

[Report and Opinion]

The Injurious Arthropods of Wild Pistachio Trees (*Pistacia Vera*: Anacardiaceae) In Northeastern Iran

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ABSTRACT

During 2001-2003, a survey was carried out to identify arthropods associated with wild pistachio trees (*Pistacia vera*L.) in the natural forests of pistachio of Khorasan province (Northeastern Iran). A variety of collection methods including direct collection, shaking the foliages, knockdown and light trap were used. In some cases, the immature stages were reared to adult. As a result, a total of 18 species of insects and mites were determined as the common injurious arthropods of the pistachio natural forests in the region. Among them, 2 species belonging to the order of Lepidoptera are recored from wild Pistachio trees of Iran for the first time. Also, 6 species are new for Khorasan province. Overall, the majority of the species were in common with cultivated pistachio trees. Data on their importance and biology where possible is given.

Key words: Wild Pistachio pests, Khorasan, Iranian fauna.

INTRODUCTION

Being economically important, the most researches have been focused on pests of the cultivated pistachio trees. This is in spite of this fact that natural forests of pistachio play a vital role in conservation of soil and protection from erosion; provision of wildlife habitats and also, being very tolerant to environmental stresses like cold and drought, probably because they have genes that allow them to handle different stressors. Unfortunately, not only no enough effort has been made to conserve these plant genetic resources but also, overexploitation (e.g., overgrazing, cutting down trees for firewood) still threaten these fragile ecosystems. Beside the human activities, some years the attack of pests cause considerable damage to these neglected valuable trees. Fortunately, some remainders of these natural resources still exist in Iran, mainly in Kerman, Fars, Baluchestan, Kermanshah, West Azarbijan and Khorasan provinces (Taghizadeh and Safavi,1951).

Reviewing the literature (Behdad, 1988; Davatchi, 1958; Khalil-Manesh, 1973; Kirukhin, 1946; Mehrnejad and Daneshvar, 1991; Mehrnejad and Uekerman, 2001; Mehrnejad, 2001), while at least one hundred ar-

thropod pests have been reported from cultivated pistachio in Iran, information on the pests associated with the wild *Pistacia vera* is little or nothing! The present study, as part of a conservation project was conducted to collect and identify arthropods of natural pistachio forests in Khorasan to provide a base for further studies.

MATERIALS AND METHODS

During 2001-2003, a survey of arthropods associated with wild pistachio trees was conducted in the natural pistachio-growing areas of northeastern of Iran. In order to sampling, a variety of collection methods including direct collection, shaking the foliages, knockdown and light trap were used. In some cases, the immature stages of collected pests were reared to adult.

Specimens identified using available references (Taghizadeh and Safavi,1951; Davatchi,1958; Jeppson, Keifer and Baker,1975; Behdad, 1988; Blackman and Eastop, 2000). Some specimens were sent to E. von Nieuwerkerken and J.Salesbergs (The Natural History Museum of Leiden, the Netherlands) for confirmation or identification. All the specimens are kept in the Collection of Plant Protection Department, Khorasan Head

Office of Natural Resources.

The Study area located at 35-38° N, 56-60° E as scattered stands. The principal site was Khajeh -e- Kalat, a forest with about 9000 ha area in north east of Chah-chahe village, adjacent Iran-Turkemanistan border.

RESULTS AND DISCUSSIONS

Among numerous insects and mites collected on the wild pistachio trees (*P. vera*), the activity of 16 insect pests and 2 phytophagous mites were considerable. In comparison with cultivated pistachio trees, the number of pests of wild pistachio trees was much lower, 16 out of 18 pests were in common. These pests can be divided into two groups based on their importance in the region. The first group include the first 4 species which are abundant throughout the area and usually cause significant defoliation on pistachio trees in the study areas. The second group contains the phytophagous insects and mites which rarely so numerous to harm economically the wild pistachio trees. However, under certain conditions, some of these occur as key pests on cultivated pistachio trees. Biological data for recorded specimens are presented in accordance to their importance as follow:

Serious pests

The gelechiid leaf borer, *Gelechia cuneatella* Douglas (Lep., Gelechiidae)

Gelechia cuneatella is reported from the wild *pistacia vera* for the first time in Iran. Already, it has been reported from willow (*Salix* sp.) in Europe. The larvae are leaf borer and active immediately after the emergence of new leaves in mid March. In early season, the larval feeding leave only the petiole of the newly emerged leaves. However, later in season they feed on parenchyma of tied leaves. The larvae wriggle rapidly out of their habitation and drop to the ground if disturbed. In some years, the larvae are so numerous that their feeding results in nearly complete defoliation of trees in early spring. The damage of the first generation was considerable and is one of the key pest of the wild pistachio trees in the region. Counting the leaves of ten randomly selected trees on 10 April 2004 showed that the ratio of leaves which at least 50% of them are were eaten by larvae to total leaves of each tree was 47/8%. Preliminary biological studies showed that

the insect has 3 generations per year in the region. The insect over winters as pupa in loose silken cocoon under the fallen leaves and soil surface.

The pyralid leaf borer, *Nephoptrix minimella* Amsel (Lep., Pyralidae)

The leaf borer, *Nephoptrix minimella* was found the second important defoliator on the wild *pistacia vera* in Khorasan natural forests. This is the first report of occurrence of this pest on pistachio trees in Iran. Its larvae remove tissue from upper side of leaves, leaving the lower surface intact. The larval feeding may seen as a distinct russetting towards late season. The larvae tie together 2/3 leaves with silk and feed inside the shelter. The insect has 2 generations a year and over winters as pupa in soil surface.

The pistachio leaf and hull borer, *Arimania komaroffi* Rag. (Lep., Pyralidae)

This species already has been reported as a fruit hull borer on cultivated pistachio in Iran (Samet, 1985). However, this study revealed that the larvae of this moth are leaf borer rather than a fruit pest. Only in few cases, it was observed that larvae were feeding on fruit hulls. Overall, in early spring the adult moths emerge from over wintered pupae and soon start laying eggs on newly appeared leaves. Larval feeding results in skeletonized leaves, desiccated prematurely. Each larva folding and spinning 2/3 leaves together with silk. However larvae are very active and drop to the ground if disturbed. Pupal stage spends inside a loose cocoon between leaves and within 3 weeks the adult appears in August. The insect has another generation until late season and hibernates as pupa under soil surface and fallen leaves.

The common pistachio psylla, *Agonoscena pistaciae* B. & L. (Hom., Psyllidae)

The occurrence of the common pistachio psylla on wild and cultivated pistachio trees in Iran first was reported by Kiriukhin (1946). According to Davatchi (1958) for years, this insect has been a secondary pest of pistachio trees, but chemical control of *idiocerus stali* has changed its pest status and now, the common psylla is the most serious insect pest of cultivated pistachio trees in all pistachio-producing areas in Iran (Mehrnejad, 2001). According to the latter, this insect has two

seasonal forms. Winter forms appear in early October and emigrate towards the over wintering shelters. They are large with generally darker forewings with brown shading in the cells and pigmented veins. The winter forms attack the pistachio trees in the late winter and early spring, feed on swollen buds, young leaves and shoots and establish the summer form generations. The insect lay her eggs mainly on the upper surface of the leaves and in lesser extent on the petiole of the soft leaves and young succulent plant shoots. Both nymphs and adults produce huge amounts of honeydew that turns to white solid granule, soon after secretion. This species has several generations per year.

Minor pests

The pistachio leaf miner, *Stigmella promissae* Stg. (Lep., Stigmellidae)

This leaf-miner was found on leaves of the wild pistachio throughout the region. Larval feeding on the leaf parenchyma cause irregular black spots on the leaves. Sometimes, several black spots were found on one leaf. Towards end of season, its injury symptoms are more visible. This pest has one generation per year in the region.

The cotton bollworm, *Helicoverpa armigera* Hubner (Lep., Noctuidae)

In early season, the larvae of this polyphagous pest attack the fruits and feed on young soft shelled pistachio fruits. However, later in season, several times the larvae were found to be eating leaves. Overall, its population in the region was low. Information on the biology of this pest in the region is nearly nothing, but Jalilvand *et al.* (2000a) have done some investigation on the biology of *Helicoverpa* species in Rafsanjan, one of the main pistachio producing area in Iran.

The pistachio leaf-rolling psyllid, *Megaronoscena viridis* (Baeven) (Hom., Psyllidae)

Comparing with the common pistachio psylla, the leaf-rolling psylla is a little larger with green colour. Also, its density was lower than the common pistachio psylla in the region and its feeding cause rolling the leaves, so the the psyllid nymphs develop in the shelter. The leaf-rolling psylla aestivate and hibernate in egg stage. This psylla has one generation per year, already it has been

reported from cultivated pistachio in Iran (Mehrnejad, 2001).

The pistachio twig and fruit scale, *Pistaciaspis pistaciae* Archan (Hom., Diaspididae)

This insect was found to be one of the most widely distributed insect pest in pistachio natural forests of Khorasan. Also, it is one of the most destructive pests in pistachio orchards in Iran (Mehrnejad, 2001). The brood of the first generation infest the twigs, fruit cluster base and petioles, but in subsequent generations infestation extends towards leaves and nuts. The feeding sites on the infested foliage and nuts turn yellow and purple. In case of heavy infestation, the twigs and branches are killed. Also, the infested nuts remain smaller and their ripening is delayed. This scale has 3 generations per year and over winter as adult on the pistachio twigs.

Anapulvinaria pistaciae B. (Hom., Coccidae)

From mid spring, the presence of the pest become obvious as fully mature females spins a cushion-like sac of white, waxen threads within which eggs deposited. The pest easily found under side and sometimes upper side of leaves and shoots. The feeding of young nymphs on sap of leaves and shoots weaken pistachio trees. However, compared with twig and fruit scale its abundance is locality and very low. This is a univoltine pest and is not of economic importance in the area.

The pistachio leaf hopper, *Idiocerus stali* Fieb. (Hom., Jassidae)

The pistachio leaf hopper has been the most serious pest of cultivated pistachio throughout Iran (Davatchi, 1958), but now it is no longer considered an important pest. However, it is still an important pest in mountainous areas where *Pistacia mutica* are grown. The over wintered adults of leaf hopper appear on the trees in early spring and start feeding on swollen buds. Soon, the females start laying her eggs in plant tissues such as flower clusters, new shoots, petioles and leaf mid veins and cause damage to pistachio trees. The nymphs feed on young parts of the plants, especially on fruit clusters, consequently the young fruits fall-off from trees. Due to secretion a lot of honeydew which contaminates the aerial parts of the plants, a

mould infestation occurs subsequently. This hopper has one generation per year.

***Forda hirsuta* M. (Hom., Pemphigidae)**

This is the only *Forda* species known to gall on *Pistacia vera*. It has been also reported from other *Pistacia* spp. (e.g., *P. mutica*; *P. khinjuk*). The galls are bright red, and are formed by rolling downward and back of the leaf edges to form pockets. Usually several pockets occurring by side along the edge of one leaf (Davatchi 1958). Previously it has been reported from Iran, Crimea, Caucasus and Iraq. It is a heterocious aphid and produce colonies on roots of gramineae such as *Agropyron*, *Cynodon*, *Hordeum* later in season (Balckman & Eastop 2000).

***Slavum mordvilkovi* Kreutzberg (Hom., Pemphigidae)**

Already, Davatchi (1958) has reported two species of genus *Slavum* on Pistachio trees in Iran. This study found only one species, the *S. mordvilkovi* which produces branched, coral-like galls on wild *pistacia vera*. This species has been reported from Turkemeniya, Afghanistan and east Iran. This is also a heterocious aphid, but its secondary host plant is unknown (Blackman & Eastop 2000).

The pistachio root beetle, *Capnodis cariosa hauseri* Ob. (Col., Buprestidae)

Surveying the aerial parts of the wild pistachio trees in the region, only a few adults were collected. The author couldn't catch any larvae. The adults may be found through year, but it's feeding on pistachio leaves is not of importance. The main damage results from larvae which immediately after hatching penetrate into tree trunks just beside the trunk collar and bore the trunk and roots of pistachio trees. The insect complete its life cycle in two years (Farivar-Mehin, 1997).

The pistachio weevil, *Polydrosus davatchii* Hoffman (Col., Curculionidae)

The occurrence of *Polydrosus davatchii* on pistachio trees in Khorasan, Iran already has been reported by Taghizadeh and Safavi (1951). Field sampling indicated that the appearance of the adult insects on pistachio trees in the region corresponds closely with phonological stage of pistachio trees, so that at blooming stage around 3rd decade of March adults appear on trees and cause

minor injury by feeding on buds. Knowledge about the larval biology is limited. Based on a study by Jalilvand *et al.* (2000b) this insect has one generation per year.

pistachio seed wasp, *Eurytoma plotnikovi* Nikol. (Hym., Eurytomidae)

The pistachio seed wasp was found to be well distributed in the region. The wasp larvae feed on the pistachio kernel and overwinter inside the infested nuts either on the trees or on the ground. The adult wasps appear in May to June and lay their eggs in inner surface of endocarp. Egg hatching start in a few days, but larval feeding delayed until seed development start. The infested fruits stop development and dried out. The pest has one generation per year. Although widely distributed throughout the pistachio-growing areas, it is not considered an economic pest in Iran (Mehrnejad, 20001).

pistachio seed chalcid, *Megastigmus pistaciae* Walker (Hym., Torymidae)

This wasp was found to be the second common seed wasp of pistachio nuts in Khorasan natural forests. Its biology is very similar to *Eurytoma plotnikovi*, but this species has two generations per year.

***Tenuipalpus granati* Sayed (Acari, Tenuipalpidae)**

The specimens of this mite were collected several times and from different locations in the study area, but in low numbers overall. In Iran, this mite is considered as an economically important pest on cultivated pistachio trees (Mehrnejad, 2001). It also has been reported as occasional pest on pomegranate and grapevine plants in Egypt. Moreover, *Tenuipalpus granati* has been reported from Greece, Georgia, Kazakhstan and azarbaijan (Jeppson *et al.*, 1975). This mite hibernates as adult under the bud scales, near the base of buds. Also it can be found in crevices on the plant branches and twigs. In the late summer, its population is higher than ever. Heavy infestations may cause stop kernel development and dropping fruit buds. This is a multivoltine mite.

pistachio eriophyid mite, *Aceria pistaciae* Nalepa (Acari, Eriophyidae)

The first report of occurrence of an unknown *eriophyid* species on pistachio tress

in Iran belongs to Khalil-Manesh (1973). Later, Mehrnejad and Daneshvar (2000) reported two species of *Aceria*(=*Eriophyes*) from pistachio trees in Kerman, Iran. During this study, the occurrence of *A. pistaciae* on the wild *pistacia vera* in natural forests of Khorasan is confirmed. The mite causes flower stalk brooming which getting reddish and noticeable towards late season.

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