Research Article

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Foraging Activity of Termites at Different Sites in Multan, Pakistan

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ABSTRACT

Termite monitoring is an important part of designing the management strategy. In the current study, termite activity was observed at four sites in Multan (three structures and one agriculture area). For this purpose, monitoring traps consisted of plastic bin and wood pieces were buried in soil. The termite activity was observed on weekly basis for two months during March and April 2022. The results indicated that there were five species (*Odontotermes* spp., *Microcerotermes* spp., *Amitermes* spp., *Microtermes* spp. and *Coptotermes* spp.) infesting the buildings and agriculture area. The lowest termite contacts in traps were observed on the 1st week which were increased with the passage of time (maximum contacts recorded on 4th week of April). Similarly, the numbers of termites were also less at the 1st inspection at all sites (24-2059 numbers per station) and maximum numbers of termites per station were recorded on 4th week of April. The results will be helpful to manage termite infestation.

Keywords: Subterranean Termites, Foraging Activity, Fungus Growing Termites, Rhinotermitidae.

INTRODUCTION

Termites are important structural and agricultural pest and are almost present every except Antarctica. There are more than 3000 different species of termites worldwide [1]. The maximum number of termite species (1000 species) were recorded in Africa. While there are 435 documented species of termites in Asia, there are more than 400 species in South America, 360 in North America, 50 in Australia, and 10 in Europe [2]. According to studies, the estimated termite density of living biomass in the savanna is between 70 and 110 kg/ha. The termite colonies are expected to hold 2.5 million members of one termite species in the forest ecosystems of Cat Tien National Park (south Vietnam), or about 20.5 kg/ha [3]. The average number of termites per square meter is between 2,000 and 7,000 whereas the largest number recorded is 15,000 per square meter [4]. According to some estimates, the overall biomass of termite is comparable to that of terrestrial animals [5].

There are three primary types of termites, each with a specific habitat preference: drywood termites which prefer dry wood but do not require close exposure to soil, dampwood termites that live in excessively dampwood, and subterranean termites which have nest in the soil and prefer to consume soft woods. Additionally, termites can be categorized into four different feeding guilds, including those that eat grass, fungi, soil, wood, and fungi [6]. Almost all termites exclusively eat cellulose or derivatives of it. A colony of 200,000 termites can use more than 5 kilograms of woody material (cellulose) annually, according to studies [4]. As a result, termites cause harm to plant components that contain cellulose. Termites inflict damage to bridges, dams, decks, homes, surviving walls, roads, poles, underground cable and pipeline insulation, and residences [4, 7, 8, 9]. Paper, rubber goods, synthetic films and plastics, food products, and other commodities are also affected [10, 11, 12, 13].

More research is necessary to create effective control measures, particularly understanding about termite species found in urban settings.

Article History

Received: January 05, 2024, Accepted: February 21, 2024, Published: March 03, 2024.

Specifically, termite species that are serious wood pests in urban areas. There is correlation between the termite damage and climate change [14]. Termite monitoring in a given region is useful for determining the termite and its control [15]. The current study aims to identify the termite species found in building and agriculture locations of Multan. We hypothesize that agriculture areas have more population of termites as compared to urban settings.

MATERIAL AND METHODS

Study Site

The present study was conducted at different locations of Muhammad Nawaz Shareef University of Agriculture Multan, Nishtar Medical University Residential Area and Mujahid town in Multan, Punjab, Pakistan.

Installation of Monitoring Traps

The experiment was conducted by following the methodology of Iqbal et al., [16] with little modification. Briefly, the stations (23.5 cm high, top Ø 21 cm, bottom Ø 18.5 cm) consisting of 10 wooden pieces (each measuring 22.86×7.62×2.54 cm) were buried in the soil with their tops at soil surface level. The stations were covered with the plastic sheet and soil on the top very carefully. A total of 60 stations were installed at four locations.

Data Recording

These stations were inspected for termite activity on weekly basis for two months (March-April 2022). For this purpose, soil was carefully removed from the top and eight wood pieces were gently inspected for numbers of termites present on them. After this, the woods were again placed in the stations and covered with the plastic sheet and soil. The stations and numbers of termites in each station were counted at each inspection. The soldiers were captured from each station and preserved in ethanol solution (80%) for further identification of species.

Data Analysis

The data of numbers of stations contacted and numbers of termites per station were subjected to analysis of variance and their means were compared using Tukey's HSD test with the help of Statistix 8.1 software.

RESULT

Termite species in Different Areas of Multan

The termite species captured from different areas of Multan is given in Table 1.

Numbers of stations contacted and termite population in C Block

The total numbers of termite contacts on the monitoring stations varied significantly among inspection week ($F_{7,98} = 10.29$; $P < 0.001$). The total termite contacts were increased along inspection weeks with maximum contacts recorded on 4th week of April 2022 (0.933 stations) (Fig. 1). The population of termites was also significantly different in different weeks ($F_{7,119} = 8.75$; $P < 0.001$). The lowest population was recorded on the 1st week of March 2022. After this the population was increased along weeks with maximum population was recorded on the 4th week of April 2022 (2059.3 termites/trap) (Fig. 2).

Numbers of stations contacted and termite population in B Block

The total numbers of termite contacts on the monitoring stations installed at B Block of MNS University of Agriculture, Multan varied significantly among inspection week ($F_{7,98} = 6.24$; $P < 0.001$). The lowest contacts were recorded on 1st week of March (0.40 stations) while maximum contacts recorded on 4th week of April 2022 (0.933 stations) (Fig. 3). The population of termites was also significantly different in different weeks ($F_{7,119} = 10.35$; $P < 0.001$). The lowest population was recorded on the 1st week of March 2022 (73.30 termites/station) while maximum population was recorded on the 4th week of April 2022 (1716.6 termites/trap) (Fig. 4).

Numbers of stations contacted and termite population in Mujahid Town

The total number of termite contacts on the monitoring stations installed in Multan's Mujahid Town varied significantly throughout inspection weeks ($F_{7,98} = 2.30$; $P = 0.032$). The average number of termite encounters on monitoring stations was lowest in March (0.53 stations) and greatest in April (2022) (1.0 stations) (Fig. 5). The termite population varied significantly over weeks ($F_{7,119} = 7.36$; P 0.001). The lowest population (159.1 termites/station) was discovered in the first week of March 2022, while the largest number (1905.0 termites/trap) was discovered in the fourth week of April 2022. (Fig. 6).

Table 1 Termite species recorded from stations installed at different areas of Multan

Sr. No.	Location	Termite Species Recorded
01	C Block Research Area, MNS University of Agriculture, Multan	*Odontotermes* sp. *Microcerotermes* sp. *Amitermes* sp. *Microtermes* sp.
02	B Block (Near Sardar Tanveer Ilyas Khan Library), MNS University of Agriculture, Multan	*Odontotermes* sp. *Microcerotermes* sp. *Coptotermes* sp. *Microtermes* sp.
03	Mujahid Town, Multan	*Odontotermes* sp. *Microcerotermes* sp. *Coptotermes* sp.
04	Nishtar Medical University, Residential Area	*Odontotermes* sp. *Microcerotermes* sp. *Coptotermes* sp.

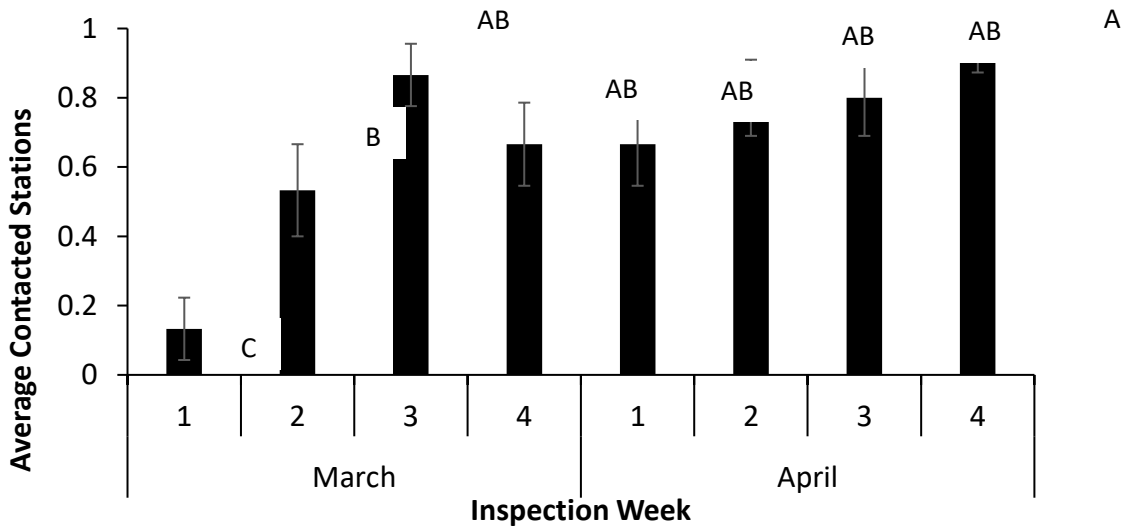

Figure 1 Average contacted infestation during different weeks at C Block, MNS University of Agriculture, Multan

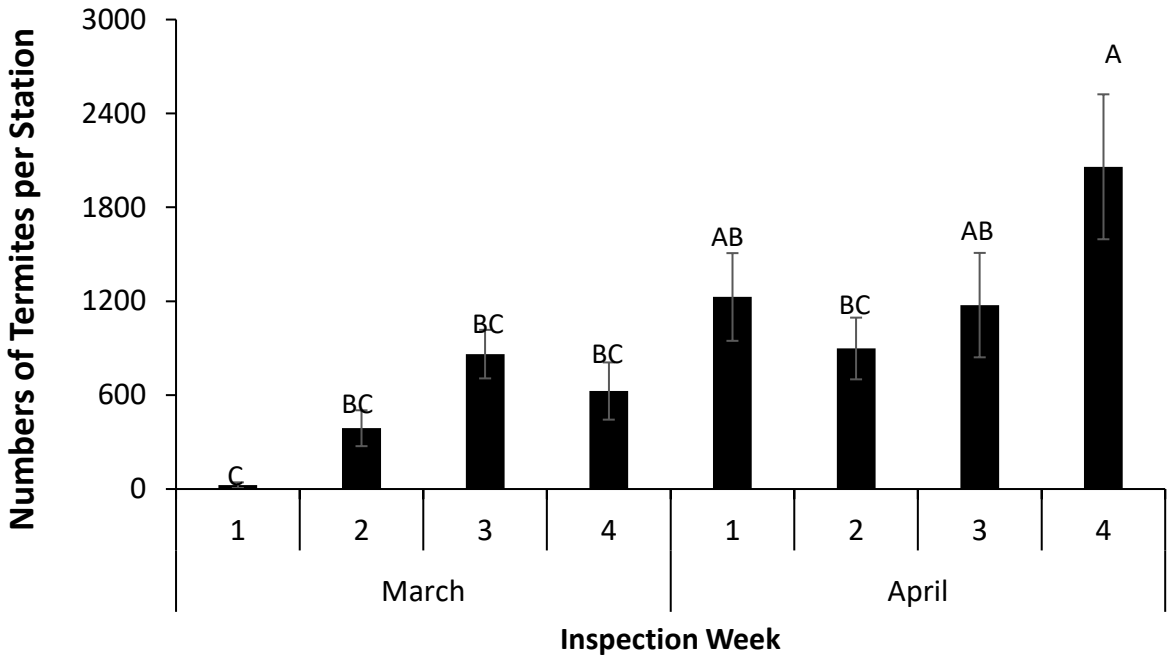

Figure 2 Number of termites per station at C Block, MNS University of Agriculture, Multan

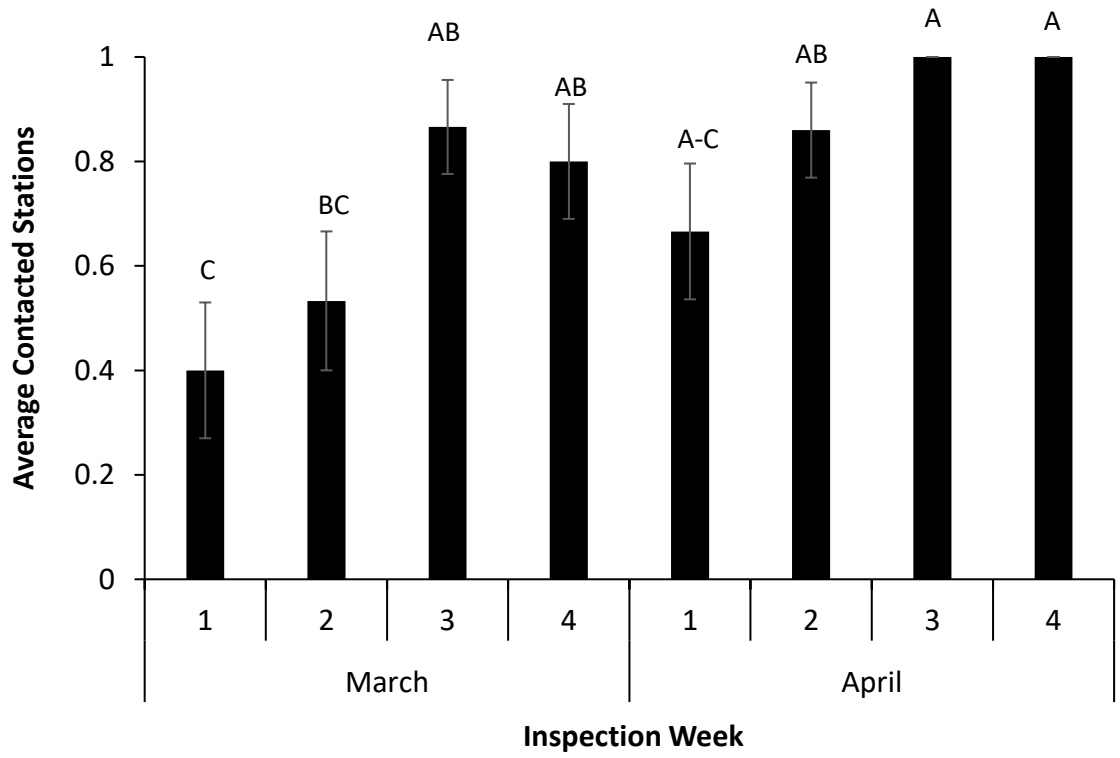

Figure 3 Average contacted infestation during different weeks at B Block, MNS University of Agriculture, Multan

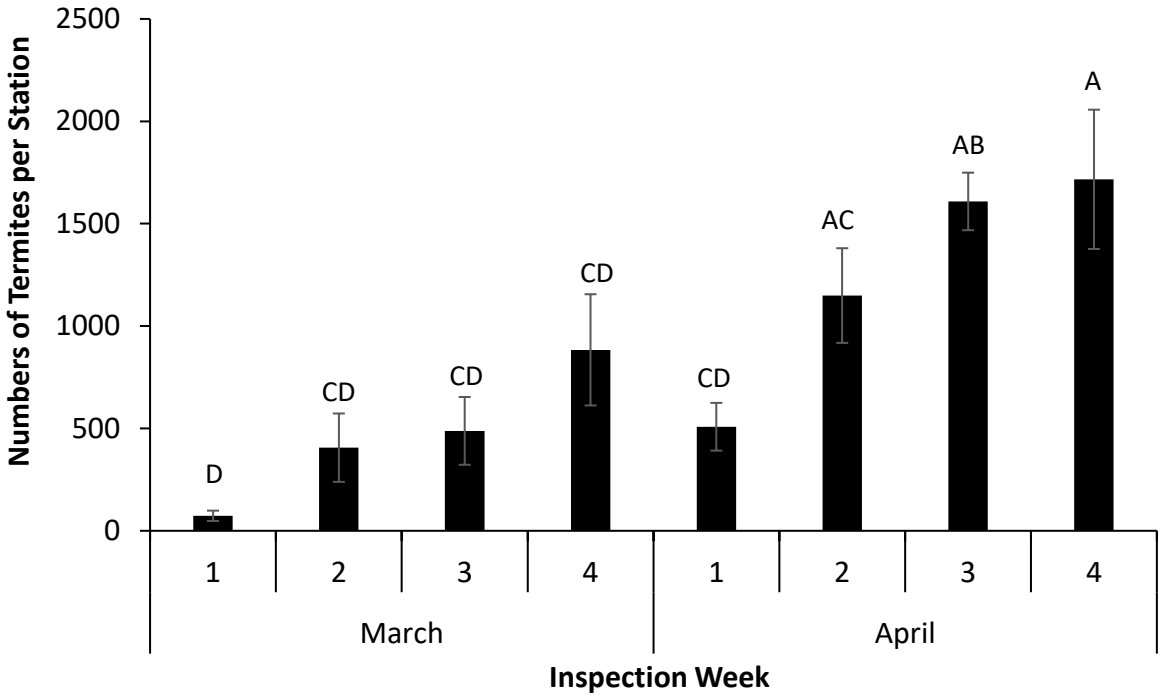

Figure 4 Number of termites per station at B Block, MNS University of Agriculture, Multan

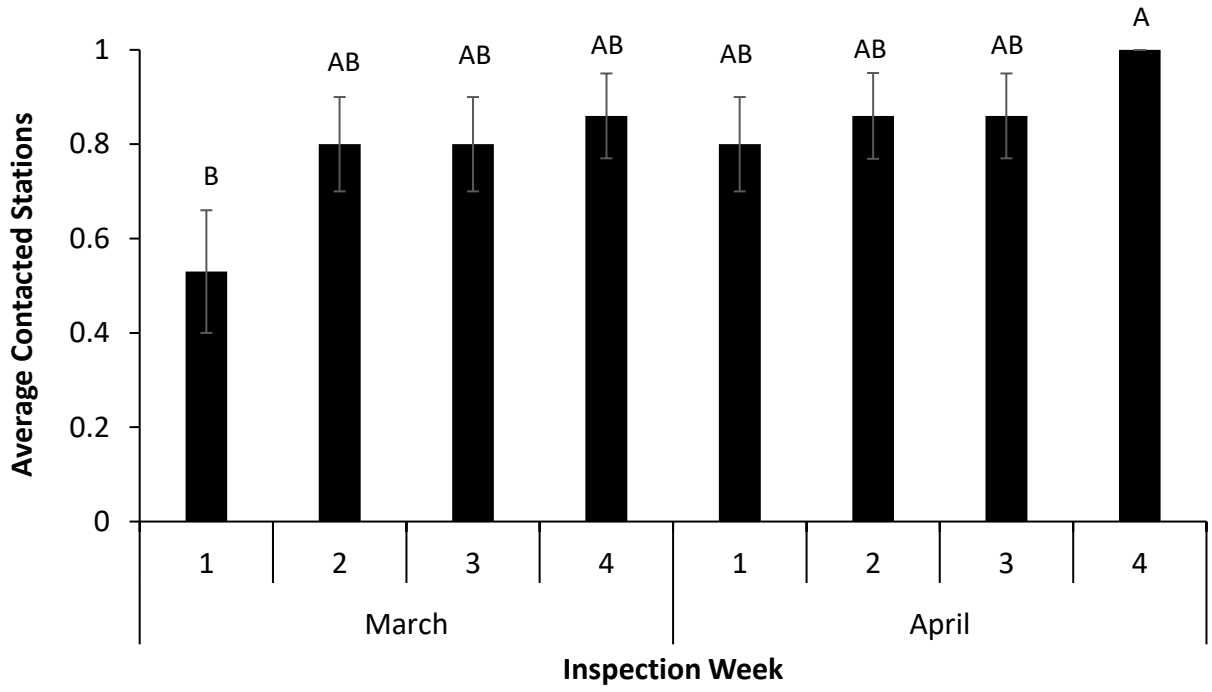

Figure 5 Average contacted infestation during different weeks at Mujahid Town, Multan

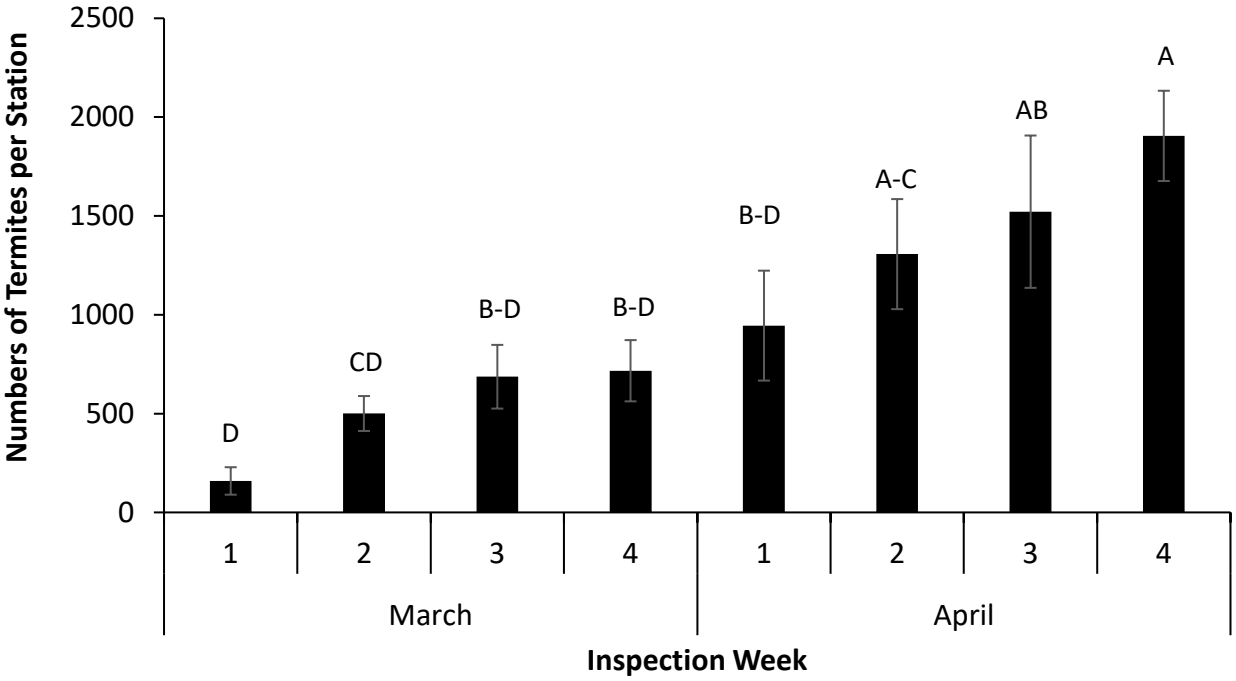

Figure 6 Number of termites per station at Mujahid Town, Multan

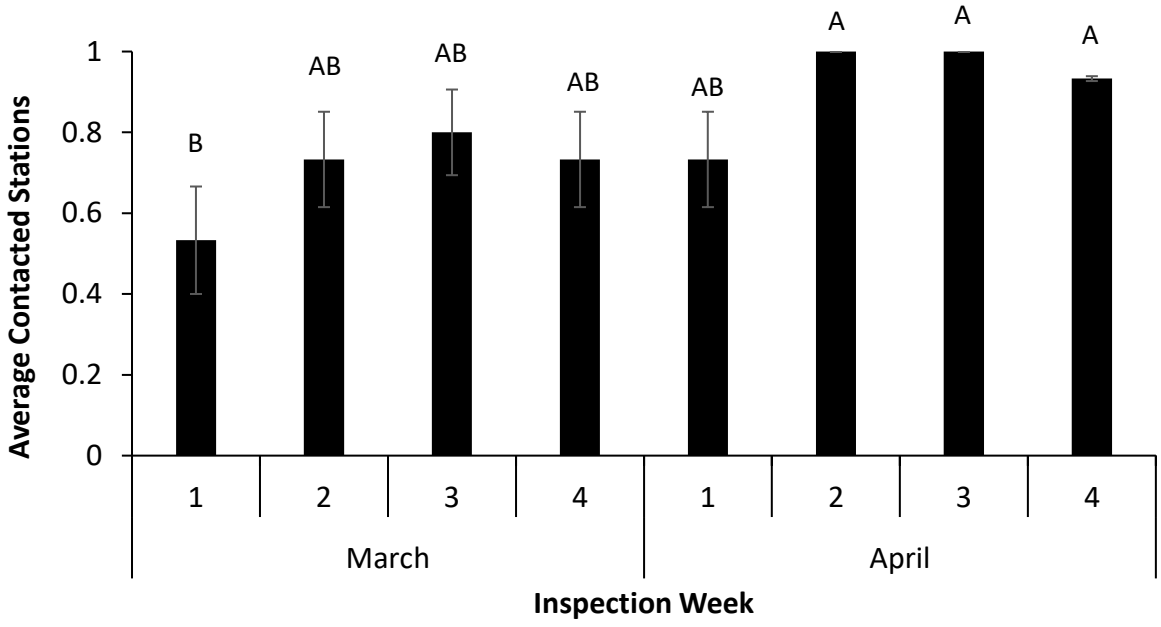

Figure 7 Average contacted infestation during different weeks at Nishtar Medical University, Multan

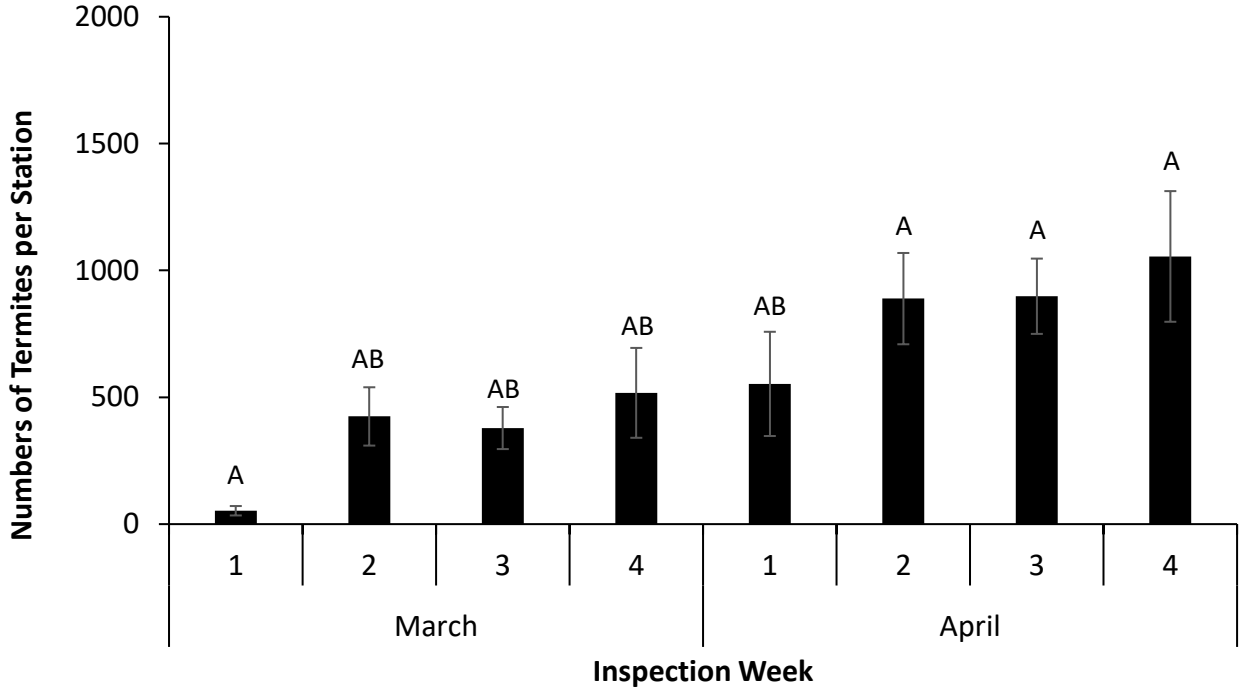

Figure 8 Number of termites per station at Nishtar Medical University, Multan

DISCUSSION

A comprehensive understanding of the behaviour of termites during their foraging and other activities is a necessary component of any termite management approach [17, 18, 19]. The monitoring and control of termites is commonly accomplished through the use of a technique known as termite baiting. The wood-destroying insect known as a termite is responsible for a considerable portion of the annual loss in both timber and home wood. Monitoring of termites on a regular basis is required for effective management of this insect pest, as is the determination of their individual identities [18]. The most up-to-date method developed specifically for this objective is known as termite baiting, and it has been documented by Kaakeh [18]. In their study on termite monitoring, Lewis et al., [20] also reported using a system quite similar to ours. The termite control programme absolutely requires an expansion of understanding on the use of bait [22].

Proper identification of termite species is also important part of termite control program. The result of the current study shows that termites are abundant in Punjab Pakistan and these findings can be justified with the results of Afzal and Rasib [23]. Similarly, the findings were also comparable to the results reported by Fatima et al. [24]. The higher activity of was observed in mostly traps in Multan [16]. The similar results were documented Akhtar [25]. It can be attributed to the fact that sub-tropical areas like Multan have more termite infestation as compared to other areas [26]. Overall termite interactions increased during the inspection weeks, with the fourth week having the largest number of contacts. The termite population also varied greatly between weeks. The population was lowest during the first week after trap placement. Following this, the population grew over many weeks, with the peak happening on the fourth week after trap infestation. Increase in termite population with the passage of time is also reported in many studies [27, 28, 29, 30]. Messenger and Su [31] also reported that the activity of *C. formosanus* was highest during summer months and the lowest during winter months. Moderate temperature promotes more insect abundance. As a matter of fact, insects could not survive extreme temperature whether hot or cold temperature [32, 33].

Conclusion: The results indicated results indicated that the population of termites per trap was maximum in C block of the university while the lowest in Nishtar Medical University. This

could be due to the fact that the C Block is an agriculture area which is less disturbed along the walls of the university. Therefore, there could be higher numbers of termite colonies in C Block as compared to Nishtar Medical University residential area where there is construction of buildings. These results will be helpful in planning the termite management program in residential and agriculture areas.

Acknowledgment: The authors are thankful to Patron Chemicals, Multan for providing funds for this research through Industry-Participatory Project No. IP-06.

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