Al-Azhar J. Agric. Sci. Sector Res.,
Vol. 2 : pp 91- 99 (June)2007

POPULATION DENSITY AND AGRICULTURAL CONTROL OF THE NILE GRASS RAT *ARVICANTHIS NILOTICUS* DES., IN SEMI ARID AREA AT SOHAG GOVERNORATE.

BY

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ABSTRACT: The population density of Nile grass rat *Arvicanthis niloticus* Des., is cleared by food consumption and active burrows methods, this methods showed the true density of Nile grass rat *Arvicanthis niloticus* Des., population. The highest peak is recorded in October 564g.(48 individuals) by food consumption method while the highest peak is recorded in February 444 active burrows (73%). by active burrows method. The reduction in food consumption by 57,71&64% in the1st.,3rd. &5th. days of treatment respectively by weed burn method, while by flooding method there were 62,65&56% reduction of food consumption in the the1st.,3rd. &5th. days of treatment respectively. The reduction of *Arvicanthis niloticus* Des., active burrows number by weed burn were 55,55&64% in the 1st.,3rd. &5th. day of treatment respectively ,while by flooding method, there were reduction of *Arvicanthis niloticus* Des., burrows number by 60,60&76% in the 1st.,3rd. &5th. day of treatment respectively.

INTRODUCTION

The range of African grass rats, *Arvicanthis niloticus* Des., is traditionally held to extend along the Nile river valley and across most of sub-Saharan Africa, with the exception of the southern and southwestern regions of the continent. From genetic analysis, this species occurs only in Egypt and northern west Africa., Delany & Monro (1986) and Ducroz *et al*(1998). Average mass *Arvicanthis niloticus* Des., was118g, with a range of 50 to 183g. Males are slightly larger than females with reported average masses of 120 to 123g for males and 92 to 114g for female, Rosevear(1969). The Nile grass rat *Arvicanthis niloticus* Des., was the dominant rodent at Sohag governorate, Abdel-Gawad(1974) and Bakri(2004). This rat was the main burrowing rodent in cultivated rural

areas of the Nile Valley and the only burrowing species in the semi-arid aria, Mourad *et al* (1974). Abazaid (1990) studied the damage of this rat to sugar cane in Upper Egypt as he found 20 to 40 % reduction in yield and 30 % in final sucrose in the infested stalks of sugar cane. Previous studies showed that food consumption and active burrows were very essential in rat density determination Strecker & Emlen (1953) and Moustafa (2005) : Abdel-Gawad & Ali (1982) and Ali (1985). The present work was carried out under semi arid area at Sohag governorate.

MATERALS AND METHODS

Deterring the population density of the Nile grass rat *Arvicanthis niloticus* Des., in Sohag governorate (Gazert Shandweel village located at 15km. North of Sohag distract).Our previous studied this rat was the dominant species and its population was estimated monthly by food consumptions and active burrows method during one year. Ten plastic stations were used for three consecutive nights and supplied with crashed maize daily. Stations were distributed at 10 meters distance on rodents ways and besides active burrows. Every morning daily food intake was estimated by subtracting the spilled and the remaining food in each station from the original quantity. While numbers of the Nile grass rat active burrows were counted at one year by using the sand to close all burrows then count the opened one at next day during three consecutive days through each month. The locations above were treated by weed burn and flooding, and we evaluated this control method by food intake and active burrows pre and after treatment through $1^{st.}$,3^{rd} and 5^{th}.days. Data were analyzed according standard procedures for analysis of variance Duncan's multiple range- test (1955) and Steel and Torrie(1980).

RESULTS AND DISSCUTION

The food consumption by the Nile grass rat *Arvicanthis niloticus* Des., for three consecutive days is shown in (Table 1). This Table proved that, the higher consumption of crushed maize was 171.193 and 200g.recorded during October, while the lower consumption is 37. 41 and 79g. recorded during April through $1^{st.}$, $2^{nd.}$ and $3^{rd.}$day respectively. The monthly consumption fluctuation in grams per calculated number of *Arvicanthis niloticus* Des., for three consecutive days in descending order as follows 564, 526, 419, 389, 291, 252, 229, 218, 198, 158 and 127g (48. 45, 36, 33, 25, 21, 19, 18, 17, 13 and 11 individuals) during October,

Table (1) :Population fluctuation of the Nile grass rat *Arvicanthis niloticus* Des.by food consumption method.

Months	Dailey intake /g.					Number rat/day					
	1st.	2nd	3rd	Total	Mean	1st.	2nd	3rd.	Total	T.	R.H
January	51	80	98	229	76	4	7	8	19	-	+
February	55	71	92	218	73	5	6	8	18	+	+
March	64	85	103	252	80	5	7	9	21	+	-
Winter	170	236	293	699	229	14	20	25	59		
April	37	41	49	127	42	3	3	4	11	-	+
May	40	54	62	158	53	3	5	5	13	-	+
June	110	125	127	389	121	9	11	11	33	-	+
Spring	187	220	238	674	216	16	19	20	57		
July	99	104	105	291	97	8	9	9	25	+	+
Augustus	78	83	85	246	82	7	7	7	12	-	+
September	116	137	166	419	140	10	12	14	36	+	-
Summer	239	324	358	956	319	20	27	30	81		
October	171	193	200	564	188	14	16	17	48	+	-
November	160	186	180	526	175	14	16	15	45	+	+
December	59	65	74	198	67	5	6	6	17	-	-
Autumn	390	444	454	1288	430	33	38	38	109		

T: temperature. R.H.: relative humidity.(-): negative correlation. (+): positive correlation.

November, September, June, July, March, January, February, December, May and April respectively. The seasonal consumption fluctuation are recorded as follow Autumn 1288g.(109 individuals), Summer 956g.(81 individuals),winter 699g.(59 individuals) and Spring 674g.(57 individuals).The highest peak is recorded in October 564g.(48 individuals). The fluctuation in numbers of rodents active burrows is shown in Table (2).Our results showed that there were statistical significance differences between investigation food intake time (day, months and seasons) $P \leq 0.05$. There were negative correlation between temperature and daily intake during January, April, May, June, Augustus and December while there were positive correlation during February, March, July, September, October and November. In the same ward, there were negative correlation between relative humidity and daily intake during March , September, October and December while there were positive correlation during January, February, April, May, June, July, Augustus, and November.

Table (2) :Population fluctuation of the Nile grass rat *Arvicanthis niloticus* Des by active burrows method.

Months	Burrows/day						Total Active burrows	Total burrows	%
	1st.		2nd		3rd				
	Active burrow	Non-Active burrow	Active burrow	Non-Active burrow	Active burrow	Non-Active burrow			
January	72 cde	51 bcd	91 cd	48 cde	92 cd	62 cd	255	416	61
February	139 a	53 bcd	152 a	57 bcde	153 a	52 cd	444	606	73
March	116 ab	59 bc	100 bcd	71 bc	126 abc	100 ab	342	572	60
Winter	327 cde	163	343	176	371	214	1041	1594	65
April	71 bcd	56 bcd	92 cd	62 bcde	74 de	54 cd	237	409	58
May	91 ab	112 a	102 cd	117 a	91 cd	115 a	284	628	45
June	113	75 b	113 bc	78 b	116 abc	79 bc	342	574	60
Spring	275	243	307	257	281	248	863	1611	54
July	132 a	47 bcd	134 ab	47 cde	134 ab	48 cd	400	542	74
Augustus	96 bc	68 bc	96 cd	68 bcd	96 bcd	68 bcd	288	492	59
September	47 e	30 d	73 be	32 e	73 de	33 d	193	288	67
Summer	275	145	303	147	303	149	881	1322	67
October	76 cde	43 cd	112 bc	38 de	97 bcd	39 d	285	405	70
November	86 bcd	42 cd	91 cd	40 de	91 cd	39 d	268	1389	69
December	58 de	41 cd	53 e	47 cde	48 e	47 cd	159	294	54
Autumn	220	126	256	125	236	125	712	1088	65

Values in a Colum followed by active and non active burrows between all most months are significantly by ($P \leq 0.05$)

The monthly active burrows fluctuation of Nile grass rat *Arvicanthis niloticus* Des., are 74% during July as follows 73,70,69,67,61,60,59,58,54 and 45% encountered during February, October, November, September, January, (March and June), Augusts, April, December and May 2005A.D.respectively. The highest peak is recoded in February 444 active burrows (73%). The seasonal burrows fluctuation of Nile grass rat *Arvicanthis niloticus* Des., are 1611, 1599, 1322 and 1088 burrows during Spring, Winter, Summer and Autumn respectively. Our results showed that, there were statistical significance difference between numbers active and non active burrow during the majority months. On the other hand comparison between food consumption and active burrows method from

population density assessment during January to December 2005A.D. at Sohag Governorate in Table(3) showed that, the population density of Nile grass rat *Arvicanthis niloticus* Des., is cleared by food consumption and active burrows methods, this methods showed the true density of Nile grass rat *Arvicanthis niloticus* Des., population. Delany & Monro (1985) recorded that the *Arvicanthis niloticus* Des., is capable of breeding year-round under highly favorable conditions. However, it usually experiences a sexual rest period beginning in March. This is the hot dry season prior to the rainy season ,and the rest period is induced at this time by long day. dry air, and high temperatures, which have an inhibitory effect on the gonads. Abdel-Gawad (1979) mentioned that *Arvicanthis niloticus* Des., was the predominant species in the clay-soil cultivated area and showed high density during Summer (June) and Autumn (September to November) which coincided with harvesting of Winter and Summer crops respectively. Asran *et al.*,(1989) found that the number of nest and young rat/ burrow of *Arvicanthis niloticus* Des., were low in January and high in October.

Table(3):Comparison between results of food consumption and active burrows methods during one year .

Months	food consumption		active burrows		
	Total Dailey intake /g.	Numbers rat/ day	Total Active burrows	Total burrows	%
January	229	19	255	416	61
February	218	18	444	606	73
March	252	21	342	572	60
Winter	699	59	1041	1594	65
April	127	11	237	409	58
May	158	13	284	628	45
June	389	33	342	574	60
Spring	674	57	863	1611	54
July	291	25	400	542	74
Augustus	246	12	288	492	59
September	419	36	193	288	67
Summer	956	81	881	1322	67
October	564	48	285	405	70
November	526	45	268	1389	69
December	198	17	159	294	54
Autumn	1288	109	712	1088	65

Evaluation of control methods of *Arvicanthis niloticus* Des. by food consumption is shown in Table(4): There were reduction in food consumption by 57,71 & 64% in the1st.,3rd. & 5th. days of treatment respectively by weed burn method, while by flooding method there were 62,65&56% reduction of food consumption in the the1st.,3rd. &5th. days of treatment respectively.

Table (4) :Evaluation of control methods of *Arvicanthis niloticus* Des. by foodConsumption.

Treatments /days		1st.day		3rd.day		5th.day		1st.day		3rd.day		5th.day	
		intake /g.	Reduction %	intake /g.	Reduction %	intake /g.	Reduction %	Number rat/day	Reduction %	Number rat/day	Reduction %	Number rat/day	Reduction %
Weed burn	Before	56	57	62	71	59	64	5	60	4	75	4	50
	After	24		18		21		2		1		2	
Flooding	Before	52	62	55	65	48	56	4	75	4	75	3	33
	After	20		19		21		1		1		2	

Evaluation of control methods of *Arvicanthis niloticus* Des., by active burrows as shown in Table (5):There were reduction of *Arvicanthis niloticus* Des., active burrows number by weed burn 55,55&64% in the 1st.,3rd. &5th. days of treatment respectively, while by flooding method, there were reduction of *Arvicanthis niloticus* Des., burrows number by 60,60&76% in the 1st.,3rd. &5th. days of treatment respectively.

Table (5) :Evaluation of control methods for *A Arvicanthis niloticus* Des. by active burrows.

Treatments /days		1st.day				3rd.day				5th.day			
		Active burrow	Non-Active burrow	Population %	Reduction %	Active burrow	Non-Active burrow	Population %	Reduction %	Active burrow	Non-Active burrow	Population %	Reduction %
Weed burn	Before	90	52	63	55	87	52	63	55	89	50	64	55
	After	26	116	82		25	114	18		26	113	19	
Flooding	Before	130	44	75	60	129	49	72	60	126	44	74	76
	After	33	24	85		32	28	53		19	13	59	

The observed loss in *Arvicanthis niloticus* Des. numbers may be due to transporting to new burrows and exposure to predators during this transporting. Packer(1983) & Senzota(1990) found that *Arvicanthis niloticus* Des., is a gregarious species that lives in underground burrows,

this burrows have multiple entrances and run about 20cm deep. Some anti-predatory behaviors have been documented for *Arvicanthis niloticus* Des., individuals typically stopping to hide under other ground cover from avian predators. Direct predation on *Arvicanthis niloticus* Des., by dwarf mongooses, black-backed jackals, spitting cobras, long-crested hawk-eagles, black-shouldered kites and black-headed herons has been observed in the field.

ACKNOWLEDGMENT

Deep thanks to Dr. Mohamed Abou-Bakr Bkheet, Researcher of Sugar Crops Research Institute Gazerat Shandweel Station for his contribution an enormous of time and help in the field experiments, valuable suggestion enthusiastic cooperation and perilous advice. Thanks also due to all staff member of Shandweel Research Station for their kind help in providing all needed facilities.

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الكثافة العددية و المكافحة الزراعية لجرذ الحشائش النيلى. *Arvicanthis niloticus* Des فى الأراضى القاحلة فى محافظة سوهاج

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الهدف من البحث تقدير أعداد جرذ الحشائش النيلى. *Arvicanthis niloticus* Des فى الأراضى القاحلة التابعة لمحطة بحوث شندويل بمحافظة سوهاج بواسطة بعض طرق التعداد وهى طريقة الطعوم المستهلكة وطريقة الجحور العمالة وغير العمالة، وتقدير إنخفاض أعداد جرذ الحشائش النيلى. *Arvicanthis niloticus* Des بواسطة طريقة حرق الحشائش وطريقة التغريق وتقدير كفاءة هاتين الطريقتين بواسطة طريقة الطعوم المستهلكة وطريقة الجحور العمالة وغير العمالة.

وأظهرت النتائج مايلى:- سجلت ذروة الأعداد فى شهر أكتوبر بواسطة طريقة الطعوم المستهلكه ٥٦٤جم (٤٨ فرد) وفى شهر فبراير بواسطة طريقة الجحور العمالة وغيرالعمالة ٤٤٤ جحر عمال (٧٣%).

كما أظهرت النتائج إنخفاض أعداد جرذ الحشائش النيلى *Arvicanthis niloticus* Des. عند مكافحته فى الأراضى القاحلة الموبوءه به بواسطة حرق الحشائش إلى ٥٧و٧١و٦٤% وتم تقدير كفاءة الحرق بواسطة طريقة الطعوم المستهلكة بينما كان الإنخفاض ٥٥%عندما تم التقدير بواسطة الجحور العمالة وغير العمالة فى اليو م الأول والثالث والخامس على التوالى.

فى حين إنخفضت أعداد جرذ الحشائش النيلى. *Arvicanthis niloticus* Des عند مكافحته بواسطة تغريق الأراضى القاحلة الموبوءه به إلى ٦٢و٦٥و٥٦% وتقدير كفاءة الحرق بواسطة طريقة الطعوم المستهلكة بينما كان الإنخفاض ٦٠و٦٠و٧٦% و تم التقدير بواسطة الجحور العمالة وغير العمالة فى اليو م الأول والثالث والخامس على التوالى.