Minufiya J. Agric. Res. Vol. 32 No.5: 1523 - 1534 (2007)

ECOLOGICAL STUDIES ON SUBTERRANEAN TERMITE *Psammotermes hypostoma* (Desn.) AT ASWAN GOVERNORATE

Y. El-Sebay and M. K. Abdel-Latif

Plant Protection Research Institute, Agric. Res. Center, Dokki, Giza, Egypt

(Received: June 18 , 2007)

ABSTRACT : *Ecological studies were carried out at Aswan Governorate on the sand subterranean termite P. hypostoma. Obtained results revealed that, the maximum seasonal foraging activity was during November-February, while the minimum was during May-August.*

The highest consumption of food was during December, while the lowest one was during June. Termite can consumed 38-61.5 kg/feddan/year of cellulose materials. And can moved 50-57 kg/feddan/year soil through its construction activity which occupied its maximum rate during August-September. While the lowest one was during Feb-Mar. with rate of 0.978 to 1.1 kg/ feddan /year. The population composition was 95-96% workers, 1.8-2% soldiers and 2-4.5% alates.

Key words: *Termits, Aswan, Ecology, subterranean*

INTRODUCTION

Termite is a hidden insect with distinct mysterious life and has ability to survive in different ecological conditions. Such ability derived the insect to cause sever damage to the buildings, crops, papers, wood....and many celluloid materials.

Traps design was modified from wooden stakes 5x 10x 45cm, (Johnson *et al.*, 1971), wooden blocks 2.5x15x 15cm, (Lafage *et al.*, 1973), toilet paper rolls (Wood, 1974), and litter bags of corrugated card or wood plots 5x 10x 25cm, Nutting *et al.* (1975). Said (1979) used toilet paper rolls baits (Whitford and Noble 1982). Frensh and Ewart (1986), used filleen traps and El-Sebay modified traps (1991).

Termite ecology was studied by several authors. Subsurface and foraging activity was mentioned by Bodine (1975), Said (1979), Abdel-Wahab *et al* (1983), Salman *et al* (1987) and El-Sebay (1993 a & b).

MATERIALS AND METHODS

Ecological studies on subterranean termite *Psammotermes hypostoma* (Desn.), were carried out at El-Edwa, Kom-Ombo, which located at 52 km north Asawn Governorate. Experimental infested area (560 m^2) was cleaned up from cultivations (herbs and weeds) ad any source of cellulose materials.

El-Sebay modified trap (1991) was prepared at the Project Laboratory (Aswan Locust Control Base) as follows: Trap consists of corrugated-cardboard wrapped in a roll shape, 5-7 cm in diameter and 12 cm in length,

covered with polyethylene sheath, except 2 cm at the end position, fixed with rubber band, Fig. (1).

Fig.(1): Corrugated-cardboard Trap

Each trap was weighted, marked and dried in an electric oven (105±2 °C) for 24hrs. Re-weighed traps until fixed and sent to the experimental area. Traps were moistened with water until saturation and distributed in 10 lines and 14 rows and at 2 m intervals as shown in Fig.(2).

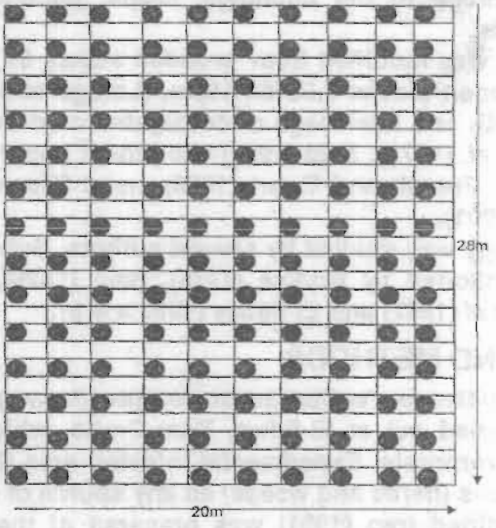


Fig. (2): Diagrammatic drawn of distributed traps in the tested area

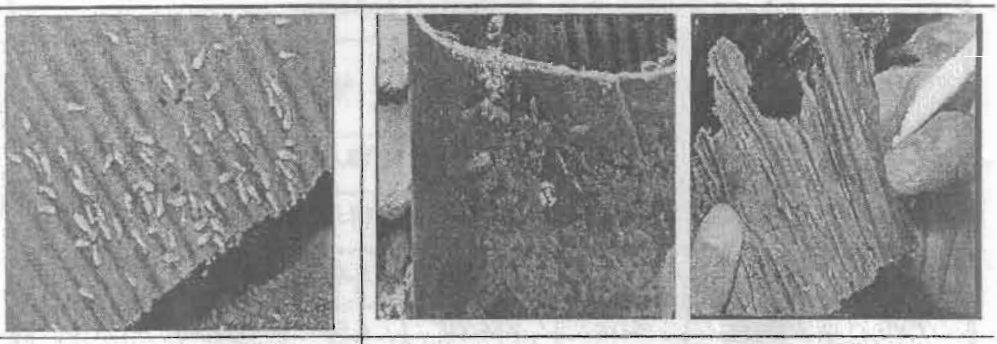
Traps were left for 30 days and replaced by another number of newly prepared ones and each one occupies the same position.

Collected traps were sent to the laboratory and examined for the three ecological aspects (Fig.3) :

a- Number of attracted termites.

b- Rate of food consumption (weight before and after).

c- Rate of soil translocation (weight of attached soil to trap).



Attracted termites | Attached soil | Food consumption

Fig. (3): Three ecological aspects of traps in the fields

RESULTS AND DISCUSSION

Data presented in Tables 1 and 2, expressed the real activity of subterranean termite under ground. Collected traps revealed some facts about *Psammotermes hypostoma* (Desn.) at Aswan governorate. Reading traps was through three ecological aspects as follow:

1- Number of attracted termites:

Data in Tables (1 and 2) and Fig. (4) showed that during 2005, the largest number of attracted termites (17659, represented 26.40%) was found during December, followed by 16227 in November and 10351 during January. While the lowest numbers of foraging termites were 18, 322 and 687 during June, July and August of the same year.

During the second year (2006) the largest number of attracted termites was 13625, followed by December (11467 individuals). While the lowest number (102 individuals) was recorded during June (Table 2).

Accordingly foraging activity of *P. hypostoma* at Aswan Governorate, starting from October to April, whereas 94.5% of the whole attracted termites

were foraged, while less foraging occurred during the summer season (May-August) at the two tested years.

El-Sebay (1993a) stated that the minimum number of *Anacanthotirmes ochracieus* foragers occurred during January, while the maximum one was during February.

Table (1): Ecological aspects of *Psammotermes hypostoma* (Desnuax) as indicated by traps at Aswan Governorate during 2005.

Month	Ecological aspects					
	No. of attracted insects	%	Food consumption in gm	%	Translocated soil in gm	%
Jan.	10351	15.50	688	13.60	287.8	0.80
Feb.	6330	9.50	587.50	11.60	148.57	0.41
Mar.	5647	8.50	321.80	6.40	103.42	0.28
Apr.	2689	4.02	234.70	4.60	566.50	1.57
May	762	1.14	133.40	2.60	2154.50	5.99
June	18	0.03	32.40	0.64	4215.70	11.71
July	322	0.50	69.70	1.40	5222.30	14.51
Aug.	687	1.03	324.10	6.40	6548.50	18.19
Sep.	1897	2.84	423.10	8.40	7652.40	21.26
Oct.	4239	6.34	455.80	8.99	5331.20	14.81
Nov.	16227	24.30	865.30	17.10	2314.50	6.43
Dec.	17659	26.40	935.70	18.50	1147.20	3.19
Total	66828	--	5071.5	--	35992.6	--

Table (2): Ecological aspects of ***Psammotermes hypostoma*** (Desnuax) as indicated by traps at Aswan Governorate during 2006.

Month	Ecological aspects					
	No. of attracted insects	%	Food consumption in gm	%	Translocated soil in gm	%
Jan.	13625	27.79	1243.20	15.20	89.40	0.42
Feb.	5326	10.87	932.10	11.37	124.50	0.58
Mar.	4326	8.83	832.40	10.20	303.40	1.42
Apr.	2315	4.72	789.20	9.63	568.90	2.65
May	954	1.95	632.10	7.70	1789.30	8.35
June	102	0.21	98.30	1.19	2356.40	10.99
July	324	0.66	135.40	1.65	3125.80	14.58
Aug.	689	1.41	265.30	3.24	2800.3	13.06
Sep.	1234	2.51	465.30	5.68	3935.5	18.35
Oct.	2136	4.36	532.70	6.50	4794.99	22.36
Nov.	6521	13.30	722.30	8.81	823.40	3.84
Dec.	11467	23.39	1546.30	18.86	724.03	3.37
Total	49019	---	8194.6	---	21435.92	---

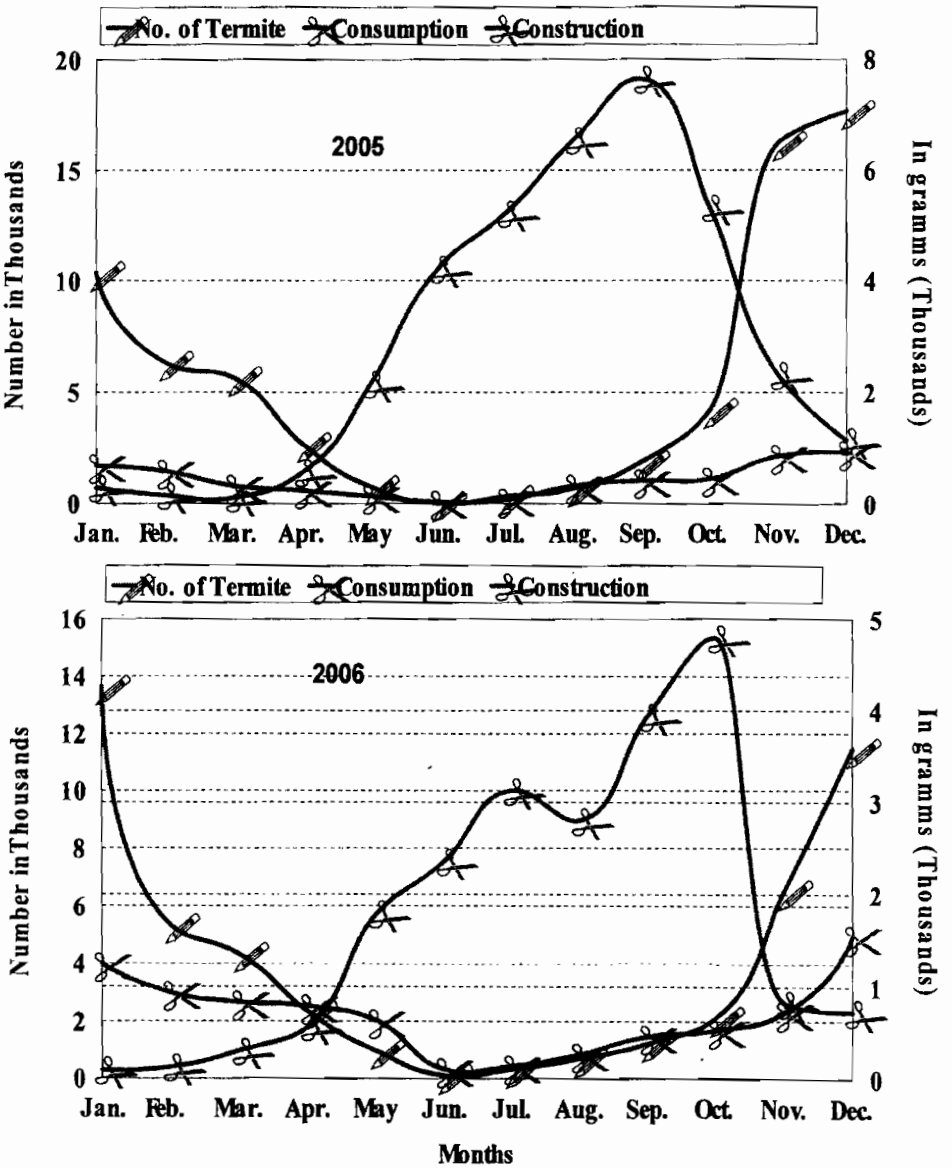


Fig.4: The three ecological aspects; number of attracted termites, food consumption and soil construction of *P. hypostoma* at Aswan Governorate during 2005 and 2006.

2- Food consumption:

As shown from obtained data in Tables (1 and 2) and illustrated in Fig. (4), the annual food consumption of termite in 560 m^2 was 5071.5 gm during 2005 (38 kg/feddan /year) and 8194.6 gm during 2006 (61.5 kg/feddan/year). The maximum consumption was 935.7 gm (18.5%) during December 2005 and 1546.3 gm (18.9%) at the same month during 2006. While the minimum consumption rates were during June (32.4 and 98.3 gm, respectively) in both tested years.

On the other hand, it could be concluded that the trend of food consumption is the same with foraging termite. That means about 84.5% of annual food consumption occurred during the period extended from September till March.

3- Construction activity:

Soil construction is the third ecological aspects of the trap which is cleared from data in Tables (1 and 2) and Fig.(4). The highest weight of attached soil to the traps was during August and September (7652.4 and 6548.5 gm, respectively) at 2005 and during September and October (3935.5 and 4794.9 gm, respectively) at 2006.

While the lowest translocated soil activity was during February and March (148.6 and 103.42 gm, respectively) at 2005. And during January and February (89.4 and 124.5 gm, respectively) at 2006. The annual moved soil were 57 kg/feddan/year in 2005 and 49.5 kg/feddan/year in 2006.

El-Sebay (1993b) estimated the rate of soil translocated of *A. ochraceus* as 58 gm/ m^2 or 243 kg/feddan. The obtained results with agree with those of Said (1979) who stated that the quantity of translocated soil reached its maximum during July-August and September, while its minimum was obtained during the winter and spring.

El-Sebay (1993a) at Ismailia Governorate mentioned that the translocated soil by *A. ochraceus* ranged between 6726 and 1878 gm/colony/year.

4-Seasonal activity:

Data in Tables (1 and 2) and Fig. (5) show that the termite started to forage (sub-surface) by July 2005 and 2006 recorded 322 and 324 individuals, respectively. It increased gradually to reach its peak during December and January with counts of 17659 and 13625 individuals , respectively and continued during the winter season with the minimum numbers of 18 and 102 individuals) in June of both tested years, respectively. Rizk *et al.* (1985) stated that the larvae of *P. hypostoma* were found all over the year, except from May to August.

Workers cast (Tables 3 and 4) was distributed all the year with peaks of 17228 and 13047 individuals during December 2005 and January 2006 respectively . The lowest percent was recorded during February 2005 and 2006 with 88.23 and 93.48%, respectively.

Soldier cast was rarely found during June and July in two tested years (Tables 3 and 4). The highest number of soldiers was obtained during January 2005 and December 2006 with counts of 523 and 263 individuals, respectively. 2005 and 2006 (523 and 260 in both years). Its occurrence lasted 4 weeks in 2005 and 7 weeks in 2006.

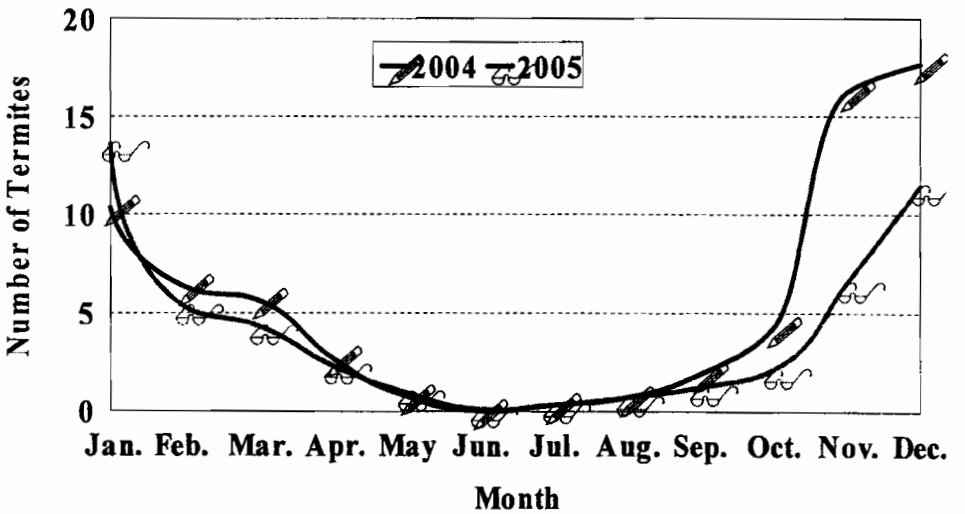


Fig. (5): Seasonal activity of *P. hypostoma* at Aswan Governorate during 2005 and 2006 as indicated by number of attracted termites.

As shown from data obtained in Tables (3 and 4) alates started to appear during November 2005 (ten winged individuals) and October 2006 (three

winged individuals). Te highest numbers of alates were recorded during February 2005 and December 2006, with values of 512 and 319 individuals , respectively.

5- Cast Compositions:

Data in Tables (3 and 4), show that, the main part of the termite's population was consisted of workers (64201 individuals in 2005 and 47037 individuals in 2006) and represented 96.1 and 95.96% of the whole attracted termites in the two respective years. The total numbers of attracted soldiers were 1325 and 875 individuals, which represented 1.99 and 1.79% of the whole population in the first year and second year, respectively. Alates composed 1.95 and 4.5% of the total numbers during 2005 and 2006, in respective.

Table (3): Cast composition of *Psammotermes hypostoma* (Desnuax) as indicated by attracted termites at Aswan Governorate during 2005

Number	Workers		Soldiers		Alates		Total
	Number	%	Number	%	Number	%	
Jan.	9393	90.74	523	5.05	435	4.20	10351
Feb.	5585	88.23	233	3.7	512	8.10	6330
Mar.	5441	96.4	98	1.74	108	1.91	5647
Apr.	2653	98.66	36	1.34	0.0	0.0	2689
May	754	98.95	8	1.05	0.0	0.0	762
Jun.	18	100	0.0	0.0	0.0	0.0	18
Jul.	322	100	0.0	0.0	0.0	0.0	322
Aug.	684	99.56	3	0.44	0.0	0.0	687
Sep.	1882	99.21	15	0.79	0.0	0.0	1897
Oct.	4206	99.22	33	0.78	0.0	0.0	4239
Nov.	16035	98.82	182	1.2	10	0.0	16227
Dec.	17228	97.56	194	1.09	237	1.34	17659
Total	64201	96.1	1325	1.99	1302	1.95	66828

El-Sebay (1993b) found that the cast composition of *A. ochraceus* were 66.0, 31.0 and 3.0 for workers, nymphs and soldiers, respectively. The highest number of workers occurred during December, while the least one occurred during June. Larvae were highest during March, while the lowest one were found during June and January. Soldiers were highest during October and the lowest were occurred during June. The highest number of alates occurred during December, while were zero in the main months.

Nutting *et al* (1970) studied the cast composition of *H. aureus.* He found 4% soldiers and 96% non-soldiers. Foraging of *G. preplexus* have been reported to contain mainly workers and only about 0.4% soldiers (Lafage *et al.* 1973).

Table (4): Cast composition of Psammotermes hypostoma (Desnuax) as indicated by attracted termites at Aswan Governorate during 2006.

Month	*Workers*		*Soldiers*		*Alates*		*Total*
	Number	%	Number	%	Number	%	
Jan.	13047	95.76	260	1.90	318	2.33	13625
Feb.	4979	93.48	103	1.93	244	4.58	5326
Mar.	4120	95.24	73	1.68	133	3.07	4326
Apr.	2279	98.44	31	1.34	5.0	0.22	2315
May	944	98.95	10	1.05	0.0	0.0	954
Jun.	101	99.01	1.0	0.98	0.0	0.0	102
Jul.	322	99.38	2.0	0.62	0.0	0.0	324
Aug.	686	99.56	3.0	0.44	0.0	0.0	689
Sep.	1230	99.67	4.0	0.32	0.0	0.0	1234
Oct.	2118	99.15	15.0	0.70	3.0	0.14	2136
Nov.	6326	97.01	114	1.75	81	1.24	6521
Dec.	10885	94.92	263	2.29	319	2.78	11467
Total	47037	95.96	879	1.79	1103	4.50	49019

REFERENCES

Abdel-Wahab, A. M.; M. R. Rizk; M. H. Hussin; T. K. Abd El-Raof and M. S. El-Taib (1983): Surface activity of sand termites *Psammotemes hypostoma* Desneux in Aswan. Assuit J. Agric. Sci., 14(3): 99-108.

Bodine, M. C. (1975): Effect of desert termites on herage and litter in a shortgrass ecosystem in west Texas. H. Damage Manag., 28: 353-358.

El-Sebay, Y. (1991): A modified trap for El-Sebay subterranean termies. Fourth Arab Cong. of Plant Protection, Cairo, 1-5 Dec. 1991.

El-Sebay, Y. (1993a): Ecological studies on the colony of the harvester termite, *A. ochraceus* (Burm.) in Egypt. Bull. Soc. Ent. Egypt, Econ. Ser., 20: 1-9.

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

Frensh, K. L. and J. H. Ewart (1986): An easy method for collecting subterranean termites *Anacanthotermes ochraceus* (Burm) from filleen. Sociobiology, 7: 311-314.

Johnson, H. R.; V. K. Smith and R. H. Beal (1971): Chemical for subterranean termites control: Results of long-term tests. J. Econ. Entomol., 2: 745-748.

Lafage, J. P.; W. L. Nutting and M. I. Harverty (1973): Desert subterranean termite: A method for studying foraging behaviour. Environ. Entomol., 2: 954-956.

Nutting, W. L.; M. I. Harverty and J. P. Lafage (1975): Demography of termite colonies as related to various environmental factors: population dynamics and role in the detritus cycle. US/IBP Desert Biom. Res. Memorandum, 75-31, Report of 1974, Progress, 3: 53-78.

Rizk, M. M. A.; A. K. El-Sayed; A. Maher Ali and S. A. Eraky (1985): Flight activity and annual cost fluctuation and sand termite *Psammotermes hypostoma* Desenex, western Desert, Egypt. Assiut J. Agric. Sci., 16 (2): 137-148.

Said, W. A. (1979): Ecological and toxicological studies on Fam. Hodotermitidae . M. Sc. Thesis, Fac. Of Agric., Ain-Shams Univ., Egypt.

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

Whitford, W. G. and J. C. Noble (1982): The importance of subterranean termites in semi-arid ecosystem in south eastern Australia. J. Arid-Environments. 22(1): 87-91.

Wood, T. G. (1974): Field investigations on the decomposition of leaves of *Eucalyptus delegatensis* in relation to environmental factors. Pedobiologia. 14: 343-371.

دراسات بيئية على حشرة النمل الابيض التحت ارضى "ساموتيرمس هيبوستوما" بمحافظة أسوان

يسرى السباعى ، محمد كمال عبد اللطيف

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – ش نادى الصيد – الدقى – الجيزة

الملخص العربى

أجريت دراسات بيئية على حشرة النمل الابيض التحت ارضى ساموتيرمس هيبوستوما فى محافظة أسوان خلال عامى ٢٠٠٥ و ٢٠٠٦ وكان ملخص النتائج كالآتى:

وجد أن أقصى نشاط سنوى لسروح النمل الابيض كن خلال نوفمبر وديسمبر ويناير بينما كان اقل نشاط فى شهور يونيو و يوليو وأغسطس

وجد أن أعلى معدل للاستهلاك الغذائى كان فى ديسمبر واقله خلال يونيو وتبين ان الحشرة تستهلك حوالى ٣٨-٦١,٥ كجم/فدان/سنويا من المواد السليولوزية ويمكن لحشرة نقل ٤٩,٥-٥٧ كجم/فدان/سنويا من التربة لبناء الانفاق وهذا ما يسمى بالنشاط البنائى ويصل هذا النشاط الى قمته خلال شهر سبتمبر واكتوبر ويقل لادناه فى يناير – مارس بكمية من ٩٧٨جم-١,١ كجم/فدان/سنويا

وجد ان تكوين المجتمع الحشرى فى المصائد كان مكونا من ٩٥,٩٦-٩٦,١٠% شغالات ، ١,٧٩-١,٩٩% جنود و ١,٩٥-٤,٥٠% فردا مجنحا .