

## ASSESSMENT OF DAMAGE CAUSED BY RODENT INFESTATION IN DIFFERENT FIELD CROPS AT KAFR EL-SHEIKH AND GHARBIA GOVERNORATES.

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### ABSTRACT

The damage caused by rodent infestation for some field crops in different location *i.e* nearby buildings, nearby poultry farms and nearby storehouse in addition to control in Kafr El-Sheikh and Gharbia Governorates during the two successive seasons 2002 and 2003 were studied. Results of rice crop revealed that the damage percentages in immature and mature stages were [ (2.5 and 2.8 %) and (1.2 and 1.4 %) ] and [ (2.6 and 2.8 %) and (1.8 and 2.2 %) ], [ ( 2.6 and 3.6 %) and (1.5 and 2 %) ] and [ ( 2.6 and 2.9 %) and (2 and 2.2 %) ], [ (2 and 1.2 %) and ( 0.8 and 0.8 %) ] and [ ( 1.9 and 2.5 %) and ( 1.4 and 1.8 %) ], [ ( 1.8 and 2 %) and ( 0.7 and 0.9 %) ] and [ ( 1.4 and 1.9 %) and ( 1.1 and 1.1 %) ] and [ ( 1 and 0.8 %) and (0.5 and 0.5 %) ] and [ ( 1.4 and 1.8 %) and (1 and 1.3 %) ], with total mean average damage percentages of [ ( 2 and 2.3 %) and (0.9 and 1.1 %) ] and [ ( 2 and 2.4 %) and (1.5 and 1.7 %) ], respectively, for immature and mature stages of rice crop.

For broad bean crop damage percentages were [ ( 1, 1.3, 0.8, 0.9 and 0.7 %) and ( 1.1, 1.5, 1, 1.2 and 0.8 %) ] and [ ( 0.9, 1.3, 0.9, 0.9 and 0.6 %) and (1.1, 1.2, 1.1, 0.7 and 0.7 %) ] with mean damage percentages of [ ( 1 and 1.1 %) and ( 0.9 and 1 %) ], respectively.

For wheat crop damage percentages were [ ( 0.6, 1, 0.8, 0.6 and 0.4 %) and ( 0.9, 1.2, 1, 0.6 and 0.5 %) ] and [ ( 0.9, 1.3, 0.6, 0.8 and 0.4 %) and ( 1.3, 1.6, 0.9, 0.7 and 0.5 %) ] with mean average damage % of [ ( 0.3 and 0.4 %) and ( 0.6 and 0.5 %) ], respectively for the different location during the two tested seasons in the two Governorates.

For maize mature stage % of damage in the different tested location at two sowing date during the two tested seasons in the two experimental Governorates were [ ( 2.1, 2, 1.6, 1.3 and 0.7 % ), ( 2.3, 2.5, 1.7, 1.4 and 0.8 %) ] and [ ( 5, 4.6, 4.6, 4.8 and 3.6 % ), ( 5.4, 5.9, 5.8, 5.5 and 4.3 %) ], respectively, in Kafr El-Sheikh and [ ( 1.3, 1.4, 1.1, 1.2 and 0.4 % ), ( 2.1, 1.9, 1.8, 1.7 and 0.6 %) ] and [ ( 3.4, 3.8, 3.4, 3.6 and 1.8 % ), ( 4.5, 4.7, 4.3, 3.7 and 2.2 %) ], respectively in Gharbia Governorate.

### INTRODUCTION

Damage caused by rats involves agriculture specially rice, wheat, corn, sugar-cane and fruit trees. Rodents cause losses during all stages of crop growth (Raddy 1968). Rats attack the germinating seeds in seedbeds and cause extensive damage on the base of the young pencil shoot and approximately bite of stem and feed on the grain. (Alfonso, 1968 and Taylor 1968). Rice is a crop that can be subjected to rat attack at all stages of growth, (Buckle and Rowe, 1981), but early damage results in negligible yield loss because compensatory growth gives complete yield recovery.

The damage is concentrated by borders of cultivated areas and that there is a negative simple correlation between the rate of damage and the

distance from the border towards the center of the field (Abdel-Gawad *et al.* 1982).

The degree of wheat infestation started from the edge then increased towards the center (El-Deeb *et al.* 1990). Also, they found a positive correlation between the number of active burrows and level of infestation. The present study was carried out under field conditions in Kafr El-Sheikh and Gharbia Governorates to estimate the rat of damage in some field crops, i.e. rice, wheat, broad bean and maize during the two successive years (2002 / 2003).

## MATERIALS AND METHODS

The damage percentages in rice, wheat, broad bean and maize crops due to Norway rats, *Rattus norvegicus* infestation were assessed in Kafr El-Sheikh and Gharbia Governorates during the two successive years 2000 and 2003. for this purpose five locations represented various rat habitat were chosen i.e fields nearby buildings, drains, poultry farms, storehouse in addition to control ( fields far away these conditions). In each location area of one feddan were randomly selected and replicated three times .

The damage assessment techniques were conducted as follows:

### A) Rice

Rice is susceptible to rat damage at all stages of growth. In each fields, a single diagonal transect is made. These trials were achieved throughout two stages of growth; immature stage (panicle initiation- heading stage) and mature stage (milk, daugh and maturing) damage assessment was made by collecting 25 samples from each experimental field using the sampling method of Yong (1974). The numbers of damaged and undamaged tillers and hills in a quarter of  $1 \times 1 \text{ m}^2$  for every singed point were counted at the end of the two stages. An estimate of percentage damage from pre-mature stage was calculated according to (Swink *et al.* 1974) by using the following formula :

$$\% \text{ damage} = \frac{ac}{b + c} \times 100$$

Where :

a = number of damaged hills.

b = number of undamaged tillers in the hills containing damage.

c = number of damaged tillers.

At mature stage the number of ripe tillers is recorded in each of the sampled hills and the percentage of ripe tiller loss estimated as follows (Rennison, 1979) :

$$\% \text{ ripe tiller loss} = 100 (A-B) / A$$

where :

A = ripe tillers per hill in undamaged hills.

B = ripe tillers per hill in 25 sample.



### b) Broad bean

The damage was assessment only in the mature fruit stage. The technique adapted by El-Deeb *et al.*(1990) was followed. In each field, 10 rows were randomly selected. The number of damaged and undamaged fruits in 30 successive plants in each row were counted and the percentage of damage was calculated using the following equation:

$$\% \text{ damage} = \frac{\text{Total number of damaged fruits}}{\text{Total number of investigated fruits}} \times 100$$

### c) Wheat

In each field, 25 samples were investigated by using quadrate wooden frame (40 × 40 cm ) on diagonal of the field at fixed distance according to its length. Inside the frame number both damaged and undamaged tillers were recorded. The damage percentage was calculated according to the equation followed by Poche *et al.* (1982):

$$\% \text{ damage} = \frac{\text{No. of damaged tiller}}{\text{No. of investigated tiller}} \times 100$$

### d) Maize

In the first trial the chosen time of plantation was May, while in second trial was August during the two successive years 2002 and 2003. In each location the number of rows in one feddan selected randomly was divided by 10 and the results of the dividing and its duplicates were used as row number from which the samples were to be collected. For each row samples 30 successive plants were randomly located using the random table, then the number of area in them were counted and inspected to estimate the degree of damage in the area (undamaged, ¼ damage, ½ damage, ¾ damage and complete damage) this proceeding was replicated 10 times. The percentage of damage was calculated by using the following equation (Asran *et al.*, 1985 ):

$$\% \text{ damage} = \frac{\text{No. of undamaged areas} \times 0.0 + \frac{1}{4} \text{ damage} \times 0.25 + \frac{1}{2} \text{ damage} \times 0.5 + \frac{3}{4} \text{ damage} \times 0.75 + \text{complete damage} \times 1.0}{\text{Total investigated areas}} \times 100$$

## RESULTS AND DISCUSSION

The damage caused to various field crops by rodent infestation was assessed during the two successive years 2002 / 2003 in Kafr El-Sheikh and Garbia Governorates results revealed that :

**a) Rice crop**

Data in Table (1) showed that the overall damage ranged from (1.0 to 2.6 %) and ( 0.8 to 3.0 % during 2002 & 2003 years, respectively in immature stage under the conditions of the five examined habitats. While in the same period (2002 & 2003 years) the maximum damage percent in mature stage were (1.5 and 2.0 %) respectively at Kafr El-Sheikh Governorate. Also, the damage percent at Garbia were ranged between [(1.4 to 2.6 ) and (1.8 to 2.9 % ) ] and [(1 to 2 %) and (1.1 to 2.2 % ) ] during 2002 and 2003 seasons in immature and mature rice stage, respectively. stage during (2002 &2003 ), respectively. The mean average of damage in mature stage were 1.5 and 1.7 % during the same period, respectively.

**Table (1): Estimation of damage caused by rats to different stages of rice during the two successive years 2002 /3002.**

Location	Damage percentages							
	Kafr El-Sheikh				Gharbia			
	Immature stage		Mature stage		Immature stage		Mature stage	
	2002	2003	2002	2003	2002	2003	2002	2003
Field nearby buildings	2.5 a	2.8 ab	1.2ab	1.4 ab	2.6 a	2.8 a	1.8ab	2.2 a
Fields nearby drains	2.6 a	3.6 a	1.5 a	2.0 a	2.6 a	2.9 a	2.0 a	2. a
Fields nearby poultry farm	2.0 ab	2.2 b	0.8bc	0.8 bc	1.9 b	2.5 ab	1.4bc	1.8 ab
Fields nearby storehouse	1.8 ab	2.0 ab	0.7bc	0.9 bc	1.4 b	1.9 b	1.1 c	1.1 b
Control	1.0 b	0.8 c	0.5 c	0.5 c	1.4 b	1.8 b	1.0 c	1.3 b
Mean average of damage	2.0	2.3	0.9	1.1	2.0	2.4	1.5	1.7
L.S.D(5 %)	0.9	0.8	0.5	0.6	0.7	0.8	0.6	0.8

**b) broad bean crop**

Table (2) showed that the damage assessment in mature stage of broad bean under different five habitats in Kafr El-Sheikh and Garbia Governorates. It is noticed that the high percentage of damage was found in fields nearby drain (1.3 & 1.5 %) during 2002 & 2003 years, respectively comparatively lower percentages by control (0.7 & 0.8 %) at the same period at Kafr El-Sheikh Governorate. Also, the obtained results at Garbia Governorate during 2002 & 2003 seasons were (0.9 & 1.0 %), (1.3 & 1.2 %), (0.9 & 1.0 %), (0.9 & 0.7 %) and (0.6 & 0.7 %) in fields nearby (buildings, drain, poultry farm and storehouse) and control, respectively.

**Table (2) : percentage of damage caused by rats on broad bean during 2002 / 2003 seasons.**

Governorates	seasons	Fields near by					Mean average of damage	L.S.D 5 %
		buildings	drain	Poultry farm	storehouse	control		
Kafr El-Sheikh	2002	1.0 a	1.3 a	0.8 a	0.9 a	0.7 a	1.0	0.6
	2003	1.1 a	1.5 a	1.0 a	1.2 a	0.8 a	1.1	0.5
Gharbia	2002	0.9 ab	1.3 a	0.9 ab	0.9 ab	0.6 b	0.9	0.5
	2003	1.1 a	1.2 a	1.0 a	0.7 a	0.7 a	1.0	0.4



**c) Wheat**

the results recorded in Table (3) showed that at Kafr El-Sheikh Governorate, the peak of damage percentages were (1.0 & 1.2 %) in fields nearby drain during 2002 & 2003 seasons, respectively, while the lowest were (0.4 & 0.5 %) at the same periods, respectively in control. In contrast at Garbia Governorate the same trend of results were observed percentages of damage were (0.9 & 1.3 %), (1.3 & 1.6 %), (0.6 & 0.9 %), (0.8 & 0.7 %) and (0.4 & 0.5 %) in fields nearby buildings, drain, poultry farms, nearby storehouse and fields far away these conditions (control) during 2002 & 2003 years, respectively.

**Table (3) : percentage of damage caused by rats on wheat during 2002 / 2003 seasons.**

Governorates	seasons	Fields near by					Mean average of damage	L.S.D 5 %
		buildings	drain	Poultry farm	storehouse	control		
Kafr El-Sheikh	2002	0.6 b	1.0 a	0.8 ab	0.6 bc	0.4 b	0.7	0.3
	2003	0.9 ab	1.2 a	1.0 a	0.6 bc	0.5 b	1.0	0.4
Gharbia	2002	0.9 ab	1.3 a	0.6 ab	0.8 ab	0.4 b	0.8	0.6
	2003	1.3 ab	1.6 a	0.9 bc	0.7 ab	0.5 c	1.0	0.5

**d) Maize crop**

Table (4) represents the damage assessment in the ripening stage of maize at different time of planting and different locations. Results revealed that there were significant differences in the damage percentages between different locations values were (2.1 & 2.3 %), (2.0 & 2.5 %), (1.6 & 1.7 %), (1.3 & 1.4 %) and (0.7 & 0.8 %) in fields near by ( buildings, drain, poultry farm, and storehouse) and fields far away these conditions (control) during 2002 and 2003 seasons, respectively. Concerning, Garbia Governorate the results tabulated in Table (4) showed that the highest percent damage were (1.4 & 1.9 %) and (3.8 & 4.7 %) in fields near by drain at May and August during 2002 and 2003 seasons, respectively while the lowest were found in control (0.4 and 0.6 %) and (1.8 and 2.2 %).

**Table (4): Damage caused by rats to mature stage of maize at certain habitats and sowing date in Kafr El-Sheikh and Gharbia Governorates during 2002 / 2003 seasons.**

Location	Damage percentages							
	Kafr El-Sheikh				Gharbia			
	May*		August		May		August	
	2002	2003	2002	2003	2002	2003	2002	2003
Field nearby buildings	2.1 a	2.3 ab	5.0 a	5.4 ab	1.3 a	2.1 a	3.4 a	4.5 ab
Fields nearby drains	2.0 a	2.5 a	4.6ab	5.9 a	1.4 a	1.9 a	3.8 a	4.7 a
Fields nearby poultry farm	1.6ab	1.7 ab	4.6ab	5.8 a	1.1 a	1.8 a	3.4 a	4.3 a
Fields nearby storehouse	1.3 b	1.4 b	4.8ab	5.5 ab	1.2 a	1.7 a	3.6 a	3.7 a
Control	0.7 c	0.8 b	3.6b	4.3 b	0.4 b	0.6 b	1.8 b	2.2 b
Mean average of damage	1.5	1.7	4.5	5.4	1.1	1.2	3.2	3.9
L.S.D(5 %)	0.5	1.2	1.3	1.4	0.4	0.4	1.2	1.2

\* Sowing date

The results of damage assessment to certain crops due to rats infestation at five location in the two Governorates were summarized in Table (5). It is clear that the highest mean damage percentages were recorded in maize crop (2.5 and 3.4 %) and (2.2 and 2.9 %), while the lowest means were noticed in broad bean crop (1.0 and 1.1 %) and (0.9 and 1.0 %) at Kafr El-Sheikh and Garbia Governorates during the two successive seasons 2002 and 2003 respectively.

Statistically there are positive correlation between the degree of infestation, locations time of planting and the size of experimental area.

Discussing the aforementioned results it was clear that our findings are in agreement with those of many authors, where Abdel- Gawad *et al.* (1982) estimated the damage caused by rodents in wheat, sorghum and maize fields. They found that the damage caused by the Nile grass rat, *A.niloticus* in wheat field was more predominant during the milky and paste stage and reached about 7.3 % from total examined plants. The loss in sorghum and maize were 9.5 and 8.33 % from the total counted plants. Somsook *et al.* (1986) recorded that the total rat damage on rice stems during the growing season exceeded 10 %. Also, Asran *et al.* (1985) found that the damage of wheat caused by rats increased from 0.47 % in December to 2.83 % in April and the ripen stage of wheat was the most preferable field rats. Finally Hussien (1991) estimated the damage caused by *M.masculus* to some field crops. He reported that the highest percentage of damage occurred to sweet melons, while the lowest was to broad beans. Rodent damage reached to 4.82, 1.04, 0.73, 0.48 and 0.28 % for sweet melon, tomato, wheat, maize and broad bean, respectively.

**Table (5): Mean average of damage percentages in certain crops at Kafr El-Sheikh and Gharbia Governorates during 2002 /2003 seasons.**

Crops	Mean average of damage percentages			
	Kafr El-Sheikh		Gharbia	
	2002	2003	2002	2003
Rice				
immature stage	2.0	2.3	2.0	2.4
Mature stage	0.9	1.1	1.5	1.7
Broad bean	1.0	1.1	0.9	1.0
Wheat	0.7	1.0	0.8	1.0
Maize*	1.5	1.7	1.1	1.2
Maize**	4.5	5.4	3.2	3.9

\* Sowing date 20/5

\*\* Sowing date 20/8



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الخسائر الناتجة عن الإصابة بالفئران لبعض المحاصيل الحقلية المختلفة في مصر  
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أجريت هذه الدراسة لتقدير الخسائر الناتجة عن الإصابة بالفئران على بعض المحاصيل تحت ظروف بيئية مختلفة ، وكذلك دراسة مدى تأثير ميعاد الزراعة على درجة الإصابة في الذرة الشامية ، ولقد أظهرت النتائج مايلي :

- ١- هناك ارتباط بين طور النمو ونسبة الخسارة ، فقد وجد أن طور ما قبل الأزهار في الأرز كان أكثر إصابة عن طور ما بعد الأزهار بالرغم من إعادة النمو في الإصابات المبكرة عنها في الإصابات المتأخرة وفي كلاهما أحدث فقد في المحصول الناتج . كذلك وجد أن الإصابة أعلى مايمكن في المناطق القريبة من مصرف الصرف عنها في الحقول الموجودة في تجمعات كبيرة.
  - ٢- في محصول الفول وجد أن نسبة الخسارة لم تتجاوز ٥% في محافظة كفر الشيخ عام ٢٠٠٣ بينما أقلها وجد في محافظة الغربية ٠,٦% في حالة التجميعات الكبيرة .
  - ٣- في محصول القمح وجدت أعلى الإصابات كلما بعدنا عن الحواف الى داخل الحقل وسجلت أعلى إصابة ١,٦% في محافظة الغربية عام ٢٠٠٣ بالحقول الغربية من المصرف بينما أقل إصابة وجدت بمحافظة كفر الشيخ وكانت ٠,٤% في التجميعات ذات المساحة الكبيرة .
  - ٤- في محصول الذرة بالإضافة الى الارتباط الواضح بين المكان ونسبة الخسارة هناك علاقة واضحة بين نسبة الخسارة وميعاد الزراعة حيث وجد أن أعلى خسارة في كلا المحافظتين وجدت في الزراعات المتأخرة أى في شهر أغسطس .
- أى يمكن القول أن هناك ارتباط موجب بين نسبة الخسارة والمكان وميعاد الزراعة وتوافر البيئة الملائمة لنمو وتكاثر الفئران .