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Feeding habitats and wood preferences of termites in Iran

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Abstract

Termites are one of the most destructive insect pests of crops, buildings and forests across the world, causing heavy damages each year. For effective control of termite, its feeding preferences and habitats are important. Feeding habits and preferences of wood destroying termites was carried out in ten provinces of Iran, i.e. Sistan, Baluchistan, Kerman, Hormuzgan, Khurasan, Esfahan, Khuzistan, Fars, Tehran and Mazandaran in 2011. Five habitats were recognized on the basis of dominance of five tree species, i.e. *Populus alba*, *Tamarix gallica*, *Morus alba*, *Salix babylonica* and *Vitis vinifera*. Maximum infestation (20.6%) was recorded for *P. alba* and minimum (0.072%) for *M. alba*. A total of 17 tree species were found in five habitats. *P. alba* habitat harbored higher number of 13 species of termites and this habitat was more diverse in vegetation than other habitats. *P. alba* was the preferred host for termite species, *Postelectrotermes pasniensis*. In *T. gallica* dominated habitat only two termite species, i.e. *Anacanthotermes iranicus* and *A. vegans* were present. *A. vegans* had positive association with *T. gallica*. *Microtermes mycophagus* and *A. gurganiensis* were recorded in *Vitis vinifera* and *Salix babylonica* habitats, respectively. The findings of the present research might help in devising efficient control strategies against the wood feeding termites.

Keywords: Feeding habitats, termite species, wood preferences.

1. Introduction

Termite cause tremendous losses to agricultural crops, forest trees and wood works in buildings. In some countries damage to the houses by termites exceeds to that caused by natural disasters and fires in a single year. In the developing countries, they have more impact, destroying local huts and crops of poor subsistence. Termites have destroyed villages in India and Egypt and inhabitants forced to move to other area ^[1]. Out of 2500 described species throughout the world, about 300 species are considered as pest ^[2]. A lot of work has been done on feeding preferences of termites in different parts of the world ^[3-7].

2. Materials and Methods

For feeding preferences of termites, 81 plots in ten provinces of Iran were surveyed in 2011. The plots, each 30m × 30m in size, were classified on the basis of vegetation, trees/shrubs. *Populus alba*, *Tamarix gallica*, *Populus diversifolia*, *Populus ciliata*, *Tamarix aphylla*, *Tamarix dioica*, *Salix babylonica*, *Phoenix dactylifera*, *Morus alba*, *Acacia seyal*, *Morus sp.*, *Acer acuminatum*, *Acer monspessulanum*, *Acer cinerascens*, *Vitis vinifera* and *Vitis parviflora* were observed for termite preferences and feeding habitats. The present research will provide some basic information about the feeding preferences and habits of termite in different habitats.

3. Results and Discussion

3.1 Habitat types

A survey carried out in ten provinces of Iran, a total of 16 species of termites were recorded damaging trees/shrubs like *Populus alba*, *Tamarix gallica*, *Morus alba*, *Salix babylonica* and *Vitis vinifera*. In the present study, 1050 plants were examined for termite infestation. The results revealed variable infestation of tree species by the different termite species, viz: *Populus alba* (591), *Tamarix gallica* (320), *Morus alba* (55), *Salix babylonica* (30) and *Vitis vinifera* (54) (Table 1).

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Table 1: Habitat types found in the study area of Iran surveyed for termites.

Plot Number	Habitat Type					Total
	P. alba	T. gallica	M. alba	S. babylonica	V. vinifera	
	1-7, 28-33 34-36, 55-69	37-51	52-45, 73-78	79-81	70-72	
Trees/Shrubs						
<i>Populus alba</i>	185*	-	-	-	-	185
<i>Tamarix gallica</i>	60	98	-	-	-	158
<i>Populus spp</i>	13	-	-	-	-	13
<i>Populus diversifolia</i>	33	-	-	-	-	33
<i>Populus ciliata</i>	12	-	-	-	-	12
<i>Tamarix aphylla</i>	26	37	-	-	-	63
<i>Tamarix dioica</i>	32	97	-	-	-	129
<i>Salix babylonica</i>	92	-	-	19	-	111
<i>Phoenix dactylifera</i>	31	-	-	-	-	31
<i>Morus alba</i>	63	42	46	-	9	160
<i>Acacia seyal</i>	44	-	-	-	-	44
<i>Morus sp.</i>	-	46	-	-	-	46
<i>Acer acuminatum</i>	-	-	-	-	4	4
<i>Acer monspessulanum</i>	-	-	9	-	-	9
<i>Acer cinerascens</i>	-	-	-	11	-	11
<i>Vitis vinifera</i>	-	-	-	-	26	26
<i>Vitis parviflora</i>	-	-	-	-	15	15

*:Importance value of trees in each habitat

3.2 Number of trees infested in various habitats

One hundred twenty two (20.6%) out of 591 *Populus alba* trees, 50 (6.40%) out of 320 *Tamarix gallica*, 4 (0.072%) out

of 55 *Morus alba*, 4 (0.133%) out of 30 *Salix babylonica* and 10 (0.185%) out of 54 *Vitis vinifera* were found infested by termites (Table 2).

Table 2: Number of trees infested by termites in various habitats in 2011.

Trees	Habitat Type									
	Populus alba		Tamarix gallica		Morus alba		Salix babylonica		Vitis vinifera	
	No. of trees	No. of infested trees	No. of trees	No. of infested trees	No. of trees	No. of infested trees	No. of trees	No. of infested trees	No. of trees	No. of infested trees
Populus alba	185	46	-	-	-	-	-	-	-	-
Tamarix gallica	60	17	98	26	-	-	-	-	-	-
Populus alba	13	9	-	-	-	-	-	-	-	-
Populus diversifolia	33	10	-	-	-	-	-	-	-	-
Populus ciliata	12	1	-	-	-	-	-	-	-	-
Tamarix aphylla	26	4	37	4	-	-	-	-	-	-
Tamarix dioica	32	5	97	14	-	-	-	-	-	-
Salix babylonica	92	15	-	-	-	-	19	1	-	-
Phoenix dactylifera	31	4	-	-	-	-	-	-	-	-
Morus alba	63	6	42	4	46	3	-	-	9	2
Acacia seyal	44	5	-	-	-	-	-	-	-	-
Morus sp.	-	-	46	2	-	-	-	-	-	-
Acer acuminatum	-	-	-	-	-	-	-	-	4	1
Acer monspessulanum	-	-	-	-	9	1	-	-	-	-
Acer cinerascens	-	-	-	-	-	-	11	3	-	-
Vitis vinifera	-	-	-	-	-	-	-	-	26	5
Vitis parviflora	-	-	-	-	-	-	-	-	15	2
Total	591	122	320	50	55	4	30	4	54	10

3.3 Distribution of termites in relation to various habitats

The distribution of termites on different tree species is presented in Table 3. The termite species found on *P. alba* were *Postelectrotermes pasniensis*, *P. zabuliensis* n. sp., *P. bidentatus* n. sp., *Anacanthotermes vegans*, *Psammotermes prohylojostoma* n. sp., *P. rajasthanicus*, *Heterotermes indicola*, *Microtermes mycophagus*, *Microcerotermes diversus*, *M.*

buelttker, *M. gabrielis*, *Amitermes paravilis* n. sp. and *A. baluchistanicus*. *Microtermes mycophagus* was found on *Vitis vinifera* and *A. gurganiensis* on *Salix babylonica*. On *Tamarix gallica* termite species *A. iranicus* n. sp. and *Anacanthotermes vegans*; on *Morus alba*, *A. gurganiensis* n. sp., *Microcerotermes diversus* and *A. baluchistanicus*; on *Salix babylonica* only *A. gurganiensis* n. sp. was present.

Table 3: Distribution of termites in relation to different habitat types in 2011.

Termite species	Habitat Types					Total
	<i>P. alba</i>	<i>T. gallica</i>	<i>M. alba</i>	<i>S. babylonica</i>	<i>V. vinifera</i>	
<i>P. pasniensis</i>	++	-	-	-	-	1
<i>P. zabuliensis</i> n. sp.	+	-	-	-	-	1
<i>P. bidentatus</i> n. sp.	+	-	-	-	-	1
<i>A. vegans</i>	++	++	-	-	-	2
<i>A. gurganiensis</i> n. sp.	-	-	+	+	-	2
<i>A. iranicus</i> n. sp.	-	+	-	-	-	1
<i>Psammotermes</i>				-	-	
<i>prohyljostoma</i> n. sp.	+	-	-	-	-	1
<i>P. rajasthanicus</i>	+	-	-	-	-	1
<i>H. indicola</i>	+	-	-	-	-	1
<i>M. mycophagus</i>	+	-	-	-	+	2
<i>M. diversus</i>	+	-	+	-	-	2
<i>M. bueltkeri</i>	++	-	-	-	-	1
<i>M. gabrielis</i>	++	-	-	-	-	1
<i>Amitermes paravilis</i> n. sp.	+	-	-	-	-	1
<i>A. baluchistanicus</i>	+	-	+	-	-	2
<i>A. belli</i>	-	-	-	-	-	-
Total:	3	2	3	1	1	0

+present, - absent, ++ positive association.

3.4 Feeding Habits

P. pasniensis was recorded excavating irregular galleries inside infested portion of trees. The termite was not found externally on the infested trees. No galleries were present on the tree bark. This species has positive association with *P. alba* as its preferred host.

P. zabuliensis feeding pattern and nature of damage to *P. alba* was similar to that of *P. pasniensis* but it was not positively associated with this tree.

P. bidentatus feeding pattern was almost similar to that of *P. pasniensis*. It makes irregular galleries in the infested portion of the tree. No external galleries were found on the bark surface. It makes nest inside the tree stump. It has no positive association with *P. alba* host.

A. vegans made galleries on bark of *P. alba* and *T. gallica*. Foraging galleries, on the adjoining ground were also present. Pieces of grasses were recovered from nest. This species makes small lumps of mound type structure consisting of loose soil particles in Sistan and Baluchistan but makes mounds in Khorasan. *A. gurganiensis* made internal galleries in *M. alba* and *S. babylonica*. The former was its preferred host. *A. iranicus* feeding pattern was almost similar to that of *A. vegans*, but made mud sheeting and galleries on trees. Pieces of grasses were also recorded from their nests in soil. *P. rajasthanicus* made galleries on *Acacia seyal* similar to that of *P. prohylystoma* n. sp. *P. prohylystoma* n. sp. made galleries in the soil and on *P. alba*. The consumed portion of stump was not replaced by mud. *H. indicola* constructed galleries on the bark of the trees and branches of *P. alba*. The fungus growing termite *M. mycophagus*, made galleries on *S. babylonica*. The damaged and consumed portion of the tree was replaced by the clay by this species.

In the present research a total of 17 tree species were found in five habitats. Infestation of the five termite species was different in the five tree habitats. The termite species showed varied infestation and preferences for the tree species. *P. alba* habitat was more diverse harboring higher number (13) of termite species. Some termite species made external while some internal galleries on the host trees. Some termite species have positive association with the trees. Some species made nest in the infested portion of branches while others in the bark of trees. Foraging galleries in the ground and mud sheeting by some termite species were also recorded.

Termites usually feed on a wide variety of food sources like trees, dead wood, humus fungi, etc. Feeding preferences of the dry wood termite *Cryptotermes brevis* were studied and found that only pine was consumed in significantly less quantity both by volume and weight as compared to Balsa Western Red Cedar [8]. Point-quarter technique was used to estimate the abundance of *Reticulitermes* in dead wood in four southeastern coastal habitats in the USA. The four habitats chosen were: lowland hardwood forest dominated by oak (*Quercus* spp.), sweet gum (*Liquidambar styraciflua*) and poplar (*Liriodendron tulipifera*), Turkey oak (*Quercus nigra*) woodland, and burned and unburned pine (*Pinus* spp.) plantations [9]. Abundance of termites was studied in various plant communities of Eastern Baluchistan, Pakistan. On the basis of termite nest density and extent of termite infested area, it was concluded that out of the 19 plant communities, four have serious termite infestation problem (nest density 7124/ha) [10]. Relative susceptibility of 11 species of wood attacked by *Psammotermes hybostonza* was determined by measuring the amount of wood consumed, from samples of two successive years. They reported that *Albizia lebbek* was consumed least by this termite [11].

Termites collected from different portions of trees showed *C. heimi*, *M. mycophagus* (dead portion) and *O. guptai* (dead portion) inhabited bark of trees of *D. sissoo*, *D. sissoo* and *M. indica*, respectively. *M. mycophagus*, *O. guptai*, *O. obesus*, *M. obesi* and *M. championi* were recovered from the trunk of *D. sissoo*, *M. indica* (dead portion), *D. sissoo* and *D. sissoo* (dead portion), respectively. *C. heimi* and *M. obesi* were collected from the wood debris of *D. sissoo*, while *O. obesus* from the fallen twigs [12].

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