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**Description and Seasonal Abundance of the Tea Mealybug,
Pseudococcus viburni (*Affinis*) (Signoret)
(Homoptera: Pseudococcidae) Found on Tea in Iran**

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Abstract: A survey of mealybugs occurring in tea gardens of north of Iran was conducted during 2003-2005 seasons. Obscure mealybug, *Pseudococcus viburni* (*affinis*) (Signoret) was recorded as dominant species from tea gardens of Mazandaran and Guilan provinces of north of Iran. This species is collected from all of tea gardens, where it was found infesting tea plants (*Camellia sinensis* var. *sinensis*) and some other host plants. Description of adult female and different instars of tea mealybug is given. In tea gardens of north of Iran, tea mealybug density increased rapidly to an early peak in April, followed by a decline and then a low, but steady density for remainder of the season until there was another decline in November. Across the tea gardens monitored, four generations per year are indicated by peaks in crawler density.

Key words: Pseudococcidae, *Pseudococcus viburni*, Tea, *Camellia sinensis* var. *sinensis*, North of Iran

INTRODUCTION

Mealybugs (Homoptera: Pseudococcidae) are important plant pests worldwide (Ben-Dov, 1994; Daane, 2000; Williams, 1985; Williams and Granara de Willink, 1992; Miller *et al.*, 2002, 2005). Their feeding may cause leaf yellowing, defoliation, reduced plant growth and in some cases death of plants. Indirectly, they may also damage plants by serving as vectors of plant diseases. In addition, production of honeydew contributes to the development of sooty mold that decreases photosynthesis and may reduce the marketability of plant products such as fruits, leaves and etc. Besides their direct and indirect damage to crops, mealybugs are also of quarantine concern, adding to costs of production to prevent or eliminate their presence on plants and produce.

Information on the occurrence and distribution of mealybug species in the north of Iran is limited. For example Maffi (1998) documented the presence of five species of mealybugs on citrus and other host plants, in which *P. citri* is known as dominant species. He noted the need for additional survey and taxonomic studies on such pests in this area. Tea plant (*Camellia sinensis* var. *sinensis*) is also an economically important crop in the temperate and humid northern parts of Iran. *Pseudococcus affinis* has previously been reported from citrus gardens of north of Iran (Unknown, 1998), but there was not a clear scientific evidence of its occurrence and its situation in the tea gardens. The objective of this study was to find different mealybugs present on tea trees and seasonal abundance of their dominant species in north of Iran. Here we document tea mealybug description and its seasonal abundance in tea gardens of north of Iran.

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MATERIALS AND METHODS

As part of our project on population fluctuations of tea mealybugs in tea gardens of Iran, mealybugs were collected during 2003-2005 from tea plants in Mazandaran and Guilan province of Iran to identify species present in this area. Field studies were conducted in tea gardens of two regions (Lahijan and Ramsar) of north of Iran. At each location we studied the seasonal abundance of mealybugs. There are no simple and effective methods to monitor most mealybugs species (Millar *et al.*, 2002) but we used 5 min counts (Geiger and Daane, 2001). In this method, all mealybugs were collected when noticed on the brunches, leaves and main trunk of plants and were recorded by developmental stage and condition (alive or parasitized). All samples brought to ARC (Agricultural Sciences Research Center) for Identification. Sampling was carried out biweekly and continued for eight months.

All mealybug specimens were slide-mounted for identification using the method outlined in Williams and Granara de Willink (1992), except that xylene was used instead of clove oil. Voucher specimens of these insects are deposited in the arthropod collections of Plant Protection Research Institute of Iran and Entomology Lab. of University of Shahed.

RESULTS AND DISCUSSION

Tow mealybugs species were found in the tea gardens (Table 1). *Planococcus citri* (Risso) was found on citrus and tea plants especially in Ramsar area where citrus trees are inside or near to tea gardens. *Pseudococcus viburni* (Obscure mealybug) is a cosmopolitan species, very similar taxonomically to *Pseudococcus maritimus* (Ehrhorn) and has been recorded previously in Iran (as *Pseudococcus affinis*) on citrus plants (Maffi, 1998; Unknown, 1998). This species has broad host range including economically important crops such as walnut, pomegranate, apple, citrus, peach, strawberry as well as tomato, grape and potato (Ben-Dov, 2004).

Description of Tea Mealybug

In life, adult females of *P. viburni* are pinkish-purple to gray, generally lightly dusted with white powdery wax, with short, fine lateral wax filaments and one pair of long terminal wax filaments usually more than half as long as the body.

The first-instar nymphs (crawlers) can be distinguished from later-instar nymphs by their small size (as measured by width of the anal ring). As Gullan (2000) mentioned in first-istar nymphs of *P. viburni*, there is a simple pore on the margin of each eye (Fig. 1).

Second-instar females have six-segmented antennae, as do first-instar nymphs, from which the second-instar females are distinguished by their larger anal ring and the presence of conical or robust lanceolate cerarian setae in at least the penultimate as well as the presence or absence of an anal lobe bar, cerarian sclerotisation and a simple pore on the eye margin (Fig. 1).

Table 1: Records of mealybugs (Homoptera: Pseudococcidae) collected from tea gardens of north of Iran during period of 2003 to 2005

Mealybug species	Collection location	Host plants
<i>Pseudococcus viburni</i> (Signoret)	Ramsar, Lahijan	<i>Camellia sinensis</i>
<i>Planococcus citri</i> (Risso)	Ramsar	<i>Camellia sinensis</i> , <i>Citrus</i> spp.
<i>P. viburni</i>	Ramsar	<i>Vitis vinifera</i>
<i>P. viburni</i>	Ramsar, Lahijan	<i>Cyperus rotundus</i>
<i>P. viburni</i>	Ramsar	<i>Glycine max</i> , <i>Cucurbita pepo</i> , <i>Malus</i> spp., <i>Prunus persica</i> , <i>Salix</i> spp., <i>Nicotiana colossea</i> , <i>Juglans regia</i> , <i>Punica granatum</i> , <i>Fragaria</i> sp., <i>Solanum tuberosum</i> , <i>Lycopersicon esculentum</i> and some others.

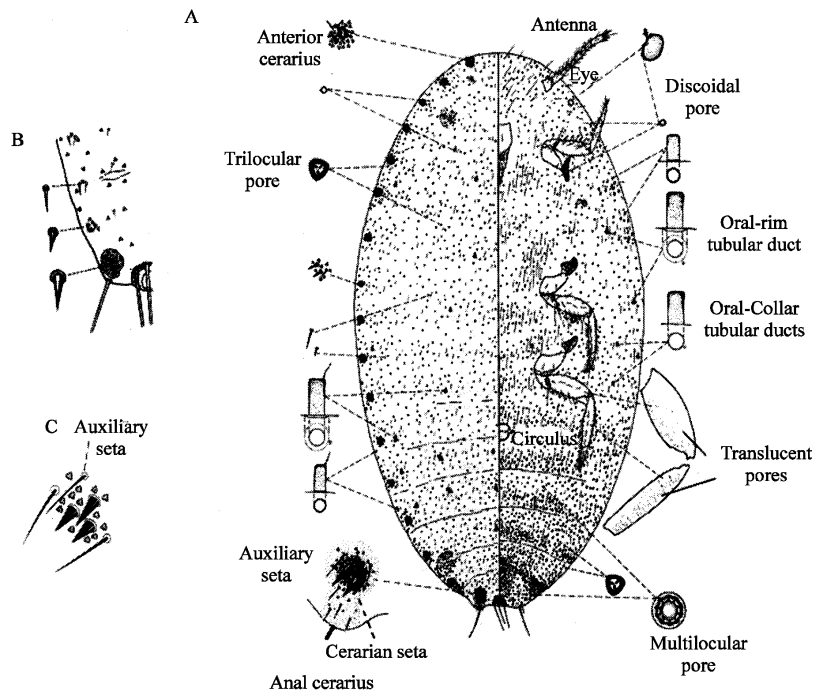


Fig. 1: A-General morphology of adult female of *P. viburni* (Modified from Williams, 1985), B- Dorsum of the posterior abdomen of second-instar female of *P. viburni* (Gullan, 2000) and C-Cerarius containing auxiliary setae of *P. viburni* (Watson and Kubiriba, 2005)

The second-instar male nymphs can be distinguished from second-instar female nymphs by the presence in the former of numerous scattered oral collar tubular ducts and/or oral rim ducts on the dorsum. In *P. viburni* only oral collar tubular ducts are present.

Third-instar females are recognized readily by their seven-segmented antennae. Adult females of *Pseudococcus* have eight-segmented antennae (Williams, 1985; Cox, 1989). The third-instar females of *P. viburni* have been described and illustrated by Miller (2000), Ghosh and Ghose (1989), Miller *et al.* (1984) and Gimpel and Miller (1996), respectively.

Seasonal Abundance and Distribution

In tea gardens of north of Iran, tea mealybug density increased rapidly to an early peak in April, followed by a decline and then a low, but steady density for remainder of the season until there was another decline in November (Fig. 2 and 3). Across the tea gardens monitored, four generations per year are indicated by peaks in crawler density (Fig. 2 and Table 2). Changes in the tea mealybug within tea tree distribution showed greater seasonal variation than its density. The most notable aspect of the within-tree distribution is that some tea mealybug were found on the roots on all sample dates. The proportion was smallest during the June-July period, when the mealybug density was peaking (during the spring flush of growth and the harvest period). As tea mealybug population entered the warmest summer months the proportion of the population found under ground and on the lower portion of the tea trunk increased. These data suggest that the tea mealybug was seeking protection (probably from heat) underground.

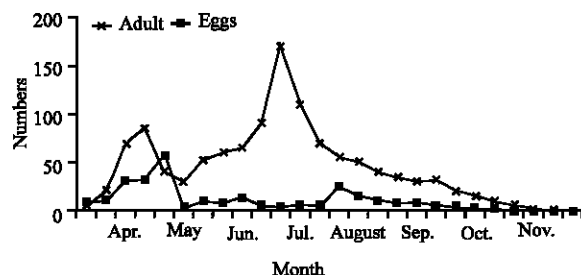


Fig. 2: Seasonal density of adult and egg sac of tea mealybug, *P. viburni* in the tea gardens of north of Iran during period of 2003 to 2005

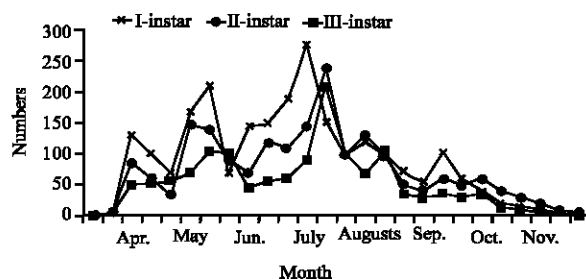


Fig. 3: Seasonal density of nymphal instars (first, second and third instars) of tea mealybug, *P. viburni* in the tea gardens of north of Iran during period of 2003 to 2005

Table 2: Growth period and number of generations of tea mealybug, *P. viburni* in natural condition in tea gardens of north of Iran during period of 2003 to 2004

No. of generation	Date of generation starts	Date of generation ends	Generation period	Temp. (°C) during period	Rh. during period (%)
First	5 April 2003	20 May 2003	45 days	23.4	80.8
Second	25 May 2003	2 July 2003	40 days	27.0	77.5
Third	5 July 2003	25 Aug. 2003	50 days	23.0	80.1
Fourth	25 Aug. 2003	Hibernation	Hibernation	-	-

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