

Rat Damage to Certain Vegetable Crops and Population Density of *Arvicanthis niloticus* (Desmart) with its Number of Active Burrows in Qalubia and Fayoum Governorates

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Abstract

Experiments were carried out during two successive years 2017 and 2018 in Qalubia (Kaha City-Tokh district) and Fayoum (Tamia district) Governorates. The aim was to study the correlation between the Field Nile Rat *Arvicanthis niloticus* (Desmart) population density and its active burrows per 100 m., in and around the field both and its damage to each of tomato, green pepper (Rumi), peas and squash in February and March. Results proved that the Field Nile Rat, *Arvicanthis niloticus* (Desmart) damage percentage, population density and number of the active burrows per 100 m., in and around the field differs from crop to crop, from Governorate to Governorate and from month to another during the ripening stage. Also, the results obtained proved that there is a positive correlation between the rat damage percentages and each of population density of Rats and their active burrows per 100 m., in and around the field. The highest percentage of damage, number of active burrows and rat population density was recorded on tomato crop during March in Fayoum Governorate. Meanwhile, the lowest figures for *Arvicanthis niloticus* (Desmart) damage, population density and number of active burrows per 100 m., was recorded on green pepper (Rumi) during February in Qalubia Governorate.

Keywords: *Damage assessment the Nile Field Rat Arvicanthis niloticus (Desmart), population density, active burrows, vegetables: (tomato, green pepper (Rumi), peas and squash)*

Introduction

Rodents cause untold economic loss to farmers, food manufacturers and processors, as well as causing damage to the structure and fabric of buildings. Undoubtedly, the economic loss due to rodents is enormous, particularly in the tropics (Meehan, 1984). The World Health Organization (WHO) estimates that about 33 million tons of food is destroyed world wide each year. In the 1950's FAO experts estimated that 5% of food production was lost; enough to feed 130 million people at

that time (Parkin, 1959). In Brazil, where beans are a major protein source 5 – 10% lines are not unusual and in Argentina, material pastures which are used to graze horses, sheep and cattle, can occasionally be destroyed (Woronecki, 1973). Cassava, yams, taro, sweet potatoes and many other plants can be considered root crops. The true extent of its damage is unknown, but losses of 5-10% are found in West Africa, and up to 15% in central Africa. Up to 30 % damage is claimed for some root crops in the Pacific Islands and in Southern India rodents are major pests of guava (Lal,

S.S. and Pillai, K.S., 1981). EL Deeb *et al.*, (1985) found that tomatoes suffered the highest damage (4.73 %) followed by strawberry (2.48 %), squash (1.41%) and peas (0.43%) in some delta Governorates in Egypt. In general the losses to growing crops caused by rodents in temperate countries are significantly less than those in the tropics and subtropics and usually the species are some what deferent (Winygaarden, 1957). The national of some methods of estimating damage and losses has been reviewed, but the conclusion was that none of the methods is totally reliable (Jackson, 1977).

This manuscript aims to determine the most attractive vegetable crop to rats during its ripening stage. Also, to clear the kind of linkage between the rat damage to vegetable crops, with each of their population density and the number of active burrows per 100 m around and in the field.

Materials and Methods

The rats damage assessment was made only in the mature fruits of the studied vegetables, (tomatoes, green pepper Crouai), peas and squash. The technique of assessment was as follows: Forty sampling areas for each crop, two Feddan per each were taken by random in different locations in Qalubia, (Kaha city, Tokh district) and Fayoum (Tamiya district) Governorates. The rows in each two Feddan. Area were counted and divided by ten, the results and its duplicates were the numbers of sampling rows. For each sampling row, the damaged and undamaged fruits in thirty successive plants were counted and recorded. The tested plants in

each row were located as follows: for each row, a random number from the random Table was chosen. This number, after deducting ten to out of it, represented the number of steps from the head of the field after which the thirty plants of the sample of the row a tested. The identification of rat damage was done as described by Asran *et al.*, (1985). The percentage of damage was calculated as follows %:

$$\% \text{ damage} = \frac{\text{No. of damaged fruits}}{\text{Total No. of fruits}} \times 100$$

The dominant rodent was determined in each crop by trapping for three successive nights. These traps were checked daily and the classified the rodents caught. The common rat was the Nile Field Rat, *Arvicanthis niloticus* (Desmart).

Regarding the population density of rats and their active burrows, twenty traps were prepared every two weeks in the site of each experiment for three successive nights. These traps were checked daily and the entrapped rats were counted and identified. The population density percentage was calculated as follows:

$$\text{population density \%} = \frac{\text{No. of entrapped rats}}{\text{No. of traps} \times \text{No. of nights}} \times 100$$

The numbers of active burrows of the rats were counted in each 100 m. in and around the chosen fields.

Results and Discuccion

Results in Tables one and two indicate that tomatoes was the most preferred to the Field Nile Rat *Arvicanthis niloticus* (Desmart) when compared to green pepper (Rumi), peas and squash under the field conditions of each of Qalubia and Fayoum Governorates at season of two successive years 2017/2018. The average percentages of rat damage to tomatoes were 0.58% and 0.66% dur-

ing February and 0.69% and 0.78% during March, 0.33% and 0.37%, 0.41% and 0.41% and 0.49% and 0.52% in green pepper (Rumi), peas and squash in Qalubia and Fayoum Governorates, respectively during February. Meanwhile during March the rat damage percentages which caused by *Arvicanthis niloticus* (Desmart), in the same vegetables mentioned previously were 0.42% and 0.48%, 0.53% and 0.56% and 0.61% and 0.67% for each of Qalubia and Fayoum Governorates, respectively. The represented data in Tables one and two cleared that the rat damage varied considerably according to the location of the field and from month to another. Fayoum Governorate showed the highest percentages of rat damage in the whole investigated vegetables in February in tomatoes 0.66% followed by squash 0.52%, peas 0.41% and green pepper (Rumi) 0.37%, whereas Qalubia trials showed the lowest damage in the same vegetable during February. The gained figures proved that the highest rat damage percentages were recorded during March in the whole investigated vegetables for both Governorates. Regarding the population density of *Arvicanthis niloticus* (Desmart) and there active burrows in the for vegetable crops it was found that tomatoes crop showed the highest percentages of population (0.4% and 0.4% and the number of the active burrows 4.1 and 4.9 in February and 0.7% and 0.8% and 4.6 and 5.7 in March for Qalubia and Fayoum Governorates respectively. whereas, green pepper (Rumi) field showed the lowest percentages of population 0.1% and 0.3% and the number of the ac-

tive burrows 1.7 and 1.9 in February and 0.2% and 0.4% and 2.1 and 2.5 in March for Qalubia and Fayoum Governorates respectively. In general, the former results proved that the Field Nile Rat damage percentages, population density and number of the active burrows in the field of the experimented vegetables differs from crop to crop, from location (Governorate) to location and from month to month during the repine stage. Also, the result obtained proved that there is a positive correlation between the rat damage percentages and each of population density of rat and there active burrows in the field. Tomatoes crop had the highest damage, population density and numbers of active burrows. The same conclusion was recorded for Fayoum Governorate. Than Qalubia Governorate during March. Mean while green pepper (Rumi) crop had the lowest damage, population density and numbers of active burrows in Qalubia Governorate during February. Abd El-Gawad and Ali (1982) found that maize was the most attractive bait for rodents in upper Egypt. El-Deeb *et al.*, (1985a) found that the wheat was the most preferred bait to *Arvicanthis niloticus* (Desmart) when compared with maize, sorghum, rice, bagasse, soy bean and cake of cotton seed. El-Deeb *et al.*, (1985b) found that tomatoes suffered the highest damage 4.73% followed by strawberry 2.48%, squash 1.41% and peas 0.43% in some Delta Governorates in Egypt. Asran *et al.*, (1985) showed that the stored food stuffs found in *Arvicanthis niloticus* (Desmart) burrows were kernels of wheat, rice, maize and horse bean as well as clover and

herbs. Abd El-Kader *et al.*, (2014) stated that rice grains were the most preferred and consumed by both males and females of *Rattus norvegicus* (Berkanhout), followed by wheat, clover and maize seeds. Asran *et al.*, (2015) reported that for rodent damage to winter crops, the rodents attacked tomatoes lower than wheat; mean while, rat damage for horse bean was less than each of wheat and tomatoes. The summer crops they could be arranged in descending order according to their mean of damage percentages were: maize 0.57% > tomatoes 0.55% > soybean 0.23%.

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الضرر الذي يحدثه جرد الحقل النيلي (*Arvicanthis niloticus* (Desmart) لبعض محاصيل
الخضر والكثافة العددية بجانب عدد الجحور العمالة في محافظتي القليوبية والفيوم

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الملخص

أجريت هذه الدراسة في محافظتي القليوبية (مدينة قها - مركز طوخ) والفيوم (مركز طاميه) خلال شهري فبراير ومارس لعامين متتاليين ٢٠١٧/٢٠١٨ لدراسة العلاقة بين كلا من الكثافة العددية لجرد الحقل النيلي (*Arvicanthis niloticus* (Desmart) وعدد الجحور العمالة / ١٠٠ متر داخل وحول الحقل وما يسببه من ضرر لمحاصيل الطماطم والفلفل الأخضر الرومي والبسلة والكوسة. وأكدت النتائج أن نسبة الضرر الذي يسببه الجرد للمحاصيل المذكورة سابقا والكثافة العددية و عدد الجحور العمالة / ١٠٠ متر تختلف من محصول لآخر ومن محافظة لأخرى ومن شهر لشهر خلال فترة النضج. أيضا أكدت النتائج المتحصل عليها أن هناك علاقة موجبة بين نسبة الضرر و كل من الكثافة العددية لجرد الحقل النيلي و عدد الجحور العمالة / ١٠٠ متر داخل الحقل وحوله. أوضحت النتائج أن أعلى نسبة ضرر وكثافة عددية وعدد الجحور العمالة سجلت في محصول الطماطم بمحافظة الفيوم وفي شهر مارس، بينما أقل نسبة ضرر وكثافة عددية وعدد الجحور العمالة سجلت في محصول الفلفل الأخضر الرومي بمحافظة القليوبية وفي شهر فبراير.

Table 1. Population density and active burrows *Arvicanthis niloticus*, (Desmart) and its damage to certain vegetables in Qalubia Governorate during two successive years 2017 and 2018.

Crop	Population density of <i>Arvicanthis niloticus</i> /100 m.		Average of active burrows/100 m.		Damage%					
	Feb.	March	Feb.	March	Feb.			March		
					Mean± S.E	Min	Max	Mean S.E	Min	Max
Tomato	0.4	0.7	4.1	4.6	0.58± 0.07	0.32	0.69	0.69± 0.16	0.44	1.21
Green pepper (Rumi)	0.1	0.2	1.7	2.1	0.33± 0.04	0.24	0.48	0.42± 0.04	0.33	0.53
Peas	0.3	0.6	3.2	3.6	0.41± 0.08	0.23	0.61	0.53± 0.07	0.41	0.68
Squash	0.3	0.4	3.6	3.8	0.49± 0.05	0.39	0.58	0.61± 0.07	0.49	0.75

Table 2. Population density and active burrows *Arvicanthis niloticus*, (Desmart) and its damage to certain vegetables in Fayoum Governorate during two successive years 2017 and 2018.

Crop	Population density of <i>Arvicanthis niloticus</i> /100 m.		Average of active burrows/100 m.		Damage%					
	Feb.	March	Feb.	March	Feb.			March		
					Mean± S.E	Min	Max	Mean S.E	Min	Max
Tomato	0.4	0.8	4.9	5.7	0.66± 0.09	0.50	0.81	0.78± 0.11	0.58	0.96
Green pepper (Rumi)	0.3	0.4	1.9	2.5	0.37± 0.04	0.29	0.52	0.48± 0.08	0.30	0.67
Peas	0.3	0.7	3.3	3.6	0.41± 0.06	0.26	0.58	0.56± 0.02	0.45	0.66
Squash	0.4	0.6	4.1	4.8	0.52± 0.04	0.44	0.61	0.67± 0.09	0.51	0.83