Pak. J. Bot., 41(5): 2633-2637, 2009.

PISTACHIO TREE - A NEW HOST FOR TWO SPECIES OF TERMITES (ISOPTERA, ARTHROPODA) FROM IRAN

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Abstract

Two termite species viz., *Anacanthoterms vagans* (Hagen), harvester termite and *Microceroterms diversus* (Silvestri) mound–building termite are reported for the first time from cultivated and wild pistachio trees in the main pistachio growing areas of Iran. Out of 200 plants studied, 47 were infested with termites and the rate of infestation was 23.50%. *A. vagans* attacked more frequently as compared to *M. diversus* on all three varieties of *Pistacia* viz., *P. vera* L., *P. mutica* Fisch. & Mey., and *P. khinjuk* Stocks. Percentage damage of trees was also discussed in relation to different environmental factors like soil temperature, ambient temperature, humidity, rainfall and drought. The density and species richness in termites was positively correlated with soil temperature. An enhancement in termite feeding activity also showed a direct relationship with soil temperature.

Introduction

Pistachio (Family Anacardiaceae) belongs to the nut tree group and is a very important economically in arid and semi-arid agricultural production in Iran. The genus has 11 species, which are distributed mainly around the Mediterranian sea, western Asia, middle East and central Asian regions. Three out of the 11 species occur in Iran, viz., *P. vera, P. mutica, P. khinjuk*. These pistachio trees are distributed at latitude of 27-37°C and an altitude of 700-3000 m. The trees have a wide range (-20 to +45 degree °C) of tolerance for temperature. The optimum relative humidity level for this nut is less than 35%.

Through ancient times, people have been using pistachio as one of the most nutritious food in the world (Abrishami, 1995). These are delicious and are nature's super heart-healthy snack. These are highly nutrient dense, full of fiber and antioxidants, pistachios are calories rich nuts than any other nut.

A survey of termites associated with Pistachio trees was conducted in the Pistachio orchard in the Province of Sistan and Baluchistan, Iran during the period 2006-2007. Previously only a few species of termites were known from Pistachio trees in Iran. In the present paper, infestation of termites onto three different species of Pistachio viz., *Pistacia vera, Pistacia mutica* and *Pistacia khinjuk* are described for the first time and feeding preference of the two termite species is also discussed.

Materials and Methods

Present survey was conducted in 2006-2007 from pistachio Gardens in the province of Sistan Iran and Baluchistan. A total of 200 trees were examined randomly from three different localities and from three different plots measuring 500 x 500 meters Collected termites were preserved in 80% ethanol for subsequent studies in the laboratory and were identified with the help of diagnostic keys by Akhtar, (1974), Ravan & Akhtar, (1993), and Ghayourfar, (2001). Environmental factors like atmospheric temperature, soil temperature,

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humidity, rainfall and drought were recorded each day during the visit. For percentage of damage done by termites, infested plants out of the total standing plants in the pistachio garden were counted in three randomly selected plots in three different localities of the said provinces. Correlation coefficient was used to see the relationship of termite population to percent damage and other different environmental factors.

Results

During the study period 200 plants/trees were examined. Two species of termites, viz., *A. vagans* Hagen: Hodotermitidae and *M. diversus* (silvestri): Termitidae were recorded damaging pistachio trees in Iran. Out of 200 plants, 47 plants/trees were infested and the rate of infestation was 23.50% (Table 1). Results also revealed that a total of 47 plants were attacked by different termite species in the Province of Sistan and Baluchistan, Iran. Further studies also revealed that *A. vagans* Hagen attacked more frequently as compared to *M. diversus* (silvestri) in all the three varieties i.e., *P. vera, P. mutica, P. khinjuk* (Table 2). This table also shows the frequency of occurrence of *A. vagans* (Hagen) *M. diversus* (silvestri), on different host plants in different provinces. Besides percent damage of trees, a relationship to different environmental factors like soil temperature, atmospheric temperature, humidity, rainfall and drought were also discussed. Relationship between the number of termite species and different atmospheric temperature was positive and significant indicating that with rise of temperature number of termite species of the locality increased ($r= 0.5752$, $df =12$; $p<0.05$).

The relationship between the number of termite species at different soil temperature was Positive and significant indicating that with rise of temperature number of termite species of locality increased and showed that soil temperature favoured termite activity ($r= 0.5101$, $df=12$; $p<0.05$). Relationship between the number of termite species at different relative humidity was negative and non-significant, indicating, however, had no effect on termite activity ($r = -0.2753$, $df=12$; $p>0.05$). As far as rainfall is concerned, there was no rainfall during the study period except in month of December. About 2 mm of precipitation was recorded and no termites were found infesting trees during this month (Table 3). It is also evident from the table that the temperature and drought are major physical factors effecting termite population.

Table 1. Percentage of infested (Damaged) plants /trees recorded in three localities.

Name of province	Plant examined			Plants infested			Percentage (%) infested
Sistan & Baluchistan	3 localities			3 localities			
	1	2	3	1	2	3	23.50
	50	70	80	12	18	17	
Total (3 plots)	**200**			**47**			**23.50**

Table 2. Frequency of occurrence of termites on different plants/trees in different localities in province of Sistan and Baluchistan; Iran.

Termite species	Host plant attacked
A. vegans	*Pistacia vera* (8)
	Pistacia mutica (10)
	Pistacia khinjuk (11)
M. diversus	*Pistacia vera* (6)
	Pistacia mutica (8)
	Pistacia hinjuki (6)

Table 3. Relationship of different environmental factors with number of termite in the province of Sistan & Baluchistan, Iran during. (2006-2007).

Months/Date	Atmospheric temperature (°C)	Soil temperature (°C)	Relative Humidity (%)	Ranifall (mm)	*A. vagans* (number)	*M. diversus* (number)
01-10-2006	26.50	20.00	55.50	__	_	02
11-10-2006	24.50	20.00	55.00	__	02	__
30-10-2006	25.00	21.00	55.00	__	20	07
01-11-2006	22.50	20.00	40.00	__	__	02
12-11-2006	22.00	18.00	40.00	__	__	02
14-11-2006	20.00	17.00	40.00	__	__	01
01-12-2006	21.50	21.50	59.00	2.0	__	__
11-12-2006	20.50	20.50	59.00	__	__	__
19-12-2006	20.50	18.50	59.00	__	__	__
01-01-2007	27.50	24.50	48.00	__	04	02
01-01-2007	29.00	24.50	48.00	__	06	05
30-01-2007	30.00	26.50	49.00	__	10	10
01-02-2007	29.50	26.00	40.00	_	10	01
10-02-2007	29.00	26.00	45.00	_	05	02
30-02-2007	30.00	26.00	49.00	_	10	03
01-03-2007	35.00	30.00	49.00	_	05	06
11-03-2007	36.00	30.00	49.00	_	06	_
30-03-2007	37.00	30.00	50.00	_	02	06
01-04-2007	39.00	35.00	40.00	_	25	10
11-04-2007	39.00	35.00	40.00	_	27	02
29-04-2007	40.00	38.00	45.00	_	29	08
01-05-2007	42.00	38.00	50.00	_	20	10
10-05-2007	41.00	39.00	50.00	_	22	02
30-05-2007	42.00	39.00	50.00	_	10	08
01-06-2007	39.00	34.00	50.00	_	0	0
10-06-2007	38.00	35.00	50.00	_	0	0
29-06-2007	36.00	35.00	51.00	_	0	0
01-07-2007	29.00	27.00	50.00	_	0	0
10-07-2007	29.00	28.00	50.00	_	0	0
29-07-2007	29.00	28.00	50.00	_	0	0
01-08-2007	30.00	29.00	50.00	_	0	0
10-08-2007	29.00	28.50	50.00	_	0	0
30-08-2007	28.00	27.00	50.00	_	0	0
01-09-2007	27.00	26.00	50.00	_	0	0
10-09-2007	29.00	27.00	50.00	_	0	0
30-09-2007	29.00	27.00	50.00	_	0	0

Correlation coefficient:

Atmospheric temperature and number of termite species: $r=0.5752 (p<0.05)$

Soil temperature and number of termites: $r=0.5101 (p<0.05)$

Relative humidity and number of termites: $r=-0.2753 (p>0.05)$

Discussion

In different parts of the world, various researchers have studied the termite damage on different crops (Johnson *et al*., 1981; Wood *et al*., 1987). Emerson (1955) studied the temperature and moisture as major physical factors for the distribution of termites. Termites of Iran are poorly known and only few studies on termites of Iran are available

(Ravan & Akhtar, 1993; Ghayourfar, 2001). Keeping this in view, present study was done to evaluate the infestation of termites on Pasticho trees. In the present study, infestations of three different species of Pistachio i.e., *P. vera, P. mutica, P. khinjuk* by two different species of termites *A. vagans* (Hagen) *M. diversus* (silvestri) has been reported in two different provinces of Iran. Frequency of occurrence of termites showed that *A. vagans* (Hagen) occurs more frequently than *M. diversus* (silvestri) (Table 2). When different environmental conditions were compared from January, 2007 to December, 2007, Highest atmospheric temperature 41°C was recorded in the month of May, 2007. Similarly, highest soil temperature 38°C was recorded in May, 2007. Highest number of termites were collected in the month of April, 2007. As far as rainfall is concerned, it only occurs the month of December, 2007. We can safely conclude that drought was in most of the months of the year and no termites were collected from June, 2007 to September, 2007 and whenever there is increase in temperature, the number of termites increased and draught decreased the number of termites. The correlation coefficient as discussed in the results also proves this statement. For Pistachio, it is believed that stone age people used pistachios in Iran. It is also said that Queen Belqais of Shiba used to serve imperial guests with the finest Iranian pistachio, which was only available to the Royals. The largest pistachio plantations belonged to Iran. That's why Iranian farmers are more interested in Pistachio. Therefore during the last 100 years, Iran has been the biggest and the most important of Pistachio grower and country of the world. Out of total world Pistachio production, which some years touches peak annual production of 300,000 metric tons, more than 70 percent was grown in Iran. Our present research indicates that the percent damage is not so high (23.50%) and in most months of the year there is no termite attack, but attack may be enhanced by environmental conditions like temperature. Therefore there is a strong need to study the biochemical component of this tree that contains antitermitic properties either in stem, root, bark or seed of the tree. Literature shows that besides termites, fourteen mite species belonging to eleven families are reported from cultivated and wild pistachio trees of the main pistachio growing areas of Iran (Mehrnejad & Ueckermann, 2001). Though the damages caused by termites in pistachio are less than those incurred by mites, however the aforesaid losses due to termite should not be ignored in order to save the economy of the country.

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(Received for publication 20 August 2008)