

EVALUATION OF DAMAGE CAUSED BY THE NILE GRASS RAT *ARVICANTHIS NILOTICUS* (DES.), IN SUGAR CANE AND SUGAR BEET.

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ABSTRACT: *The damage caused by the Nile grass rat *Arvicantis niloticus* (Des.), to the yield of four sugar cane varieties G.T. 54-9, G.95-19, G.95-21 and PH.8013, in 2004/2005 and 2005/2006 seasons. G.95-19 variety was the highest sensitive variety to infestation while PH8013 was the lowest sensitive one during the plant cane, first and the second seasons, respectively. The percentage of rats damage for the four sugar cane varieties were highest during the first season than the second.*

*The damage caused by *Arvicantis niloticus* (Des.) increased from the first distance sample (10m.) towards the center during two cultivation seasons at Assiut and Minia Governorates. The mean numbers of roots in sugar beet sample were 20 roots (20kg) divided into infested and whole roots during each cultivation season (2004/05 and 2005/06) at Assiut and Minia Governorates. Losses to sugar beet by rats were about (47.33 and 39.33kg.) and (51.54 and 43.33 kg.) during each cultivation season respectively. The damage was concentrated at the upper part of the root.*

Key Words: *Arvicantis niloticus, Nile grass rat, Rodents, sugar cane, sugar beet.*

INTRODUCTION

Rodent pests are a major constraint on agricultural production in Egypt as well as in many countries of the world. They may damage sugar cane *Sacchrum officinarum* and sugar beet *Beta vulgaris* from the time of planting through harvesting, and cause additional waste by contamination, Abd El-Gawad (1974), Abd El-Gawad *et al.* (1982), Brooks *et al.*(1989), Ali & Farghal (1994), Ali & Farghal (1995), Brodie & Webster (1997), El-Nashar (1998), Engeman *et al.* (1998), Zhang & Zhang (1999) and Bakri (2004). The Nile grass rat *Arvicantis niloticus* (Des.), was the dominant rats at Minia, Assiut and Sohag governorates, Abd El-Gawad *et al.*,(1982), Abd El-Gawad (1987), Asran (1991), Asran (1994), El-Nashar (1998) and Bakri (2004). The annual loss in sugar cane crop caused by the Nile grass rat *Arvicantis niloticus* (Des.), was estimated about 5-8% by weight. The proportions of rat damaged mill able stalk averaged 23.99% and of dead stalks (due to damage) 7.17% in non baited fields while in baited fields, rat damaged mill able stalks averaged 13.53 % and of dead stalks 3.85 %, Porquez & Barredo(1978). In North

California rodents infested almost 27% of all roots of sugar beet fields examined and account for a 9% loss in total production, Salmon *et al.*(1984).

MATERIALS AND METHODS

The damage caused by The Nile grass rat *Arvicanthis niloticus* (Des.) assessment technique was studied as follows:

The first experiment was carried out during two successive cultivation seasons (2004/05-2005/06) in Shandweel Agricultural Research Station; Sugar crops Research Institute, A.R.C. at Sohag Governorate. The damage caused by The Nile grass rat *Arvicanthis niloticus* (Des.), in four sugar cane varieties Viz, G.T. 54-9, G.95-19, G.95-21 and PH.8013 was determined. The experiment was laid out in a randomized block design with 4 replications for each variety plated in 6x7 meters plots (1/100 of Fadden). At the harvest time four random samples (each one 30 stalks) representing each variety were taken. The stalks were carefully examined to determine the percentage of *Arvicanthis niloticus* (Des.), damage. The percentage of damage was calculated using the following equation:

$$\text{Damage \%} = \frac{\text{Total numbers of damaged internodes}}{\text{Mean number of internodes in stalk} \times 30} \times 100$$

The second experiment was carried out during two successive agriculture seasons (2004/05-2005/06) in Assiut and Mallawy districts at Assiut and Minia Governorates. During the harvest stage the damage to Sugar beet crops fields was estimated in infested area. Sample of about 20 roots were taken from every 10 meters from the outside borders till 50 meters towards the center 5 replicates were used for each. To assess the effect of *Arvicanthis niloticus* (Des.) infestation on sugar beet production, the weight in kg. (For infested and non infested roots) were recorded (it was converted to estimate: root yield (ton/fed.). The roots were carefully examined to determine the Nile grass rat *Arvicanthis niloticus* (Des.), damage percentage, using the following equation:

$$\text{Damage \%} = \frac{\text{Weight of damaged roots in kg.}}{\text{Total weight of roots in kg.}} \times 100$$

Data were analyzed according to the standard procedures for analysis of variance Duncan (1955) and Steel & Torrie(1980).

RESULTS AND DISCUSSION

A-Sugar cane: The damage caused by the Nile grass rat *Arvicanthis niloticus* (Des.), to four sugar cane varieties G.T. 54-9, G.95-19, G.95-21 and PH.8013, in plant cane , first and second ratoon, this damage was shown in Fig(1). Data showed that G.95-19 variety was the highest sensitive variety to infestation followed by G.T. 54-9 where the total damage percentages were 8.75 and 7.95 % without significant difference between the damage

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percentages occurred in the two varieties, while PH.8013 was the lowest sensitive variety with significant difference between the damage occurred and the damage in other varieties on plant sugarcane during 2004/2005 season, the same observation were noticed in first ratoon where there are significant differences between the total damage percent ages of varieties except PH.8013. As for the second ratoon the total damage percentage significantly differ from are variety to another recording 13.53; 12.50; 8.46 and 4.07% for G.95-19, G.T. 54-9, G.95-21 and PH.8013. Data in Table (1) cleared that, the bottom infestation percentage was the highest than top that may be related to the high sucrose content in bottom. The infestation percentage in the sugarcane plant were less than that in first and second ratoons that may be attributed to the extensive agricultural practices, also the phonology of plants in cane plant may explain the low percentage of rats damage as compared with that in first and second ratoon, furthermore, the plant density in the cane plant was less than first and second ratoon. The percentage of damage by rats for the four sugar cane varieties were highest during the first season (2004/2005) than the second (2005/2006) it may due to, and to the controlling programs applied in this area during the second season. Whenever cane is harvested, rats that were living in the mature cane move to a safe cover or runs through grass lands adjacent to cane have been noted. This migration tendency of rats indicates that the first serious damage to young cane fields will occur along the edges. This results are in agreement of that obtained by Abd El- Gawad *et al.*(1982), Abazaid (1990), Asran (1991) Ali and Farghal (1995) and Bakri (2004).

B- Sugar beet: Data in Table (2) showed that, the damage caused by rats increased from the first distance sample (10m.) towards the center during two agriculture seasons at Assiut and Minia Governorates. Results cleared that, mean numbers of roots in sugar beet sample were 20 roots (20kg) divided into infested and uninfested roots during each agriculture season (2004/05 and 2005/06)at Assiut and Minia Governorates. Total losses of sugar beet by rats were about (47.33 and 39.33kg./100kg.) and (51.54 and 43.33 kg./100kg.) during each agriculture season respectively. The damage was concentrated at the upper part of the root Fig.(1), where the sucrose was high Ali & Farghal (1994). The rat damage was highly noticed at depth of 40 meters followed by 50 meters from the border as the rat tend to build its burrows at the center of the fields, also 30 meters from the border recorded high damage while 10 & 20 meters has less damage with significant differences between these two distances and other distances. These results are in harmony with results obtained by Hussein & El-Deeb (1999) in sand soil and intercropping sugar beet with some essential crops.

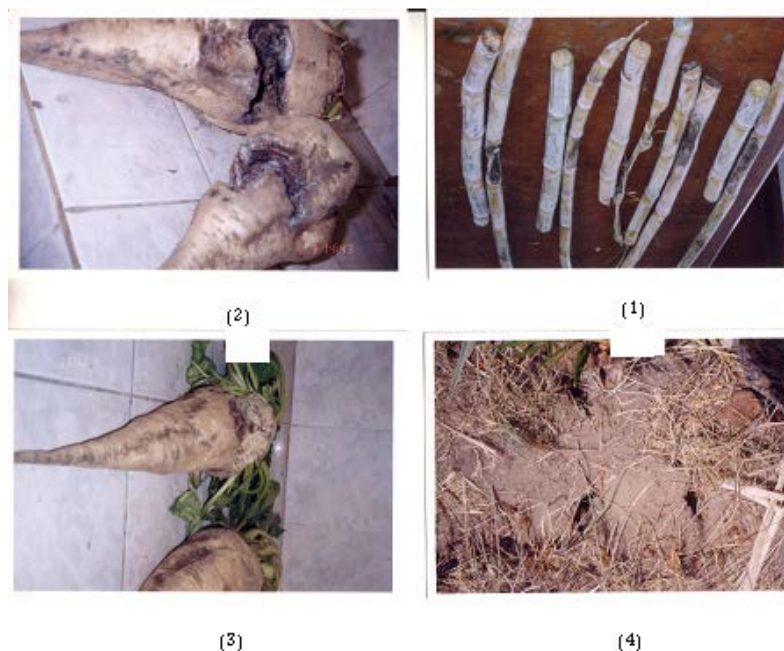


Fig.(1): Damage caused by *Arvicantis niloticus* (Des.) in (1) sugar cane, (2&3)sugar beet crops and (4) rat burrows.

Table (1): Damage caused by *Arvicantis niloticus* (Des.) in four sugar cane varieties planted at Sohag Governorate.

Damage % during 2004/2005 season									
Sugar cane variety	Plant sugar cane			1 st ratoon			2 nd ratoon		
	Bottom %	Top %	Total %	Bottom %	Top %	Total %	Bottom %	Top %	Total %
G.T.54-9	6.75	1.2	7.95a	9.17	1.77	10.94a	11.03	1.47	12.50a
G.95-19	7.29	1.46	8.75a	11.42	4.08	15.50a	10.4	3.13	13.53b
G.95-21	4.66	1.25	5.91b	7.07	1.3	8.37a	7.13	1.33	8.46c
PH8013	2.11	0.45	2.56c	2.96	0.56	3.52b	3.32	.75	4.07d
LSD5%	1.4	0.62	1.14	NS	1.01	7.48	1.28	1.58	0.71
Damage % during 2005/2006 season									
Sugar cane variety	Plant sugar cane			1 st ratoon			2 nd ratoon		
	Bottom %	Top %	Total %	Bottom %	Top %	Total %	Bottom %	Top %	Total %
G.T.54-9	5	0.32	5.32b	7.15	1	8.15a	7.14	1.35	8.49a
G.95-19	5	0.97	5.97a	7.38	1	8.38a	7.47	1.50	8.97a
G.95-21	3.74	0.44	4.18c	4.08	0.64	4.72b	5.02	0.84	5.86b
PH8013	0.64	0.25	0.89d	1.13	0.31	1.44c	2.13	0.26	2.39c
LSD5%	0.96	0.45	0.58	0.96	NS	0.58	1.4	0.59	1.05

Total damage % followed by the same letter isn't significantly different.

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Table (2): Damage caused by *Arvicanthis niloticus* (Des.) in sugar beet crops at Assiut and Minia Governorates.

Distance/m	Damage in kg / 100 kg roots and damage %							
	Assuit				Minia			
	2004/05 Kg	2005/06 Kg	% 2004/05	% 2005/06	2004/05 kg	2005/06 kg	% 2004/05	% 2004/05
10	5.11b	4.33b	26	22	5.33c	4.44c	27	22
20	6.67b	5.44b	33	27	7.33bc	6.33bc	37	32
30	11a	8.89ab	55	44	11.44ab	10ab	57	50
40	12.33a	10.89a	62	54	13.22a	10.78a	66	54
50	12.22	9.78a	61	49	14.22a	11.78a	71	59
Total	47.33	39.33	47.33	39.33	51.54	43.33	51.54	43.33
LSD at 0.05	4.08	3.56			4.89	4.29		

-Yield/Fadden=30000kg. Root weight =1kg.

- Damage in kg. followed by the same letter (s) aren't significantly different.

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تقدير الخسائر الناتجة عن الإصابة بجرذ الحشائش النيلى فى محصولى قصب السكر وبنجر السكر

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الملخص العربى

الهدف من البحث تقدير الخسائر الناتجة عن إصابة أربعة أصناف من محصول قصب السكر (محافظة سوهاج) ومحصول بنجر السكر (محافظة أسيوط والمنيا) بجرذ الحشائش النيلى فى العامين الزراعين ٢٠٠٤ / ٢٠٠٥ م و ٢٠٠٥ / ٢٠٠٦ م على التوالى. أوضحت النتائج ما يلى:-

١. كان صنف قصب السكر G.95-19 من قصب السكر أعلى حساسية للإصابة بالجرذان بينما كان الصنف PH8013 من قصب السكر أقل إصابة فى المحصول القائم والخلفة الأولى والثانية. وكانت الإصابة فى المحصول القائم والخلفة الأولى والثانية فى العقل السفلية أعلى من العقل القمية وفى الموسم الزراعى الأول من الثانى .

٢. الإصابة فى محصول بنجر السكر تتزايد من أول الحقول فى إتجاه وسط الحقل أثناء الموسمين الزراعين فى محافظتى أسيوط و المنيا. والإصابة فى جذور بنجر السكر تكون فى الجزء العلوى من الجذر والفقد فى ١٠٠ جذر يكون بمتوسط (٤٧,٣٣ و ٣٩,٣٣ كجم) و (١٠,٥٤ و ٣,٣٣ كجم) فى محافظتى أسيوط و المنيا أثناء الموسمين الزراعين ٢٠٠٤ / ٢٠٠٥ م و ٢٠٠٥ / ٢٠٠٦ م على التوالى .

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