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Knowledge, attitude and practices of household people about termites in southern Punjab, Pakistan

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Abstract
Management of the termites depends upon the basic knowledge of their biology and associated problems. In the current study an assessment of people knowledge about termites was done by asking questions related to termite biology, hosts, activity, and management options adopted by the people. Although all people were aware about termites and regarded them hazardous, a considerable numbers (54.25%) did not have knowledge about their colony set up and habitat. They had insufficient knowledge about termite's hosts and their preference, and proper inspection of termite presence in houses. Among the preventive measures adopted against termites, majority of the people (46.7%) was using highly toxic and persistent insecticides in the houses. They did not know about the most recent technique like termite baiting. This lack of proper knowledge could be a hurdle in the effective management of termites. The results highlighted the need of proper guidelines regarding termite awareness and its management in a form of booklets, educational campaigns and short trainings.

Keywords: Household people, termite biology, termite inspection, control measures, pest status

1. Introduction
The way human beings treat animals and plants largely depends on their perception, knowledge and nature of the relationship they have with a particular living being [1]. For example, in Africa, ants are considered a respectful entity as the people call them boss and bow their heads whenever they encounter with them [2]. Understanding local people knowledge and attitudes towards natural world or insects provides us an opportunity to better understand their life. For example, analyses of what people already know about a certain problem can provide the basis to design a better strategy for solving their problem [3].

Termites are important pests in the urban environment causing huge losses to wood and wood products. A basic knowledge their biology and ecology is necessary to design a successful pest control program [4]. The economic condition of the people also has a major role in determining the importance of a pest and ultimate control measures designed for it. In developing or low income countries like Pakistan, for example, overall low priority is given to urban pests in comparison to other developmental needs [3]. Although termites cause serious damage to different household commodities in Pakistan, no serious concern has been shown by the community might be due to unawareness and/or lack of resources. The damage caused by termites and economic burden on the community urge the need to make an effective training program for the community which could be helpful in the management of termites. Keeping in view the importance of indigenous knowledge in designing pest management program, we assessed perception of people about termites, its biology and favorable hosts and some other important parameters. We also got information on the management practices adopted by the people to control termites. Whether or not they are aware of the modern termite control practices such as baiting? Such studies can help a lot by highlighting the gaps and solving the problem of a community. To the best of authors' knowledge, such studies are rare in termites' research particularly in Pakistan. The results of thisstudy could be helpful for policy makers, entomologists and general public in the management of termites.

2. Material and methods
2.1 Study site
The study was a cross sectional survey during April-June, 2011 and the target population was household people in urban and sub-urban areas of southern Punjab. These areas have four seasons: winter (December to February) when the temperature goes down to 40.1 °F, spring season (March to April) with temperature ranging between 56.3-95 °F, summer when temperature rises as high as 122 °F (May to September) with several rains during the season, Autumn season (October to November) characterized by hazy and dry weather with temperature ranging between 51.6-93 °F. Among farming, cotton, wheat, rice, maize, vegetables and fruits like mango are the important crops of the region [5]. The houses are made up of bricks and cement with floor and roof made of cement, sand and crushed stone in urban and mud and sand in suburban areas [6].

2.2 Study design
A survey questionnaire was developed by following the guidelines of Frary [7]. The questionnaire consisted of three major parts for collection of the data on socio-demographic characteristics of the household people, their knowledge about the termites, and preventive measures adopted by the people for the management of termites. Knowledge of the termites was assessed by asking questions related to damage to different wood species and other cellulose materials, assessing the termite presence in their houses, the most active season and different preventive measures to manage termites. The questionnaire was approved by the Advance Studies and Research Board of Bahauddin Zakariya University, Multan, Pakistan. The questionnaire included both open and closed options. The survey was conducted by convenient sampling and the willingness of the people to participate.

2.3 Data management
The data were analyzed by simply computing the percentages of information provided by the household people using SPSS software (Version 10.0 for windows, SPSS Inc., Chicago, USA).

3. Results
3.1 Socio-demographic characteristics of the people
Table 1 shows the socio-demographic characteristics of 212 respondents in southern Punjab. Among interviewed people, 60.38% were males and 39.62% females. Highest fraction of respondents (78.77%) was in the range of 15-30 years of age. The educational level of the people indicated that 16% were illiterate and 11.38% had their education up to primary level while the rest were either graduate or post graduate. For marital status, 56.60% people claimed that they were unmarried. Data related to occupation of the interviewed people revealed that 44.34% were students while the remaining were either employed or unemployed, laborer or businessman. Regarding family members, the highest percentage of the respondents (58.49%) had five to nine members. Most people were living in 10-20 years old houses having an area of 150-300 sq yards (Table 1).

Table 1: Demographic characteristic of household people in southern Punjab, Pakistan

Socio-demographic characteristics	Frequency (n)	Percentage (%)
Gender		
Male	128	60.38
Female	84	39.62
Age (years)		
>20	73	34.43
21-30	94	44.34
31-40	28	13.21
<40	17	08.02
Marital status		
Married	67	31.6
Unmarried	120	56.6
Widow/Widower	20	09.43
Divorced	05	02.36
Family member		
1-4	36	16.98
05-10	124	58.49
<10	52	24.53
Level of education		
Illiterate	35	16.51
≥Primary	24	11.32
≥Secondary	53	25.0
Graduation	57	26.89
Post-graduation	43	20.28
Occupation		
Employed	51	24.06
Business man/woman	19	08.96
Laborer	37	17.45
Students	94	44.34
Pensioner	06	02.83
Unemployed	12	06.66
Others	03	01.42
House area (Sq. yards)		
<150	45	21.23
150-300	82	38.68
>300	85	40.09
Age of the house (years)		
<5	22	10.38
5-9	36	16.98
10-20	96	45.28
> 20	58	27.36

3.2 Knowledge about termite and its biology
Of the 212 interviewees, 88.68% had seen termite at least once in their lives. To answer the question "Is a termite hazardous?" 100% of the respondents regarded it as hazardous and 4.72% thought that it also had a beneficial role in the environment. The majority of the respondents were not aware about the colony set up and habitat of the termites. More than half of the people believed that the termite lived above ground while 14.62% of them were not sure (Table 2). Out of the 212 interviewees, 58.49% declared moist soil as the most favorable one for termites' growth and development and dry soil as the least one (Fig. 1). About half of the people said that summer was the most suitable season for termite attack followed by winter, spring and autumn (Fig. 2).
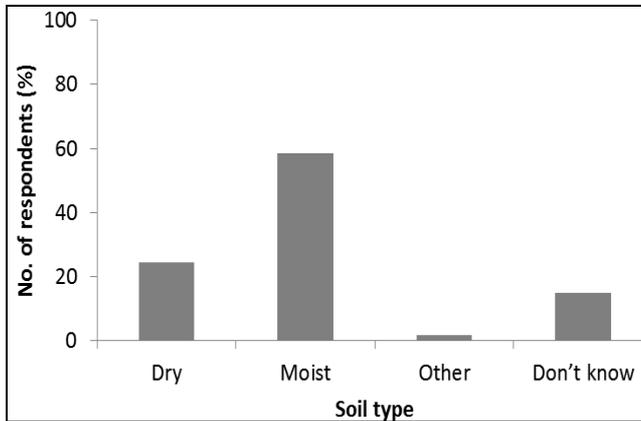
Fig 1: Knowledge of the household people about the most suitable soil for termite development and attack
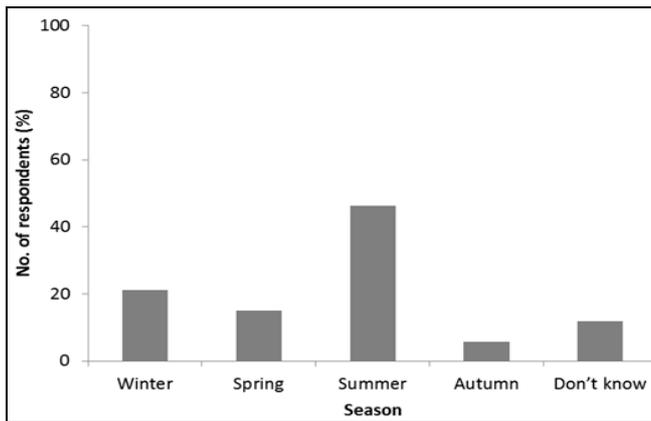
Fig 2: Knowledge of the household people about intensity of termite attack in different seasons

3.3 Knowledge about termite's hosts

According to the respondents, although termites can attack wood, papers, clothes, carpets and other cellulose material in their houses, but the highest percentage of the people (86.32%) ranked wood and wood products as only the most preferred host for termite attack (Table 2). The commonly used wood species in the houses are shown in the Table 3. The results indicated that *Dalbergia sisso* (Roxb. ex DC.), *Cedrus deodara* (Roxb.)*, Acacia* sp. and *Azadirachta indica* (A. Juss.) were the most common in surveyed houses (Table 3). When people were asked to answer about the any one most susceptible wood species to termites attack, the majority of the people did not know while others said wood products made of *D. sisso* followed by that of *Mangifera indica* (L.), and *Eucalyptus* sp. (Table 3).

Table 2: People knowledge about termites and the risks associated with termite in southern Punjab, Pakistan

Categories	Frequency (n)	Percentage (%)
Have you ever seen termite?		
Yes	188	88.68
No	24	11.32
Is termite hazardous?		
Yes	212	100
No	10	4.72
Where do termites live?		
Above the ground	115	54.25
Under ground in soil	76	35.85
Don't know	31	14.62
Termite as a pest of different materials		
Woods	199	93.87
Papers	27	12.74
Cloths	08	3.77
Carpet	13	6.13
Others cellulose materials	07	3.30
On which material did you observe sever termite attack?		
Woods	188	88.68
Papers	24	11.32
Cloths	0	0
Carpet	0	0
Others cellulose materials	0	0

Table 3: Commonly used wood species in houses and knowledge of the household people about the most susceptible wood species to termite attack.

English Name	Local Name	Technical Name	Respondents (%)	
			Wood used in houses	Termite preferred wood
Black pulm	Jaman	*Eugenia jambolana* Lam.	8.02	3.30
Deodar Cedar	Diyar	*Cedrus deodara* (Lamb.) *G. Don*	18.39	1.88
Gum arabic tree	Kikar	*Acacia nilotica* (L.) Willd. Ex Delile	17.45	5.18
Jujube tree	Bair	*Ziziphus jujube* Miller.	1.42	4.72
Long beak eucalyptus	Sufaida	*Eucalyptus camaldulensis* Dehnh.	9.43	6.13
Mango	Aam	*Mangifera indica* L.	9.91	7.54
Neem	Neem	*Azadirachta indica* A. Juss.	14.62	2.35
Shisham	Shisham	*Dalbergia sissoo* Roxb. ex DC.	33.49	13.21
Silk cotton tree	Simbal	*Bombax malabaricum* L.	4.24	2.83
White cedar	Bakain	*Melia azedarach* L.	3.77	1.88
White mulberry	Shehtoot	*Morus alba* L.	5.18	1.88
Plywood	Plywood		9.43	4.24
Chipboard	Chipboard		6.60	3.30
	Others		1.88	1.42
	Don't know		5.188	34.43

3.4 Knowledge about termite's inspection

When the respondents were asked about how they assess the presence of termite in their houses, most of them said by observing the mud tubes (48.77%) followed by wood damage (29.81%) (Fig. 3). According to the respondents of the surveyed houses, maximum termite attack is observed on door frames (41.98%) followed by window frame (22.64%) and walls (38.02%) while 11.39% were not sure about this.
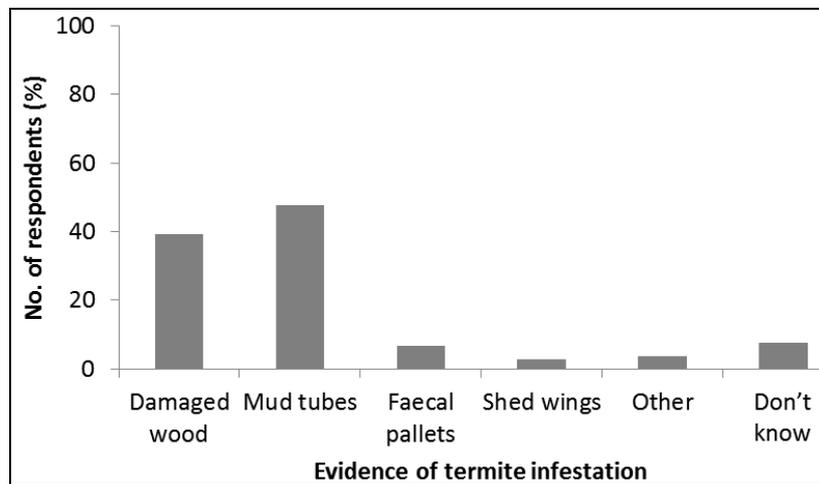
Fig 3: Monitoring of termite infestation by household people in southern Punjab, Pakistan

3.5 Preventive and control measures adopted by the people

According to the respondents, termite attack in the wooden structures and buildings could be prevented by adopting the measures like a physical barrier (i.e. plastic sheets), eliminating the moisture problem due to leakage of the drainage and water supply pipes, removal or avoiding the food sources that attract termites (excess wood or wood products lying on the bare ground) and using different insecticides (Table 4). Among all of the preventive measures maximum score was given to insecticides (46.7%). According to the respondents, they learned about the termite, their problems and preventive measures through personal experience (52.83%) followed by internet (23.58%) while the rest were guided by neighbors (11.79%), technical persons (2.35%), or print media (10.37%).

Table 4: People knowledge about the practices for termite prevention in southern Punjab, Pakistan

Categories	Frequency (n)	Percentage (%)
Is it possible to save wood or wood products from termite attack?		
Yes	95	44.81
No	72	33.96
What are the preventive measures?		
Physical barriers (Plastic sheets)	13	6.12
Elimination of moisture problems	57	26.89
Removal of food sources	27	12.74
Insecticides (Organochlorine and Organophosphate)	99	46.7
Others	8	3.77
Do nothing	38	17.92
Don't know	31	14.62

4. Discussion

The current survey revealed that household people of Multan and its adjoining areas (southern Punjab) have insufficient knowledge about the biology, favorable hosts and other necessary facts about termites. They were still using old practices for termite control in their houses. Most of them treated the infested woods with highly persistent and toxic insecticides (organochlorine and organophosphate).

When people were asked about the habitat of subterranean termites, most of the respondents answered as "aboveground" which is a misconception or improper termite identification. Most of the termite species (subterranean termites) infesting the buildings live in underground colonies and forage beneath the soil surface, but they also have the ability to come aboveground whenever there is a plenty of food. They can be recognized by earthen tubes above the soil surface [8-12], which may be a probable reason of how the respondents recognize their attack in buildings. However, underground soil is the principal habitat of the above said termites from where infestation starts and recognize above the surface. By giving information of exact habitat of these termites could enable the community to nip the evil in the bud.

In dry weather, termite swarms early in the rainy season while in humid environment, continuous swarms of termites can be seen. In the present study, people reported high attack in the summer season when the weather was dry compared to other seasons. Since in tropical environment where termite swarming occurs in the early rainy season, the food demand for nymphal maturation would be highest in the dry period, which suggested a constant adjustment of foraging to the needs of termite colony [13]. As most of the termite damage occurs in the summer season, so wood structures should be carefully observed for termite attack in this season to avoid losses.

Though termites attack all the commodities containing cellulose [14], the surveyed people declared wooden articles as the most favorite commodity for termites. It might be due to the fact that wood commodities are the most common food resources available. However, their knowledge could pose serious threat to other precious cellulose articles like books since they answered woods as the most preferred eating articles. Among the different wood species used in the house, people said that the structures made from the *D. sisso* wood had highest termite attack which might be due to the reason that it was the most common wood species in their houses used for different purpose. However in previous studies on feeding preference of termites in laboratory and field trials, *D. sisso* had not been reported as preferred wood [15, 16]. Wrong identification of the wood species by the respondents and/or different foraging preference of termites in Multan habitat are probable reasons for their responses in the current survey.

However, there is a need to assess feeding preference of the local termite species to native wood species so that exact phenomenon could be understand.

Although most of the respondents answered mud tubes and damaged wood as clue points for the presence of termites in their houses and buildings, yet few peoples were aware about the termite swarms and shed wings which usually observed after summer rains. This indicates a lack of proper identification knowledge of the respondents about termite presence in their compounds.

Current study showed that respondents had knowledge about the termites' preventive measures and were using different chemicals as localized treatment to wood structures or soil but they were not aware about the modern termites control method e.g. baiting techniques. The direct application of insecticides could have negative impact on human welfare and the environment by exposure of the household families to harmful insecticides and by posing risks to non-target organisms [17]. So people should be told and trained to use some alternatives to manage termites.

5. Conclusion
Termites are one of the major structural pests and pose economic burden on the communities particularly in developing countries. However, the results of the survey revealed that the respondents had not sufficient knowledge regarding termites. Lack of proper knowledge could be a hurdle in the effective management of termites. Baiting is the recent technique used in the developed world for termite control. This technique is more environmental friendly and aims to eliminate the entire colony of termites. But, this environmental friendly technique is not being used in Pakistan. The results necessitate that further studies should be planned to investigate basic eco-biology of termites of Pakistan in varying environmental conditions, cost effective control measures, and preparation of a proper guidelines regarding termite awareness and its management in a form of booklets. The results could also be helpful to policy makers and entomologists in delivering awareness to the community by correcting or upgrading the knowledge of the community regarding termite infestation and its management.

6. Acknowledgements

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