamecus shevketi* Marshall at vineyards was investigated from 1998 to 2003 in Manisa, Turkey. Surveys were carried out weekly during March and April. In addition, some of the biological properties of *M. shevketi* were determined in plastic jars which were closed with insect-proof gauze at laboratories. Results showed that adult *M. shevketi* emerged during March and April and fed themselves into the buds and the leaves, lacerating the vine boughs. At the infested vineyards, *M. shevketi* caused 10-95% damage on buds and approximately 9-48 adults were counted per vine. Eggs were laid 19.02±5.19 (9-40) days after the first mating of adults from early April to late August at the laboratory studies. Daily egg production per female was 5.95±1.41 (1-49) and total egg production per female was 441.25±163.42 (170-794) eggs. Oviposition and postoviposition periods were 72.36±26.08 (25-113) and 71.34+7.03 (1-53) days, respectively. The eggs hatched in 10.35±0.04 (10-11) days and the hatching ratio was 100%.

Key words: Weevils, grape, *Megamecus shevketi,* curculionidae

Introduction

Grape is considered as a valuable constituent for health. It is consumed as raisin and table grape. Also it is converted into raki, wine, alcohol and vinegar by the assistance of some technological processes. Grape is important in Turkey's economy since it was exported in the forms of raisin, wine and table grape.

Turkey is in the fourth rank (530000 ha) in vineyard area after Spain, Italy and France. On the other hand, Turkey is in the sixth rank (3600000 ton) in production after Italy, Spain, France, US and China (FAO, 2004). In Turkey, Aegean Region is the leading region of grape production with 250000 tons raisin in 2004 (MTB, 2004). The primary cities in raisin production are Manisa, İzmir and Denizli. The important raisin production towns of Manisa are Alasehir (24.5%), Salihli (15%), Turgutlu (10.31%), Merkez (10.25%), Saruhanlı (8.79%) and Sarıgöl (8.37%).

The vine weevils are an important pest of grapevine in Aegean Region. As the vine weevils in this region (*Otiorhynchus peregrinus* Stierl, *O. carceli* Gyllenhal, *O. turca* Boheman, *O. scitus* Gyllenhal and *Megamecus shevketi* Marshall (Coleoptera: Curculionidae)) were detected (Bodenheimer, 1958; Lodos *et al*., 1978). *M. shevketi* was first recorded in 1932. Its description, however, was first done in 1979 (Lodos, 1979). On the other hand, the effectiveness of insecticides against *M. shevketi* were investigated by Önçağ and Altınçağ (1980). Nonetheless, no studies and observations were done

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regarding the population density and biology of this species. In this study, the distribution, density, and pest status of *M. shevketi* at vineyards was investigated from 1998 to 2003 in Manisa, Turkey. In addition, some of the biological properties of *M. shevketi* were detected at laboratory.

Materials and Methods

The field studies were conducted in Manisa, Saruhanlı, Turgutlu and Alaşehir from 1998 to 2003. To determine the distribution, density and pest status of *M. shevketi*, surveys were carried out weekly for each location during March and April, when *M. shevketi* emerged from hibernation. The buds, shoots, stems, roots, cracks of one of the every five grapevine were sampled and the vine weevils were collected. Their identification and density were determined at the laboratory conditions. To determine the rate of damage, the buds of one shoots at four different directions were examined on one of every five vine. The level of injury was recorded.

Some biological properties of *Megamecus shevketi* was investigated in 5lt plastic jars which were closed with insect-proof gauze for ventilation in laboratory. For feeding *M. shevketi*, grape shoots (10-15 cm) were put into the small bottles containing water in the laboratories. At the 2-3 leaf stages, the bottles were tightly tied, and put into the jars. In addition, gauze (5x5 cm) was put in each jar for egg laying (Oncuer and Karaoz, 1995). Before adult *M. shevketi* did not emerge from hibernation, *M. shevketi,* collected from the vineyards, were put into the jars as one male and one female.

The weevils were observed every day. Mating, laying eggs and their deaths were recorded. The eggs laid on the gauze and leaves were counted under stero-binoculer microscope (magnification 10x). The incubation period and the hatching ratio were also determined. Through this study the longevity of females, mating frequency, daily and total egg production per female were determined. The studies were conducted in climate rooms with 25°C, 70% Rh and 40 replicates.

Results

The Distribution, Density and Pest Status of Megamecus Shevketi

The result showed that all of the 2500 weevils collected from vineyards in Manisa, Turkey were belong to *M. shevketi.* This species was common in the vineyards of Merkez, Saruhanlı, Turgutlu and Alaşehir.

The adults appeared during March and April depending on the changes in the weather conditions. They feed on buds and leaves at night by cutting characteristic U-shaped notches in the foliage of the vineyards. During the daylight hours, the adults hide in the debris and loose soil at the base of the plant. Eggs are laid during July and August in the soil under the plants on which the adults feed. As the eggs hatch, the larvae burrow into the soil and feed on the roots. It was observed that they overwintered as adult in the cracks of grapevine, under the leaf residues, and 15-20 cm deep in the soil.

Main damage is caused by adult feeding on new buds and the bunches of grapes. Subsequently this can lead to prevention of development of inter-nodes. The larval stages of this pest feed on plant roots. At vineyards infected with *M. shevketi,* it caused 10-95% damage on buds and approximately 9-48 adults were counted per vine. Therefore, heavily infested buds neither produce branch nor grape. The production of that year and the next year is affected. If 2/3 of the buds were damaged by *M. shevketi,* the shoots would not grow. On the other hand, if the damage level is low, it causes 10-15 days late shooting.

Some Biological Properties of Megamecus Shevketi in Laboratory

It was observed that the male and female weevils collected from the vineyards started mating after they were put into the jars. They continued mating until the end of their lives. The female is able to mate 30 times during her longevity. Some biological properties of *Megamecus shevketi* in laboratory are given Table 1.

Eggs were laid 19.02±5.19 (9-40) days after the first mating of adults (Table 1). The eggs were off-white color at first soon turning black. The eggs are especially laid on the gauze, but sometimes they laid on the leaves. The insect lays eggs on the margin of leaf and/or onto the gauze, and as soon as the eggs laid leaf margin or gauze folds over. Although they laid eggs from early April to late August, the most eggs mostly laid in April and May. Daily egg production per female was 5.95±1.41 (1-49) and total egg production per female was 441.25±163.42 (170-794) eggs. Oviposition and postoviposition periods were 72.36±26.08 (25-113) and 71.34±7.03 (1-53) days, respectively (Table 1).

Some females were mating, even though they never laid eggs. On the other hand there were some females which laid one or two eggs, then died in 1 or 2 weeks. When the early died females were examined, lots of eggs in their ovary were observed. Because their deaths were unusual, they were not taken into account for experiment. It was determined that the adults usually died at the end of August, nevertheless there were some adults which lived until October. The eggs hatched in 10.35±0.04 (10-11) days, and the hatching ratio was 100%. The larvae are legless, slightly C-shaped, white grubs with brown heads. The average length of the larva was 0.87 (0.7-0.9) mm.

Discussion

It was identified that all of the vine weevils collected from Manisa were belong to *M. shevketi*. In addition to *Megamecus shevketi*, other vine weevils *Otiorhynchus peregrinus, O. carceli, O. turca,* and *O. scitus* were detected by previous studies in this region (Bodenheimer, 1958; Lodos *et al*., 1978). Lodos (1979) mentioned that this species was detected in Manisa, Aydin, Denizli and Izmir. Nevertheless, Karagöz *et al.* (1998) reported that there were no species of the vine weevils in the vineyards of Aydin.

10-95% damage on buds was observed at vineyards infested with *M. shevketi*. İyriboz (1958) reported that in the Aegean region, the vine weevils damaged 75% of vineyard area in 1937. According to Iren (1976) in central Anatolia the vine weevils caused local damage. Lodos (1979) reported that *M. shevketi* is an important pest of the vineyards in the Aegean Region.

Table 1: Some biological properties of *Megamecus shevketi* in laboratory

Daily egg production per female	5.95±1.41 (1-49)
Total egg production per female	441.25±163.42 (170-794)
Preoviposition period (day)	19.02±5.19 (9-40)
Oviposition period (day)	72.36±26.08 (25-113)
Postoviposition period (day)	71.34±7.03 (1-53)
The egg period (day)	10.35±0.04 (10-11)
The egg hatchability (%)	100

The oviposition period of *M. shevketi* continued from April to August in the laboratory conditions. Öncüer and Karagöz (1995) observed the biology of *Otiorhynchus peregrinus*, and they found that *O. peregrinus* laid eggs between April and September, and the first adults emerged from August to September both laboratory and field conditions. In spite of the fact that *M. shevketi* and *O. peregrinus* are different species, their life cycles in the laboratory conditions are similar.

Although insecticide was applied to control the *M. shevketi* in the infested vineyards, *M. shevketi* was observed to be an important pest in the following year. The reason for appearance of this pest in the vineyards every year is that the larvae hatched eggs would be arisen from becoming adult at the different time than April-August period. In the future studies, the period of biological stages of *M. shevketi*, from larva to adult, should be investigated in both the nature and laboratory conditions. Based on this knowledge, the most appropriate and economical pest management methods could be found.

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