

FIELD TRIALS ON SOME RODENTS INJURIOUS TO SUGAR CANE, WHEAT AND SORGHUM AT SOHAG GOVERNORATE.

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ABSTRACT

Laboratory and field experiments had been carried out to study survey, distribution rodent species in field crops (sugar cane and cereal crops) were selected for this study in Gazert Shandweel villag Sohag district.

Population density, distribution and sex ratio of more dominant rodents (*M.musculus* and *A.niloticus*) were studied in Sohag Governorate, in addition to their body measurements and rodents damage during two successive years (2000/2001 & 2001/ 2002).

The obtained results can be summarized as follows:

- 1- the presented data proved that the house mouse, *M.musculus* was the dominant one in sugar cane and cereal crop fields. Followed by *A.niloticus* and the climb rate *R. rattus*.
- 2- The cereal crops were more suitable for *R.rattus* than sugar cane while the opposite was noticed in the case of *M.musculus* and *A. niloticus*.
- 3- Autumn season was the most suitable for Egyptian field rodent species under Sohage Governorate field conditions followed by summer, winter and spring.
- 4-Results also illustrated that the house mouse *Mus musculus* L. was trapped from cereal crop fields heavier than that from sugar cane crop fields. The males were caught from cereal crop fields heavier than females but the females caught from sugar cane crop field heavier than males.
- 5-Results proved that the variety G.87-47 was the least sensitive one to rodents injury and the two varieties G.95-19 and G.T. 54-9 were the highest sensitive for rodent damage.
- 6-Rodent damage reduced the juce quality for all varieties of sugar cane.
- 7-Damage percentage caused by rodent to the wheat crop were 5.7 and 4.1 % during the two successive years, respectively.
- 8-Damage percentage caused by rodents to the sorghum crop were 2.9 and 1.9 % during the two successive years, respectively. Rodent damage was noticed in the short stem varieties (Dorado variety) and it was nil in long stem varieties during study.

INTRODUCTION

Rodentia is one of the most important mammalian orders, which has a great effect on the environment, directly, through their destructive feeding habits and indirectly as a stable food items for many predators in the food chains (El-Sherbiny, 1987).

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, vegetables and stand crops from the time of planting through harvesting and cause additional damage and waste contamination.

Abdel- Gawad *et al.* (1982) & Ali and Farghal (1995), stated that sugar cane varieties showed great variation in the rate of infestation by rodents.

The present work aimed to survey and study the distribution of rodents in the sugar cane and some cereal crops (wheat and sorghum) and estimating rodents damage for sugar cane in comparison with wheat and sorghum during two successive years.

MATERIALS AND METHODS

These studies were carried out during two successive years at Sohag Governorate (Gazert Shandweel village located at 15 km. North of Sohag district) to resemble the traditional cultivated area in Egypt. The chosen field contained three economic crops [sugar cane and cereal crops (wheat and sorghum)].

1. Rodent damage :

The damage assessment technique were done as follows:

A- Sugar cane, *Saccharum officinarum* crop fields:

To determine the damage caused by rodent on six varieties of sugar cane, *Saccharum officinarum* planted in Sohag Governorate, Sohag district, Shandweel Agricultural Research Station. The varieties were G.T. 54-9, G. 95-19, G.95-21, G.85-37, P.H.8013 and G.84-47. The experiment was laid out in a randomized block design with 4 replications for each variety planted in 6 x 7 meter plots (1/100 of feddan). At the harvest time four random samples (each one 30 stalks) representing each variety were taken from the plant cane. The stalks were carefully examined to determine the percentage of rodent damage. The percentage of damage was calculated using the following equation.

$$\% \text{ Damage} = \frac{\text{Number of infested internodes}}{\text{Total number of internodes}} \times 100$$

B- Wheat, *Triticum spp.* crop field:

Ten wheat fields, each of 1 feddan were randomly chosen. In each field 25 sample were investigated by using quadrat wooden frame (40 x 40 cm) on the diagonal of the field at fixed distance according to its length. The number of damage and undamaged tillers inside the frame for every single sample were counted. The percentage of damage was calculated according to Poche *et al.*, (1982) by the equation:

$$\text{Damage \%} = \frac{\text{Number of damage tillers}}{\text{Total number of investigated tillers}} \times 100$$

C- Sorghum, *Sorghum bicolor* crop fields:

Five sorghum fields each of 1 feddan were randomly chosen. In every 1 feddan 20 samples (each containing 30 sorghum plants) were

randomly chosen and checked to estimate the damage. The percentage of damage was calculated using the following equation.

$$\text{Damage percentage} = \frac{\text{Number of damage stalks}}{\text{Total number of stalks}} \times 100$$

RESULTS AND DISCUSSION

1- Survey, distribution and population density of rodents in the field crops.

Survey and distribution of rodents in the field crops, sugar cane and cereal crops (wheat and sorghum) were studied in Gazert Shandweel village, Sohag district, Sohag Governorate during two successive years 2000-2001 and 2001-2002.

The trapped rodents were the white bellied rate, *Rattus rattus frugivorus* L., the gray bellied rat, *Rattus rattus alexandrinus* L., the Nile rate, *Arvicanthus niloticus* Desm., and the house mouse, *Mus musculus* L. these rodents belong to family Muridae, Sub order Myomorpha and Order Rodentia.

Survey studies were carried out by many investigators such as Shooba (1976) he recorded five rodent species. These species were *R.rattus frugivorus*, *R.rattus alexandrinus*, *A.niloticus*, *A.cahirinus cahirinus*, *A.cahirinus dmidiatus* and *M.musculus* with a distribution percentage of 27.08, 25.77, 2.62, 3.06, 23.28, 2.62 and 15.27 respectively. Gaaboub *et al.*, (1978) recorded six small rodents *R.rattus frugivoyus*, *R. rattus frugivorus*, *R.rattus alexandrinus* and *R.rattus* were found associated with cotton, wheat, maize, sugar cane vegetable, fruit and alfa-alfa plantations. *A.niloticus* comprised 42.23 % of all species collected. Maize, wheat cotton and alfa-alfa plantations were infested with about 47.27 – 59.57 % of its percentage. Abdel-Gawad (1979) encountered two species of rodents in the sugar cane. One was the Nile rat, *A.niloticus* which infested the plants in both shoots and stem stages. The other was the white bellied rat, *R.rattus frugivorus* which infested the plants during the stage only. Ahmed (2001) stated that *A.niloticus* was the dominant one in wheat and maize fields, followed by *R.rattus*, *R.norvegicus* and *M.musculus*. Also rodent species previously have the same preference to each of wheat and maize crops approximately.

1.1 Effect on field crops:

The total caught number of the different species of Egyptian field rodent in sugar cane and cereal crops (wheat and sorghum) in Sohag Governorate, Gazert Shandweel village through 2001 and 2002 were (298 and 250 individual) and (242 and 216 individual) respectively, Fig.(1 and 2). The relative presence of each of the climb rat, *Rattus rattus* L., the Nile rat, *Arvicanthus niloticus* Desm., and the wild house mouse, *Mus musculus* L. in sugar cane and cereal crops (wheat and sorghum) were respectively during the whole experimental periods [(8 and 8 individual), (44 and 38 individual) and (244 and 196 individual)] and [(12 and 12 individual, (40 and 38 individual) and (196 and 166 individual)]. Also the presented data proved that the house mouse, *Mus musculus* was the dominant one in sugar cane and

cereal crop fields. (244 and 196 individual) and (196 and 166 individual) followed by *A. niloticus* (44 and 38 individual) and (40 and 38 individual) and the rate, *Rattus rattus* L. (8 and 8 individual) and (12 and 12 individual) Fig.(1).

Generally, the cereal crops were more preferred for *Rattus rattus* than sugar cane while the opposite was noticed in the case of *Mus musculus* and *Arvicanthus niloticus*.

Sugar, cane was infested by rodents more the cereal crops where it ensure safe shelter for rodents to hide in a way from their predators, sugar cane also supplies rodents with high energy food and for along time where it occupies soil for 12-16 months from planting to harvest. Our results agree with that obtained by Eton(1936), he found that in some areas in the southeastern united states house mice was more abundant than any other species in cultivated and recently abandoned field. They have been captured in open tundra in Alaska miles from any human settlement.

1.2 Effect of the different seasons on the field rodent population density:

The caught number of different species of the field rodent in winter, spring, summer and autumn season at Sohag Governorate, Gazert Shandweel village throughout 2001 and 2002 for sugar cane cereals crops were [(52 and 40 individual) and (44 and 38 individual)],[(34 and 42 individual) and (42 and 38 individual)],[(86 and 50 individual) and (42 and 44 individual)] and [(126 and 110 individual) and (122 and 96 individual)] respectively, Fig.(2). These data proved that autumn season was the most suitable for Egyptian field rodent species under Sohag Governorate field conditions followed by summer, winter and spring, Fig.(3).

This data agree with that obtained by El-Nashar (1998)who proved that autumn season was the most suitable for Egyptian fields rodent species under Mallawy district field conditions followed by winter, summer and spring. As well as, the monthly rodent population density mean ranged from 3.0 individual (May) to 10 individuals (October).

2.1 Sugar cane crops fields:

Data in Table (1) illustrated the rodent damage in six varieties of sugar cane planted in Shandweel Agriculture Research Station during two successive years. Results proved that the least sensitive to rodent damage variety G.84-47 were 2.2 % during 1st year and 1.5 % during 2nd year while the highest sensitive varieties G.95-19 were (9.8 and 8.8%) during 1st and 2nd years respectively and G.T.54-9 were (8% damage) during 1st year and (6.9% damage) during 2nd year.

On the other hand, the damage caused by the dominant rodent on G.95-21 were 6.7 % during 1st year and 5.2% during 2nd year followed PH.8013 were (4.6 and 2.9%) during 1st and 2nd years respectively and G.85-37 were 3.2 % during 1st year and 2.3% during 2nd year. Also, weigh damage % during 1st and 2nd years were (37.5 and 33.6 %),(44.0 and 39.9%), (54.7 and 52.7 %),(29.1 and 27.6 %),(46.4 and 43.7 %)and (50.0 and 47.8 %) for varieties G.T.54-9, G.95-19, G.95-21, G.85-37, PH.8013 and G.84-47 respectively.

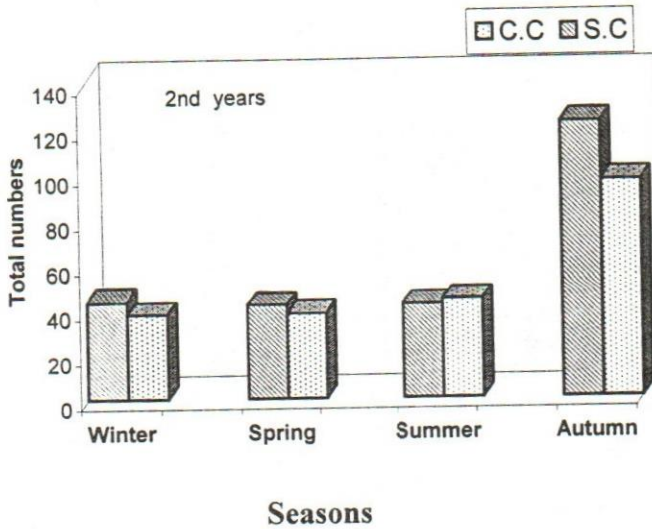
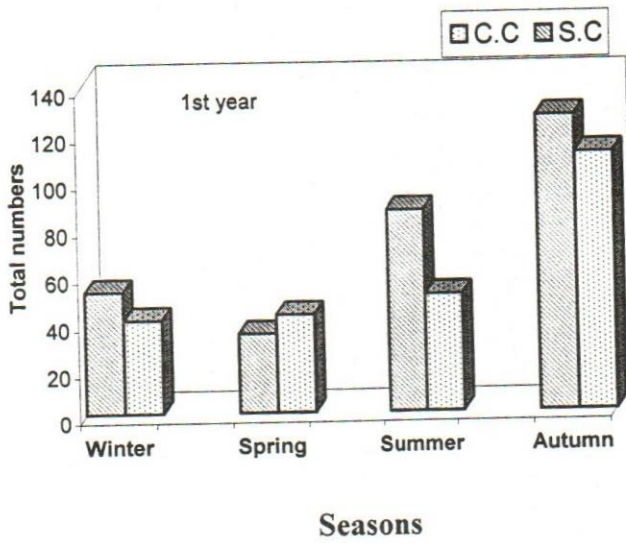


Fig.(1): Seasonal fluctuation numbers of rodent species in sugar cane and cereal crops during two successive years at Sohag Governorate.

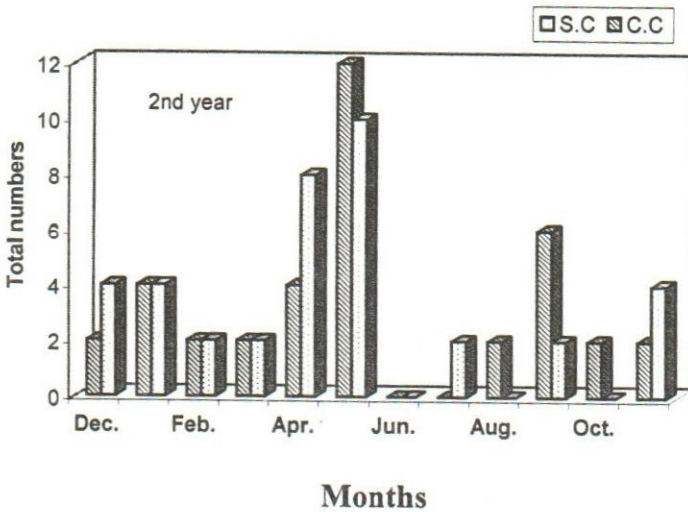
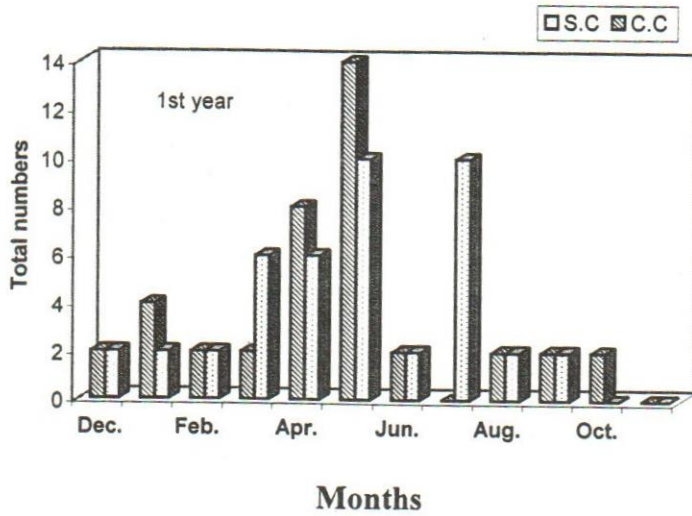


Fig.(2): Monthly fluctuation numbers of wild house mouse, *Mus musculus* Linn. in sugar cane and cereal crops during two successive years at Sohag Governorate.

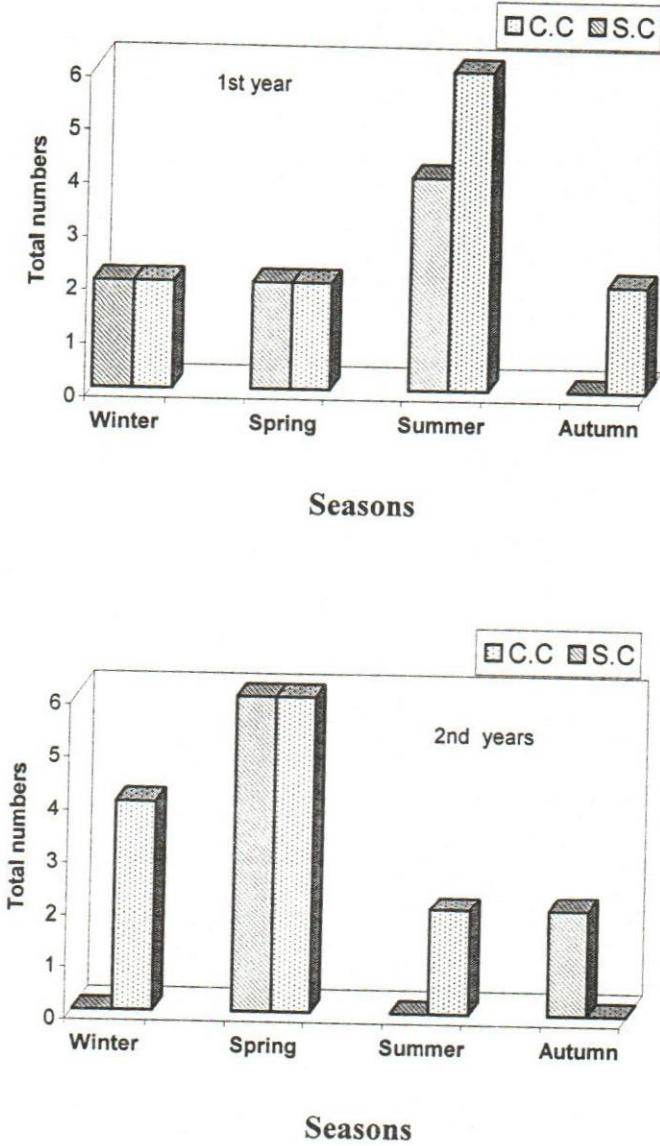


Fig.(3): Seasonal fluctuation numbers of climb rat, *Rattus rattus* Linn. in sugar cane and cereal crops during two successive years at Sohag Governorate.

Table (1): Percentage of rodent infestation in 6 sugar cane varieties planted at Shandweel Agriculture Research Station during two successive years (2001 & 2002).

Year	Variety	No.of infested inter nodes	No.of sound inter nodes	Total number of inter nodes	Damage %	Weight Kg.		
						Non infested	Infested	Damage %
2001	G.T.54 – 9	48	552	600	8	44.7	27.9	37.5
	G..95 – 19	50	460	510	9.8	39.3	22.0	44.0
	G. 95 – 21	32	448	480	6.7	36.2	16.4	54.7
	G. 85 – 37	18	552	570	3.2	38.1	27.0	29.1
	P.H. 8013	24	495	519	4.6	45.9	24.6	46.4
	G. 84 – 47	12	538	550	2.2	41.6	20.8	50.0
2002	G.T.54 – 9	41	553	594	6.9	43.5	28.0	33.6
	G..95 – 19	45	466	511	8.8	40.4	24.3	39.9
	G. 95 – 21	25	460	485	5.2	33.0	15.6	52.7
	G. 85 – 37	13	561	574	2.3	40.5	29.3	27.6
	P.H. 8013	15	503	518	2.9	38.5	21.7	43.7
	G. 84 – 47	8	536	544	1.5	43.7	22.8	47.8

The variation in the percentage of rodent damage between sugar cane varieties may be attributed to sugar content and other morphological and physiological characters of the variety. According to the present findings, the sugar cane variety G.84-47 can be grown in areas which suffer from rodent problems.

It was also observed that the percentage of rodents damage for six sugar cane varieties were highest during 1st year than 2nd year, this could be related to decreased number of rodent by live trap during 2nd year than 1st year during the study period. The majority of damage by rodent was noticed at the base of the stalks. Other investigators studied the rodent damage such as Abdel-Gawad *et al.*, (1982), he noticed that the top damage in sugarcane was caused by *R.rattus frugivorus* and *A.niloticus* usually build their nests in areas where the plants are dense and lodged. However, the base damage was noticed to be caused by *A.niloticus*. Also, Ali and Farghal (1995) stated that sugar cane varieties showed great variation in the rate of infestation by rodents. The G.84-47 variety was the least infested ones.

2.2 Cereal crop:

A- Wheat crop:

Data in Table (2) recorded that damage in wheat (G.164 variety) field crops by dominant rodents. The damage by rodents in wheat crop recorded at harvest stage were 5.7 % and 4.1 % during 1st and 2nd years, respectively. It was also the highest wheat crop damage percentage during 1st year than 2nd year. This may be related to the decrease in rodents numbers during the period of the study. Asran *et al.*,(1991) showed that wheat was the most preferred crop to field rat when compared with the broad bean and chamomile.

B- Sorghum crop:

The results in Table (2) illustrated the rodent infestation in sorghum crop (Dorado-variety). Rodents damage were recorded in harvest stage,

because rodent attacks the sorghum crop in the maturity stage. Damage percentages caused by rodents to the sorghum crop were 2.9 and 1.9 % during (2001 and 2002) respectively.

Table (2): Percentage of rodent infestation of cereal crops (Wheat and Sorghum) at Shandweel Agriculture Research Station during two years (2001 & 2002).

Crops	Year	No. of infested plants	No. of non infested plants	Total Number of plants	Damage %
Wheat	2001	4	66	70	5.7
	2002	3	71	74	4.1
Sorghum	2001	0.88	29.12	30	2.9
	2002	0.58	29.42	30	1.9

The decrease in rodent damage was observed during 2nd year than 1st year. This may be related to the decrease in rodent number during 2nd years in the area. Rodent damage was noticed in the short stem varieties (Dorado-variety) and it was nil in long stem varieties during study period, this may be related to morphological and physiological characters of the variety according to the present findings, sorghum long stem varieties can be grown in areas which suffer from rodent problems.

Abdel-Gawad *et al.*, (1982) carried out a study to estimate the damage caused by rodents in sorghum fields. They found that most of the damage was concentrated by borders of cultivated areas and also negative simple correlation was noticed between the rate of damage and the distance from the border towards the center of the field. Results showed that *Arvicanthis niloticus* attacks the sorghum crop in the harvest stage. Also the attack was concentrated beside the border and decreased towards the center of the field in sorghum, the loss in sorghum equaled about 9.5 %.

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دراسة بعض أنواع القوارض المهاجمة لمحصول قصب السكر مع المقارنة بمحاصيل القمح والذرة الرفيعة في محافظة سوهاج .

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أجريت في هذه الدراسة بعض التجارب الحقلية والمعملية لدراسة حصر وتوزيع أنواع القوارض في المحاصيل الحقلية (اصناف من قصب السكر والمحاصيل المجاورة له قمح وذرة رفيعة) وذلك في قرية جيزة شستدويل - مركز سوهاج - محافظة سوهاج بالإضافة لدراسة الكثافة العددية ، التوزيع العمري (بالغ وغير بالغ) والتوزيع الجنسي (نكر وأنثى) وقد تم اجراء القياسات الجسمية وذلك للأنواع الشائعة (فؤيرة المنازل البرية وجرز الحقل النيلي) وكذلك تم تقدير الخسائر الناجمة عن اصابة القوارض لستة اصناف من قصب السكر والمحاصيل المجاورة له (قمح وذرة رفيعة) وتمت هذه الدراسة خلال عامى ٢٠٠٠-٢٠٠١ ، ٢٠٠١-٢٠٠٢ .

ويمكن تلخيص هذه النتائج على النحو التالي :

حصر وتوزيع الكثافة العددية للقوارض في محاصيل الحقل:

- ١- أوضحت النتائج أن فؤيرة المنازل *M.musculus* كانت أكثر شيوعا في حقول قصب السكر والمحاصيل النجيلية يليها جرز الحقل النيلي *Arvicanthus niloticus* ثم الجرز المتسلق *Rattus rattus* .
- ٢- كانت المحاصيل النجيلية أكثر أفضلية بالنسبة للجرز المتسلق عن محصول قصب السكر والعكس في حالة فؤيرة المنازل وجرز الحقل النيلي .
- ٣- كان فصل الخريف أكثر الفصول ملائمة للأنواع الموجودة في البيئة المصرية من قوارض الحقل تحت الظروف الحقلية لمحافظة سوهاج ويليه فصل الصيف ثم الشتاء وأخيرا الربيع.
- ٤- أوضحت النتائج أن فؤيرة المنازل المصادة من حقول قصب السكر كانت الأثقل وزنا من تلك المصادة من حقول المحاصيل النجيلية.
- ٥- أوضحت النتائج أن أقل اصناف قصب السكر حساسية للأصابة بالقوارض الصنف جيزة ٨٤-٧ وأن أكثرها اصابة الصنفين جيزة ٩٥-١٩ وجيزة تايوان ٥٤-٩ .
- ٦- أوضحت النتائج أن الأصابة بالقوارض تقلل من صفات الجودة للعصير لجميع اصناف قصب السكر .
- ٧- كانت نسبة الخسائر الناتجة عن الاصابة بالقوارض لمحصول القمح ٥,٧ ، ٤,١ % خلال العام الأول والثانى على التوالي.
- ٨- كانت نسبة الخسائر الناتجة عن الاصابة بالقوارض لمحصول الذرة الرفيعة ٢,٩ ، ١,٩ % خلال عامى الدراسة على التوالي كما أن اصابة القوارض للذرة الرفيعة لوحظت في الاصناف قصيرة الساق (الدوراو) وغير موجودة في الاصناف الطويلة.