Foraging Activity of The Subterranean Termite, *Psammotermes hybostoma* (Desneux) (Isoptera :Rhinotermitidae) at Ismailia Governorate, Egypt

El-Sherif, S. I.*, Y. M. El-Sebay and N. A. Abd El-latif****
* Faculty of Agriculture, Cairo University, Giza, Egypt.
** Plant Protection Research Institute, ARC, MOA, Dokki, Giza, Egypt.

Received: *25/6/2009*

Abstract: Foraging activity of the subterranean termite, *Psammotermes hybostoma* (Desneux), (Isoptera: Rhinotermitidae) was studied at Ismailia Governorate, Egypt, throughout two successive years (1997-1999) using perforated P.V.C. traps filled with corrugated cardboard paper and buried into the soil to a depth of 30 cm. Fresh traps were replaced at monthly intervals. Parameters used for assessing foraging activity were % visited traps, number of workers, food consumption and soil translocation (construction activity). Percentages of visited traps ranged between 23 and 60% in 1997/98 and 32- 68% in 1998/99. Foraging took place almost all the year round, but foraging activity was comparatively greater during both summer and autumn and tended to decline during winter. The majority of the foragers (93.2%) were workers. Food consumption was relatively low during winter, more or less moderate during both spring and autumn and relatively high throughout summer, with 1-2 distinct peaks in July and September- October. Soil translocation was relatively high between July and October or November, moderate in spring (April-June) and relatively low in winter (January- March), with 1-2 peaks in April and September - October. Relative efficiencies of the four above-mentioned foraging activity parameters were discussed.

Keywords: *Psammotermes hybostoma*- Foraging activity

INTRODUCTION

Termites are a group of social insects that belong to order Isoptera. They are important pests in many countries, particularly in the arid tropics and subtropics (Emerson, 1955 and Harris, 1961& 1967). Termites are differentiated into various morphological forms or castes that live in highly organized societies or colonies (Ahmed, 1997; Rizk and Salman,1984 and El-Bassyoni, 2001). Snyder (1949), Coaton (1958), Kassab *et al.*(1960) and Hafez (1980) reported that there are - at least - 11 species of termites in Egypt among which eight species are "ground-nesting" or "subterranean" and three species are "dry-wood" or "non-subterranean".

One of the commonly abundant subterranean termites in Egypt, particularly in the desert areas, is *Psammotermes hybostoma* (Desneux) (Isoptera : Rhinotermitidae). According to Harris (1961), *P. hybostoma* occurs right around the edge of the Sahara desert and on either coast of the red sea. Krishna and Weesner (1969) added that the so-called "sand termite" *P. hybostoma* is a true desert creature found south of the tropic as far as a line from Senegal (west) to the Sudan (east), while in Arabia it reaches the southern shores of the Peninsula. Detailed geographical distribution of the different termite species in Egypt carried by Kaschef and El-Sherif (1971) indicated that *P. hybostoma* occurs chiefly in Upper Egypt and was collected from Giza, El-Fayoum, Minia, Assuit and Aswan governorates as well as from Kharga, Dakhla and Baharia oasis. Ali (1980) reported *P. hybostoma* as one of the oldest known insect pests in Egypt and the Middle East.

In seeking for food and/or shelter, termites usually damage not only wood and wood products but also cellulose-containing materials such as paper, books, cartons and fabrics in addition to a variety of inorganic materials which can neither be digested nor used like buried electric power cables, railroad signal systems and telephone or telegraph communication circuits (Harris, 1961 and Spears, 1970). *P. hybostoma* causes considerable damage to construction timbers in Egypt (Khalil *et al.*, 1982 at Aswan Governorate and *Rizk et al.*, 1982 at the New-Valley Governorate).

In an effort to contribute to the knowledge on the subterranean termite P. *hybostoma,* at Ismailia Governorate, the present investigation was aimed. It concentrated, therefore, on a study of the termite's foraging activity in a badly infested area throughout two successive years.

MATERIALS AND METHODS

The study of the foraging activity of the subterranean termite, *P. hybostoma* was carried out throughout two successive years extending from the 1st of April 1997 until the 31st of March 1999 at "Ismailia Regional Agricultural Research Station", ARC, MOA, Ismailia Governorate, Egypt. In this particular station, soil is commonly known to be severely infested with *P. hybostoma* and no termite control measures are practiced in it as well. Brian (1978) stated that the most widely used method for studying feeding habits of subterranean termites is the use of baits which are either placed on soil surface or completely or partially buried. La Fage *et al.* (1973) used toilet paper roll baits to estimate food consumption and foraging intensity of subterranean termites. Several scientists recommended using toilet paper or corrugated cardboard baited traps for the study of foraging activity of subterranean termites (*e.g.* El-Sebay, 1991 and 1993; Crawford and Seely, 1994 and Ahmed, 1997).

An experimental area of 888 m2 (74 x 12 m) was chosen for the study and carefully cleaned up –as far as possible- of any existing weeds or cellulose materials.

This area was divided into 222 square-shaped plots (37 rows by 6 columns), each measuring 4 m^2. A termite trap was buried in a horizontal position to the depth of 30 cm into a hole at the center point of every experimental plot on the 1st of April, 1997, then covered with soil to ground level. Trap locations were marked with small red plastic flags (2m apart from each other from all directions). Buried traps were replaced with new ones monthly for 23 months until the last replacement was made on the 1st of March, 1999.

Every trap consisted of a perforated P.V.C. cylinder (15cm. in diameter and 20 cm. in height) totally filled up with a clean roll of corrugated cardboard paper and covered from both open ends with polyethylene sheets of suitable size fitted to the outside wall of the cylinder with rubber bands. Before introducing the cardboard rolls into the cylinders they were dried at 105 C. for 24 h in an electric oven and weighed, then soaked in water until saturation. Traps were buried into the soil at the designated locations. As a monthly routine, buried traps were carefully taken off the soil with the aid of a shovel and replaced with new ones. Su *et al.* (1991) and Ahmed (1997) reported that corrugated cardboard is quite suitable for the nutritive requirements of termites as it provides them with cellulose, enough moisture and a site similar to the natural tunnels where the different castes live.

Removed traps were treated as follows: a) every trap was placed into a separate plastic bag and transferred to the laboratory for examination. There, the cardboard roll (or its remnants) was/were carefully taken off the P.V.C. cylinder and examined for termite damage to determine the percentage of traps visited by the termite species under investigation, b) cardboard rolls that showed symptoms of termite visits (damage) were gently and patiently unrolled, and the existing termites were separated with the aid of a fine camel-hair brush, classified into different castes (larvae, nymphs, soldiers, workers and alates) and counted to determine caste composition, c) soil particles sticking to cardboard rolls (translocated soil) were gently removed by hand then separately collected in aluminum d) after the separation of soil particles, cardboard-roll remnants were also separately collected in similar aluminum trays and e) trays containing soil or cardboard remnants were dried at 105 C. for 24 h in an electric oven then weighed. Obtained dry weights represented "soil translocation" (Collins and Nutting, 1973 and Said, 1979), and the total weight of consumed food material was used as an index for termite foraging activity (La Fage *et al.*, 1973). Food consumption was calculated by applying the following formula:

FC (food consumption) = {CB (cardboard before) –CA (cardboard after)}

Where:

FC=Food consumption (in grams).

CB=Dry weight of cardboard roll before burying the trap into the soil (in grams).

CA=Dry weight of cardboard remnants (after removing translocated soil and termite castes) (in grams).

Table (1) shows physical and chemical characteristics of the soil at the experimental area before the commencement of the investigation. Soil analyses were made at the Institute of Water and Soil Research, ARC, MOA, Giza, Egypt.

Table (1): Type and physiochemical characteristics of the soil at the experimental location.

Texture class	Mechanical analysis %			Chemical analysis							
				Soluble cations meq./L				Soluble anions meq./L			
	sand	silt	clay	Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO^{-3}	HCO^{-3}	Cl^{-}	SO^{-4}
Sand	97.0	1.8	1.2	20.7	8.1	4.2	0.2	0.0	12.85	13.9	6.75

$CaCO_3$ % 1.20 **pH** 7.73 **Ec mem/cm** 3.14 **OM%** 0.10

RESULTS AND DISCUSSION

Monthly and seasonal means of percentage of visited traps, number of captured *P. hybostoma* workers / 222 traps and foraging activity parameters [food consumption (in g/trap) and soil translocation (in g/trap)] at the study location throughout the two successive years 1997/98 and 1998/ 99 are shown in Table (2).

% visited traps:

Monthly percentages of visited traps were relatively lower in 1997/ 98 (23– 60 %) than in 1998/ 99 (32 – 68 %). During the 1st year, 23 – 36 % of the traps were visited in spring, 51- 60 % in summer, 50 – 60 % in autumn and 40 -42 % in winter. The corresponding percentages during the 2nd year were 51 -54, 49-56, 56 – 68 and 32- 52 %, respectively. Based on the seasonal means of the percentage of infested traps, the termite species under investigation foraged almost all the year round but its foraging activity was comparatively greater during both summer (53 -56 %) and autumn (55 - 62%). Foraging activity declined during winter (41 – 45 %) and oscillated during spring (29 - 52%).

During the 1st year of investigation, relatively low percentages of visited traps were recorded from April to June, whereas considerably high percentages of visited traps took place from July until December, and intermediate percentages of visited traps occurred from January to March. On the contrary, the percentages of visited traps during the 2nd year were markedly high in all months, except for January. In conclusion, the foraging activity of P. *hybostoma,* as measured by the percentage of visited traps, was usually high in spring, summer and autumn but comparatively low in winter.

Table (2): Monthly and seasonal means of % visited traps, number of captured workers and foraging activity parameters of *P.hybostoma* at Ismailia governorate in two successive years, 1997/98 and 1998/99.

Year	Season	Month	% visited traps	No. of captured workers /222 traps	Foraging activity	
					Food consumption (g/trap)	Soil translocation (g/trap)
1997/ 1998	Spring	April	28.37	4962	4.000	10.441
		May	22.97	3105	4.802	12.586
		June	36.40	365	7.869	19.347
		Mean	**29.25**	**2810.67**	**5.56**	**14.13**
	Summer	July	50.90	460	10.139	35.162
		August	59.46	1641	7.554	28.874
		September	58.11	5630	8.655	39.221
		Mean	**56.16**	**2577.00**	**8.88**	**34.42**
	Autumn	October	59.46	8646	8.059	35.532
		November	49.55	8193	3.293	12.950
		December	54.95	7312	5.014	14.036
		Mean	**54.65**	**8050.33**	**5.46**	**20.84**
	Winter	January	40.09	12487	2.446	7.851
		February	40.54	28731	2.977	8.852
		March	42.34	8842	2.428	8.716
		Mean	**40.99**	**1668.67**	**2.62**	**8.47**
		Total	-	***90374***	***67.54***	***233.4 7***
1998/ 1999	Spring	April	50.90	2772	6.676	26.081
		May	54.05	7709	6.459	23.563
		June	50.90	160	4.812	19.680
		Mean	**51.95**	**3547.00**	**5.98**	**23.11**
	Summer	July	53.60	197	5.252	22.248
		August	48.65	70	5.234	20.703
		September	56.31	723	8.563	27.572
		Mean	**52.85**	**330.00**	**6.35**	**23.51**
	Autumn	October	61.26	4530	9.225	30.842
		November	67.57	7323	5.514	22.180
		December	55.86	2592	3.441	9.311
		Mean	**61.56**	**4815.00**	**6.06**	**20.78**
	Winter	January	32.43	16836	3.324	8.270
		February	51.80	10032	3.608	10.108
		March	51.35	16832	4.500	11901
		Mean	**45.19**	**14566.67**	**3.81**	**10.9**
		Total	-	***69776***	***66.61***	***232.46***

Caste composition:

In nature, the termite colony consists of six different castes; larvae, workers, soldiers, nymphs, primary reproductives (winged or unwinged alates) and supplementary reproductives (neotenics). Detailed morphological descriptions of these castes are given by Harris (1961), El-Sherif and Kaschef (1973) and Abd El-Latif (2003). Throughout the whole period of the current investigation the total number of *P. hybostoma* individuals collected from the unrolled corrugated cardboard rolls filling 5328 P.V.C. traps (222 traps/ month x 24 months) was 171830. Out of these 160150 (93.2%) were workers, 2190 (1.3 %) larvae, 919 (0.5%) nymphs, 8271 (4.8%) soldiers and 300 (0.2%) alates.. These numbers and corresponding percentages emphasize the fact that the majority of the foragers of the considered termite species consisted of workers only.

In coincidence with the above findings, El-Bassyoni (2001) mentioned that at Ismailia, Egypt, *P. hybostoma* caste composition consisted of 92.4 -93.2, 0.68 - 2.2, 4.07 - 4.8 % and 0.47 187 % workers, larvae, soldiers and alates, respectively. Larvae peaked during winter, soldiers occurred during winter and spring and alates were found during autumn and winter. Abd El-Latif (2003) reported that also at Ismailia, Egypt, the larvae of *P. hybostoma* were never captured from April or May until September or October Nutting (1970) stated that cast composition of the termite, *Heterotermes aureus,* included 4% soldiers and 96% non-soldiers. Nutting *et al.*(1973) mentioned that the foragers of the termite, *Gnathamitermes preplexus were* mainly workers with only 0.4% soldiers. Wood (1978) added

that the food supplies of termite colonies are collected by workers which feed themselves as well as the dependent castes. Fontana *et al.* (1982) stated that the cast composition of the termite, *Reticulitermes lucifugus* in Tuscany, Italy, consisted of 85.76% workers, 8.8% larvae, 1.3% soldiers and 0.23% supplementary reproductives. Ahmed (1997) contributed that the average percentages of the castes of the termite *A. ochraceus* at El-Fayoum Governorate, Egypt, were 66.5-77.1, 21.7-32.4, 0.2-0.7 and 0.4 – 0.9 for workers, nymphs, soldiers and alates, respectively. Abd El-Latif (2003) classified the caste composition of the same termite species at El-Fayoum Governorate as 97.6 % workers, 1,8 % larvae, 0,4 %nymphs, 0.2% soldiers and 0.0% alates.

Number of captured workers:

As shown in Table(2), in 1997/ 98, workers occurred in the cardboard traps in April at a count of 4962/ 222, traps then their numbers declined to 365 and 460/ 222 traps in June and July , respectively. Starting from August and throughout September the number of workers increased and population peaks took place during October and November (8646 and 8193/ 222 traps, respectively). These peaks were followed by a slight decrease of workers population to 7312/ 222 traps in December. During winter months, the number of workers increased towards another peak of 12487/222 traps in January and 28731/ 222 traps in February then declined gradually in March. In 1998/ 99, the pattern of population fluctuation was a different than that of the previous year. Workers appeared in the traps in relatively low numbers in April, increased to a moderate population of 7709/ 222 traps in May and their count dropped significantly to minimum throughout the period June- September (70 – 723 / 222 traps). Workers population was relatively high during autumn and a peak of 7323 / 222 traps was recorded in November. During winter, workers population was relatively high and peak counts of 10032 – 16832 / 222 traps were recorded in January and March.

Despite the discrepancy of the population changes of *P. hybostoma* workers during the two years of investigation, and relying more on the 1st year's results (the year with the relatively higher population level; total counts of 90374 workers in 1997/98 compared to 69776 workers in 1998/ 99 (Table 2), the following three conclusions could be drawn out : a) workers foraged all the year round, b) foraging –as measured by the number of workers captured in P.V.C. traps – appeared as moderate in spring, relatively low between late spring and late summer (June – August) and considerably high from late summer to late winter (September – March), c) during the period of high workers' population, two peaks took place; one in November and the other in January through March.

Food consumption:

Food consumption is the actual dry weight of consumed corrugated cardboard paper / trap in grams (Abd El-Latif, 2003). In 1997/98 it was relatively low during spring but tended to increase and recorded the 1st peak of 10.1 g/ trap in July. Food consumption decreased slightly in August then increased again to reach the 2nd peak of 8.1 – 8.7 g/ trap by late summer (September) and early autumn (October). This peak was followed by an oscillating decrease of food consumption throughout the rest of autumn as well as during winter. In 1998/ 99, the 1st peak of food consumption took place relatively earlier in April and May (6.5 – 6.7 g/ trap) then it declined to a comparatively lower range of 4.8 – 5.3 g/ trap during June – August. A 2nd peak of food consumption occurred by late summer and early autumn in September (8.6 g/trap) and October (9.2 g/trap), respectively. This peak was followed by a decrease of food consumption throughout the rest of autumn and during winter. These results refer that although the total annual foraging activity of *P. hybostoma* was more or less constant (about 68 and 67g /trap in 1997/98 and 1998/ 99, respectively) it varied markedly from one month to another as well as from one season to the other.

Nel (1970), Ohiaqu and Wood (1976), Wood (1978) and Abd El-Latif (2003) coincided that termite food consumption varies according to species and natural food. Ali *el al.* (1982) mentioned that at Sohag and the New Valley Governorates of Egypt , *P. hybostoma* foraged all the year round but foraging activity is minimal during winter. Abdel-Wahab *et al.* (1983) added that at Kom-Ombo, Aswan Governorate, the food consumption of *P. hybostoma* was at its minimal level in December and maximal level in April and August. Salman *et al.*(1987) reported that in the New Valley Governorate the foraging activity of *P. hybostoma* was high in summer (with peaks during the 1st half of June, the 2nd half of July and the 1st half of September) and low in winter (from December to February).

Soil translocation (= construction activity):

Soil translocation (construction activity) is the actual dry weight of translocated soil/ trap (Abd El-Latif, 2003). As seen in Table (2), soil translocation in 1997/98 was generally low during winter, spring and late autumn (7.9 – 19.4 g/ trap) and considerably high between early summer and early autumn (28.9 – 35.5 g/ trap). In 1998/99, soil translocation was low in late autumn and during winter (8.3 – 11.9g/ trap) but obviously high by early spring (26.1& 23.6 g/ trap in April and May, respectively) and through early summer to mid-autumn (20.7 – 30.8 g/ trap). In both years of investigation, maximum seasonal means of soil translocation took place during summer (about 34.4g / trap in 1997/98 & 23.5 g/ trap in 1998/99) and minimum seasonal means occurred during winter (about 8.5 g / trap in 1997/98 &10.9 g/ trap in 1998/99). As in the case of food consumption, two peaks of soil translocation were observed; the 1st in April – July (about 26.1 –35.2 g / trap) and the 2nd in September – October (about 30.8 –35. 5 g /trap). Despite the noticeable fluctuation of the monthly amounts of soil translocation, total annual soil translocation was almost constant for both years of investigation (234 and 233 g/ trap in 1997/ 98 and 1998/ 99, respectively). El-Bassyoni (2001) reported that, at Ismailia Governorate, maximum quantity of soil translocation by *P.*

hybostoma occurred in September and October while minimum translocation took place in January.

REFERENCES

Abd El-Latif, N. A. (2003). Ecological and control studies on certain subterranean termite species. Ph.D. Thesis, Fac. Agric., Cairo Univ., 267p.

Abdel-Wahab, M. A.; Rizk, M. R.; Hussein, M. H.; Abd El-Raof, T. K. and El-Taib, M. S. (1983). Surface activity of sand termite *Psammotermes hybostoma* (Desneux) in Asswan, Assuit J. Agric. Sci., 14 (3): 99-108.

Ahmed, H. M. (1997). Ecological studies and control of harvester subterranean termite *Anacanthotermes ochraceus* (Burm.) at El Fayoum Governorate, M.Sc. Thesis, Fac. Agric., Cairo Univ. at El Fayoum branch, 77 p.

Ali, A. M. (1980). Control of termites in Egypt-present and future. Sociobiology, 5 (2): 211-212.

Ali, A. M., MN. F. Abou-Ghadir and N. A. Abdel Hafez (1982). Surface activity of termite in the New Valley. Assuit J. Agric. Sci., 13 (3): 73-78.

Brian, M. V. (1978). Production ecology of ants and termites. Cambridge Univ. Press. London. 409 p.

Coaton, W. G. H. (1958). The hodotermitid harvester termites of South Africa. Bull. S. Africa, Entomol. Ser., 375 (43): 1-112.

Collins, M. S. and W. L. Nutting (1973). High-temperature tolerance in two species of subterranean termites from the Sonoran desert in Arizona. Environ. Entomol., 2 (6): 1122-1123.

Crawford, C. S. and M. K. Seely (1994): Detritus mass loss in the Namib desert dune field influence of termites gerbils and exposure to surface conditions (*Gerbillus paeba, Psammotermes allocerus*). J. African Zoology (Belgium), 108 (1): 49-54 (*c.f.* Abd El-latif, 2003).

El-Bassyoni, A. R. (2001). A study on the ecology and biological control of subterranean termites. M. Sc. Thesis, Fac. Agric. ,Al-Azhar Univ., 145 p.

El-Sebay, Y. (1991). A modified El-Sebay trap for subterranean termites. 4th Arab. Congress of Plant Protection. Cairo, Egypt, Dec. 1991 pp. 245-247.

El-Sebay, Y. (1993). Ecological studies on the harvester termite, *Anacanthotermes ochraceus* (Burm.) in Egypt. Assuit J. Agric. Sci., 24 (4): 35-47.

El-Sherif, L. S. and A. H. Kaschef (1973). Survey and taxonomy of the termites in Egypt (Isoptera). Bull.Soc. Ent. Egypt, 57: 283-297.

Emerson, A. E. (1955). Geographical origins and dispersions of the termite genere. Fieldiana Zool., 37: 465-521.

Fontana, F., A. M. Gavioli and M. Amovelli (1982). Observations on the caste composition of three Tuscany population of *Leucotermes lucifugus* (Rossi) (Isoptera: Rhinotermitidae). Frustula Entomological, 3: 121-124.

Hafez, M. (1980). Highlights of the termite problem in Egypt. Sociobiology, 5 (2): 147-154.

Harris, W. V. (1961). Termites, their recognition and control. Longmans, London, 187 p.

Harris, W. V. (1967). Termites of the genus *Anacanthotermes* in North Africa and Near- East (Isoptera : Hodotermitidae). Proc. Roy. Ent. Soc. London, (B) 36: 79-86.

Kaschef, A. H. and L. S. El-Sherif (1971). Distribution of four termite species in the A. R. Egypt. Insectes Sociaux, 18 (4): 227-232.

Kassab, A.. M. I. Hassan, A. M. Charawi and A. M. Shahwan (1960). The termite problem in Egypt with special reference to control. Min. Agric. Publ. Cairo, 91 P.

Khalil, F. M., M. M. Rizk, A. A. Maher and M. A. Morsy (1982). Assessment of damage due to termites in Egypt. II. Aswan governorote, Upper Egypt. Assuit J. Agric. Sci., 13 (3): 101-106.

Krishna, K. and F. M. Weesner (1969). Biology of termites. Vol. I Academic Press, NY, p.598

La Fage, J. P., W. L. Nutting and M. I. Haverty (1973). Desert subterranean termite: A method for studying foraging behavior. Environ. Entomol., 2: 954-956.

Nel, J. J. C. (1970). Aspects of the behavior of worker of the harvester termite, *Hodotermes mossambicus* (Hagen), in the field (Isoptera: Hodotermitidae). J. Entomol. Society of Southern Africa, 33: 23-34.

Nutting, W. L. (1970). Free diurnal foraging by the North American nasutiform termite *Tenuirostritermes tenuirostris* (Isoptera: Termitidae) Pan-Pac. Entomol., 46: 39-42.

Nutting, W. L., M. I. Haverty and J. P. La-Fage (1973). Foraging behavior of two species of subterranean termites in the Sonoran Desert of Arizona. Proceedings, VIIth International Congress of the International Union for the study of Social Insects, London 10-15 September pp. 298-201.

Ohiaqu, C. E. and T. G. Wood (1976). A method for measuring rate of grass-harvesting by *Trinervitermes geminatus* Wasmann (Isoptera, Nasutitermitinal) and observation on its foraging behavior in Southern Guinea Savanna, Nigeria. Journal of Applied Ecolgy, 13: 705-713.

Rizk, M. M., A. M. Ali and E. A. El-Eraki (1982). Assessment of damage due to termites in Egypt. III-Port Said province, Lower Egypt. Assuit J. Agric. Sci., 13 (3): 107-113.

Rizk, M. M. and A. G. Salman (1984). Colony structure of sand termite. *Psammotermes hybostoma* (Desneux). Assuit J. Agric. Sci., 15 (5): 211-217.

Said, W. A. (1979). Ecological and toxicological studies on Family Hodotermitidae. M. Sc. Thesis, Fac. Agr,. Ain Shams Univ.,128 p.

Salman, A. G. A., M. A. Morsy and A. A. El. Sayed (1987). Foraging activity of the sand termite, *Psammotermes hybostoma* (Desn.) in the New Valley, Egypt. Assuit J. Agric. Sci., 18(4): 51-57.

Snyder, T. E. (1949). Catalog of the termites (Isoptera) of the world. J. Entomol. Res., 3 (1): 194-203.

Spears, P. J. (1970). Principles of termite control, pp. 578-604. In "Biology of termites"

Su, N. Y., P. M. Ban and R. H. Scheffrahn (1991). Suppression of foraging populations of the Formosan subterranean termites (Isoptera: Rhinotermitidae) by field applications of a slow-

acting toxicant bait. J. Econ. Entomol., 84 (5): 1925-1531.

Wood, T. G. (1978). Food and feeding habits of termites, pp. 55-80. In "production ecology of ants and termites", Brian, M. V. (ed.), Cambridge University Press, London.

نشاط الرعى لنوع النمل الأبيض التحت أرضى *Psammotermes hybostoma* (Desneux) (Isoptera: Rhinotermitidae) فى محافظة الإسماعيلية- مصر

سمير الشريف إبراهيم*- يسرى محمد السباعى- نادية عبد الشفيع عبد اللطيف****

* كلية الزراعة – جامعة القاهرة – الجيزة – ج م ع

** معهد بحوث وقاية النباتات – مركز البحوث الزراعية- وزارة الزراعة – الدقى – الجيزة – ج م ع

درس نشاط الرعى لنوع النمل الأبيض *Psammotermes hybostoma* ورتبة متساوية الأجنحة Desneux من عائلة Rhinotermitidae بمحافظة الإسماعيلية خلال العامين المتتاليين ١٩٩٧/١٩٩٨ و ١٩٩٨/١٩٩٩ بإستعمال مصائد بلاستيكية مثقبة محشوة بورق الكرتون المضلع ومدفونة فى التربة لعمق ٣٠ سم تم تغييرها بمصائد جديدة دورياً مرة كل شهر. وإستخدمت لتقدير نشاط الرعى أربعة معايير مختلفة هى النسبة المئوية للمصائد التى زارها النمل الأبيض، وعدد الشغالات بالمصائد ، والإستهلاك الغذائى ، وكمية التربة المنقولة. تراوحت النسبة المئوية للمصائد التى زارها النمل الأبيض بين ٢٣ و ٦٠ % عام٩٨/١٩٩٧ و بين ٣٢ و ٦٨ % عام ٩٩/١٩٩٨،و إستمر نشاط الرعى على مدار العام، إلا أنه كان أكبر نسبيا خلال فصلى الصيف والخريف ومال إلى الإنخفاض خلال فصل الشتاء. كانت الغالبية العظمى لأفراد النمل الأبيض التى وجدت فى المصائد (٩٣,٢%) عبارة عن شغالات، كان الإستهلاك الغذائى منخفضا نسبيا خلال فصل الشتاء، و متوسطا إلى حد ما خلال فصلى الربيع والخريف ، وعاليا نسبيا خلال فصل الصيف، مع ظهورقمة أو قمتين واضحتين للإستهلاك الغذائى الأولى فى يوليو و الثانية فى سبتمبر - أكتوبر. أما كمية التربة المنقولة إلى المصائد فقد كانت كبيرة نسبيا بين يوليو و أكتوبر أو نوفمبر ، ومتوسطة فى الربيع (إبريل – يونيو)، و قليلة فى الشتاء (يناير – مارس). وقد سجلت قمة أو قمتان واضحتان لوزن التربة المنقولة إلى المصائد أولاهما خلال شهر إبريل و الثانية خلال شهرى سبتمبر و أكتوبر. وأظهرت المفاضلة بين معايير تقدير نشاط الرعى الأربعة سابقة الذكر أن وزن التربة المنقولة هو أكثر تلك المعايير إعتمادية.