

Full Length Research Paper

Ecological distribution and feeding preferences of Iran termites

S. Ravan

Department of Plant Protection, Faculty of Agriculture, University of Zabol, Zabol, Iran. E-mail: Su_ravan@yahoo.com.

Accepted 25 June, 2010

From nine province of Iran, surveyed for wood destroying termites carried out, in 2008 - 2009, sixteen species were collected. Out of the 1050 plants examined in the nine provinces, only 190 were infested by termites. Maximum infestation (22.41%) was recorded in province of Sistan and Baluchestan. *Anacanthotermes vagans* (Hagen) and *Microcerotermes diversus* (Silvestri) were more abundant in this province, and its preferred host was *Tamarix gallica* and *Populus caspica*. In province of Khorasan, once more, *Anacanthotermes vagans* (Hagen) are frequent.

Key words: Termites, ecological distribution, feeding preference, Iran.

INTRODUCTION

Termites are social insect, through their activities. They play a critical role in the regulation of soil processes, for example nutrient and water cycling and in soil structure formation and maintenance. In turn, termites help to promote biodiversity; creating suitable conditions for plants and other biota, and acting as a reliable year-round food source for other fauna such as reptiles and frogs (Korb, 2008). Termites usually feed underground on root crops such as beets or on roots of trees and grasses. Different termite functional group exist based on different feeding and nesting behavior, which in turn may reflect the way in which different species contribute to soil and trees processes (Eggleton, 2001). Cattle grassing and fire may change termite assemblage structure, with consequent effects on soil health (Korb and Fuchs, 2006). The great majority of termites live in tropical and subtropical region, but they extend into the temperate zone (Harris, 1970). However, out of nearly two thousand species of termites reported from all over the world, a very little (over 30) species belong to 4 families of termites of Iran (Esmaeilli and Ghayorifar, 1993; Ravan and Akhtar, 1995). Emerson (1955) pointed out that temperature and the major physical factors limit the dispersal of termites. These two factors largely determine the vegetation types of biomes also, so that a high degree of correlation between the phytogeography and termite zoogeography is apparent.

In the present study, ecological distribution and feeding preferences of termites from nine provinces of Iran representing a temperature zone are described for the first time.

MATERIALS AND METHODS

The study is based on the termites collected from nine provinces of Iran such as Sistan and Baluchestan, Kerman, Isfahan, Hormozgan, Khorasan, Khuzestan, Fars, Tehran and Quom (Figure 1) in 2008 - 2009.

A total of 1050 plants were examined for the feeding preferences of termites. All the termites collected during the survey were preserved in 80% alcohol for subsequent identification in the laboratory.

RESULTS

As a result of survey carried out in nine provinces of Iran. A total of sixteen species of termites were recorded, damaging the forest trees, log and structural wood in the building. During the study, 1050 plants belonging to different species were examined in Iran. Out of these, a total of 190 (18.09%) plants were found infested by termites (Table 1). As shown in Table 1, maximum numbers of infested plants (22.41%) were recorded in Sistan and Baluchestan. Minimum damage to trees was recorded in province of Hormozgan, where only 1 out of 10 trees examined, were infested.

Province of Sistan and Baluchestan

In province of Sistan and Baluchestan, 397 plants were examined and the rate of infestation was 22.41%. As shown in Table 2, eleven species of trees were attacked

Table 1. Percentage of Infested Plants recorded in different provinces of Iran.

Name of provinces	Plant examined	Plant infested	Percent infested
Sistan and Baluchestan	397	89	22.41
Kerman	30	6	20
Isfahan	20	2	10
Hormozgan	10	1	10
Khorasan	320	50	15.62
Khuzestan	154	26	16.88
Fars	54	10	18.51
Tehran	35	2	5.71
Qum	30	4	13.33
Total	1050	190	18.09

Anacanthotermes gurganiensis n. sp.

Province of Khuzestan

In province of Khuzestan 154 plants were examined and the rate of infestation was 16.88%. *S. babylonica*, *M. alba* and *P. caspica* were attacked by termites. The termite species working in province of Khuzestan were *Amitermes paravilis* n. sp., *Amitermes baluchestanicus* and *Microcerotermes gabrielis*.

Province of Fars

In province of Fars, 54 plants were examined and the rate of infestation was 18.51%. Four species of trees (*M. alba*, *Vitis vinifera*, *Vitis parifora* and *Acer candrium*) were attacked by termites. The termite species working in province of Fars was *M. diversus*.

Province of Tehran

In province of Tehran 35 plants were examined and the rate of infestation was 5.71%. *M. alba* and *Acer monspersulanum* of trees were attacked by termites. The termite species working in province of Tehran was *Amitermes belli*.

Province of Quom

In province of Quom 30 plants were examined and the rate of infestation was 13.33%. Two species of trees (*T. gallica* and *S. babylonica*) were attacked by termites (Tables 2 and 3). The termite species working in province of Quom was *Anacanthotermes gurgniensis* n. sp.

Rate of infestation by termites

As shown in Table 4, a total of 190 plants were attacked by termite species in different provinces of Iran. Maximum damage was done by *A. vagans* and its rate of infestation was 25.26%. Next to *A. vagans* was *Postelectrotermes pasniensis* and its total rate of infestation was 20%. As regards the total number of trees attacked by different termite species, 46.84% was recorded in Sistan and Baluchestan. Minimum damage was recorded in Esfahan, where only 1% of the sampled trees were attacked.

Frequency of occurrence of termites on different host plants in different province of Iran is given in Table 5. In province of Khorasan, *Anacanthotermes iranicus* n. sp., was more frequent in *T. gallica* and was collected from 20 trees. In province of Sistan and Baluchestan *P. pasniensis* and *A. vagans* was more frequent on *P. caspica* and *T. gallica* that were collected from 13 trees. In province of Khorasan more frequent termites was *A. iranicus* n. sp. on *Tamarix dioica* collected from 10 trees.

DISCUSSION

Termites are widely distributed in tropical and subtropical regions. A wide variety of plants serve as food for termites, including living plants and dead woods, grasses, herbaceous plants and their debris, fungi, humus and cattle dung (Lee and Wood, 1971). In habitat where most of these sources are available, a large proportion of the energy resource of ecosystem were potentially available to termites. Abe (1978) studied the range of food materials eaten by termites in low land rain forest of west Malaysia. He reported their basic food was dead material, fallen leaves, wood and humus. Some termite species attacked living trees but their density was low.

In the present studies, infestation of different species of plants and dry wood by different termite species has been reported in nine provinces of Iran. A total of

Table 2. Feeding habits/preference of different termite species in different Provinces of Iran (based on live plants).

Name of plant/trees	<i>P. pasniensis</i>	<i>P. zabulensis</i> n. sp.	<i>P. bidentatus</i> n. sp.	<i>A. vagans</i>	<i>A. iranicus</i> n. sp.	<i>A. gurganiensis</i> n. sp.	<i>P. prohybostoma</i> n. sp.	<i>P. rajasthanicus</i>
Sistan and Baluchestan								
<i>T. aphylla</i>	+	-	-	+	-	-	-	-
<i>P. caspica</i>	+	+	+	-	-	-	-	-
<i>S. babylonica</i>	+	-	-	-	-	-	-	-
<i>P. dactyfolia</i>	-	-	-	-	-	-	+	-
<i>P. alba</i>	+	+	-	-	-	-	-	-
<i>P. diversifolia</i>	+	-	-	-	-	-	-	-
<i>P. liliata</i>	+	-	-	-	-	-	-	-
<i>T. gallica</i>	+	-	-	+	-	-	-	-
<i>T. dioica</i>	-	-	-	+	-	-	-	-
<i>A. seyal</i>	-	-	-	-	-	-	+	+
kerman								
<i>Morus alba</i>	-	-	-	+	-	-	-	-
khorasan								
<i>M. alba</i>	-	-	-	+	-	-	-	-
<i>M. indica</i>	-	-	-	+	-	-	-	-
<i>T. aphylla</i>	-	-	-	+	-	-	-	-
<i>T. dioica</i>	-	-	-	+	+	-	-	-
<i>T. gallica</i>	-	-	-	+	-	-	-	-
Qum								
<i>S. babylonica</i>	-	-	-	-	-	+	-	-

16 species of termites were collected from 190 species of plants (30 localities), feeding preferences of termites of Iran are poorly known and no authentic publication is available. Enough needs to be done on feeding preferences of termites of this temperate region.

All the localities were presently surveyed for termites apart from the palaerctic region. Present

knowledge of the fauna of termites of Iran, gives a total 19 species of termites belonging to four families:

1. *P. pasniensis* is distributed only in northern and southern of province of Sistan and Baluchestan (Zabol and Pishin) (Akhtar, 1974) and its hosts were *P. caspica* and *S. babylonica*.

2. *A. vagans* is widely distributed in Iran, Afghanistan, (Weidner, 1960) and its hosts were *T. gallica*, *T. dioica* and *M. alba*. However, *A. vagans* was more abundant in Iran and its preferred host was *T. gallica*.

3. *P. rajasthanicus* species collected only from southern of province of Sistan and Baluchestan (Chabahar) (Ravan and Akhtar, 1995) and its hosts

Table 3. Feeding habits/preference of different termite species in different Provinces of Iran (based on live plants).

Name of plant/trees	<i>H. indicola</i>	<i>M. mycophagus</i>	<i>M. diversus</i>	<i>M. buettikeri</i>	<i>M. gabreilis</i>	<i>A. paravilis</i> , n. sp.	<i>A. Baluchestanicus</i>	<i>A. belli</i>
Sistan and Baluchestan								
<i>P. caspica</i>	+	+	+	-	-	-	-	-
Kerman								
<i>P. caspica</i>	-	-	-	+	-	-	-	-
<i>P. dactyfolia</i>	-	-	-	+	-	-	-	-
Hormozgan								
<i>Populus caspica</i>	-	-	-	+	-	-	-	-
Fars								
<i>V. vinifera</i>	-	-	+	-	-	-	-	-
<i>V. parifera</i>	-	-	+	-	-	-	-	-
<i>A. candatum</i>	-	-	+	-	-	-	-	-
Khuzestan								
<i>S. babylonica</i>	-	-	-	-	-	+	-	-
<i>M. alba</i>	-	-	-	-	-	+	+	-
<i>P. caspica</i>	-	-	-	-	+	+	+	-
Tehran								
<i>A. monspersulanum</i>	-	-	-	-	-	-	-	+

+ Indicates presence of termite species.

- Indicates absence of termite species.

Table 4. Number of trees attacked by termite species in different Provinces of Iran.

Termite species	Number of plants/trees attacked in each Provinces																				
	Sistan and Baluchestan		Kerman		Hormozgan		Esfahan		Khorasan		Fars		Khuzestan		Tehran		Qum		Total		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
<i>P. pasniensis</i>	38	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38	20.00
<i>P. zabulensis</i> n. sp.	8	4.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	4.21
<i>P. bidentatus</i> n. sp.	4	2.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2.10
<i>A. vagans</i>	23	12.10	2	1.05	-	-	-	-	20	10.52	2	1.05	-	-	-	-	-	-	-	48	25.26
<i>M. diversus</i>	1	0.52	-	-	-	-	-	-	-	-	-	-	10	0.52	-	-	-	-	-	11	5.78
<i>P. prohybostoma</i> n. sp.	2	1.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.05
<i>P. rajasthanicus</i>	4	2.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2.10
<i>H. indicola</i>	1	0.52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.52

Termite species	Number of plants/trees attacked in each Provinces																				
	Sistan and baluchestan		Kerman		Hormozgan		Esfahan		Khorasan		Fars		Khuzestan		Tehran		Qum		Total		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
<i>M. mycophagus</i>	8	4.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	4.21
<i>M. buettikeri</i>	-	-	4	2.10	2	1.05	1	0.52	-	-	-	-	-	-	-	-	-	-	-	7	3.68
<i>A. iranicus</i> n. sp.	-	-	-	-	-	-	-	-	30	15.78	-	-	-	-	-	-	-	-	-	30	15.78
<i>A. paravilis</i> n. sp.	-	-	-	-	-	-	-	-	-	-	14	7.36	-	-	-	-	-	-	-	14	7.36
<i>M. ermes gabreillis</i>	-	-	-	-	-	-	-	-	-	-	6	3.15	-	-	-	-	-	-	-	6	3.15
<i>A. belli</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.52	-	-	-	1	0.52
<i>A. Baluchestan-icus</i>	-	-	-	-	-	-	-	-	-	-	4	2.10	-	-	-	-	-	-	-	4	2.10
<i>A. gurganiensis</i> n. sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2.10	-	4	2.10
Total	89	46.84	6	3.15	2	1.05	1	0.52	50	26.31	26	13.68	10	5.26	2	1.05	4	2.10	190	100.0	

was *A. seyal*.

4. *H. indicola* and *M. mycophagus* species collected only from southern of province of Sistan and Baluchestan. *H. indicola* host is *P. caspica* (Ravan and Akhtar, 1995) and *M. mycophagus* host is *S. babylonica*.

5. *M. diversus* is widely distributed in 4 province of Iran and collected from dry wood logs, door, windows, building and specially *M. alba* and

Phoenix dactylifolia and its preferred host was *M. alba* (Ravan and Akhtar, 1995).

6. *M. buettikeri* and *M. gablieris* distributed in Kerman, Khuzestan province and collected from *P. caspica*.

In the present study, discovered 6 species, are new to science, such as: *P. zabuliensis* n. sp., *P. bidentatus* n. sp., from province of Sistan and

Baluchestan and their hosts was *P. caspica*; *A. iranicus* n. sp., and *A. gurganiensis* n. sp., from province of Khorasan and their hosts *T. gallica*, *S. babylonica* and *T. dioica*; *P. prohybostoma* n. sp., collected from Chabahar and its hosts was *A. seyal*, *S. babylonica*, *P. caspica* and *M. alba* and its preferred was *A. seyal*; *A. paravilis*, *A. baluchestanicus* and *A. belli*, collected from province of Khuzestan (Ahwaz) and Tehran, and

Table 5. Frequency of occurrence of termites on different plants/trees, in different localities (Provinces) of Iran.

Name of termites	Host plant attacked
Sistan and Baluchestan	
	<i>T. gallica</i> (3)
	<i>P. alba</i> (7)
<i>P. pasniensis</i>	<i>P. caspica</i> (13)
	<i>P. diversifolia</i> (10)
	<i>P. lilita</i> (1)
	<i>S. babylonica</i> (4)
<i>P. zabuliensis</i> n. sp.	<i>P. caspica</i> (6)
	<i>P. alba</i> (2)
<i>P. bidentatus</i> , n.sp.	<i>P. caspica</i> (4)
<i>A. vagans</i>	<i>T. aphylla</i> (4)
	<i>T. dioica</i> (5)
	<i>T. gallica</i> (13)
<i>P. prohybostoma</i> n. sp.	<i>S. babylonica</i> (2)
	<i>Populus caspica</i> (2)
	<i>M. alba</i> (2)
	<i>A. seyal</i> (4)
<i>P. rajasthanicus</i>	<i>A. seyal</i> (1)
<i>H. indicola</i>	<i>P. caspica</i> (1)
<i>M. mycophagus</i>	<i>S. babylonica</i> (1)
<i>M. diversus</i>	<i>P. dactylifolia</i> (4)
Kerman	
<i>A. vagans</i>	<i>M. alba</i> (2)
<i>M. buettikeri</i>	<i>P. caspica</i> (3)
	<i>P. dactylifolia</i> (1)
Hormuzgan	
<i>M. buettikeri</i>	<i>P. caspica</i> (1)
Khorasan	
<i>A. vagans</i>	<i>S. babylonica</i> (4)
	<i>M. indica</i> (2)
	<i>T. dioica</i> (4)
	<i>T. gallica</i> (6)
	<i>T. aphylla</i> (4)
<i>A. iranicus</i> , n. sp.	<i>T. dioica</i> (10)
	<i>T. gallica</i> (20)
Esfahan	
<i>M. buettikeri</i>	<i>M. alba</i> (2)
Khuzestan	
<i>A. paravilis</i> n. sp.	<i>P. caspica</i> (6)
	<i>S. babylonica</i> (8)
<i>A. vagans</i>	<i>M. alba</i> (2)

Table 5. Continued.

<i>M. gabrielis</i>	<i>P. caspica</i> (7)
<i>A. Baluchestanicus</i>	<i>P. caspica</i> (3)
Fars	
	<i>M. alba</i> (2)
<i>M. diversus</i>	<i>V. vinifera</i> (5)
	<i>V. parvifera</i> (2)
	<i>A. candatum</i> (1)
Tehran	
<i>A. belli</i>	<i>A. monspessulanum</i> (1)
<i>A. vagans</i>	<i>M. alba</i> (1)
Qum	
<i>A. gurganiensis</i> n. sp.	<i>A. cinerascens</i> (3)
	<i>Salix babylonica</i> (1)

its host was *P. caspica*.

REFERENCES

- Abe T (1978). Studies on the distribution and ecological role of termite in a lowland rain forest of west Malaysia. 1: Faunal composition, size, coloration and nest of termites in Pasoh forest. Reserve. Kontyu, 46(2): 273-290.
- Akhtar MS (1974). Zoogeography of the termites of Pakistan. Pakistan. J. Zool., 6: 85-104.
- Eggleton P (2001). Termites and trees. A review of recent advances in termite phylogenetics. Insects Sociaux, 48: 187-193.
- Emerson WV (1955). Geographical origins and dispersions of termite genera. Chicago. Nat. Hist. Mu. Fieldiana. Zool., 37: 465-521.
- Esmaeilli M, Ghayurfar R (1993). An investigation on the termite fauna of Iran. In: living with insect. Proc. 19th Int. Congr. Ent., Beijing, China, 28 June - 4 July, p. 243.
- Harris AV (1970). Termites of the palaeartic region. In: Krishna, K. and F. M. Weesner (eds.). Biology of Termite. Academic Press, New York, pp. 95-313.
- Korb J (2008). The ecological of social evolution in termites. In: Korb J, Heinze J (eds). Ecology of Social Evolution. Springer Press, Heidelberg, pp. 151-174.
- Korb J, Fuchs A (2006). Termites and mites-adaptive behavior responses to infestation, Behavior, Lee K.E, Wood TG, 1971. Termites and Soils. Academic Press, New York, 143: 891-907.
- Ravan S, Akhtar MS (1995). Taxonomy and population ecology of termites of Iran and their affinities with termites of Pakistan. PhD. Thesis, University of the Punjab, Lahore, Pakistan.
- Weidner H (1960). Die Termiten Von Afghanistan, Iran Irak (Isoptera) (contribution al, etude de ha faune d, Afghanistan 29). Adh. Verh. Naturw. Ver. Hamburg., 4: 43-70.