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# EVALUATION THE DAMAGE CAUSED BY COMMON RODENTS ON RICE AND WHEAT CROPS IN AL-MAHALA EL-KOUBRA DISTRICT AT EL-GHARBIA GOVERNORATE.

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## ABSTRACT

These studies were conducted at the selected experimental area under wheat and rice cultivation in five fields in Al-Mahala El-Koubra district at El-Gharbia governorate, Egypt (30.9687°N 31.1665°E). In this work two Feddans were chosen, in some fields growing rice crop and wheat crop through two agriculture seasons during between November to September during 2018-2020.

The common rodent species in the study area for the rice and wheat crops were the Norway rat, *Rattus norvegicus* Berk., [( 221 individuals and percentage 74.41% in 2019) and (294 individuals and percentage 78.82% in 2020)] and clamp rat *Rattus rattus* (Linn.), [( 76 individuals and percentage 22.59% in 2019) and (79 individuals and percentage 21.81% in 2020)] during the two seasons in rice and wheat field crops respectively.

Estimate the loss caused by rodents in some economic crops (rice and wheat crops). The damage assessment technique caused by the Norway rat, *Rattus norvegicus* Berk., and *Rattus rattus* (Linn.), was caught from rice fields (as summer crop) and wheat fields (as winter crop).

No significant differences between experimental fields except field number 3. The second field recorded the highest mean infection 5.3% (6.6 ± 1.16) while the fourth field recorded the lowest mean infection 4.3% (5.1 ± 0.98) while no significant differences between experimental fields except field number 5. The fourth field recorded the highest mean infection 8% (7.9 ± 0.49) while the third field recorded the lowest mean infection 6.7% (7.3 ± 0.52) in rice crops.

No significant differences between the fields of 2,4 and 5. The percentage of loss in the fields of 2,4 and 5 during the dough stage were recoded 4.7%, 7.8% and 8.8%. while in the mature stage were recorded 9.4%,11.0% and 10.7% respectively. In the second season, there was no significant difference between the fields 2,4 and 5 compared to the dough

stage and the maturity stage, and the percentage loss in the dough stage was 8.5%, 8.8% and 7.8% respectively, while in the maturity phase it was 12.1%, 10.7 % and 9.2 respectively in wheat crops.
**Key Words:** Rodent- damage – rice – wheat – season.

## INTRODUCTION

Crop protection has been developed to prevent and control losses due to pests in the field **(Oerke, 2005).** Rodents can adjust to the cropping stages, from the initial period of the crop, capable of rapid population growth and emigration after crop harvest depending upon food availability **(Sarwar *et al*, 2011)**.

Several rodent species were involved in damaging rice and wheat. Rodents can cause serious damage to cereal crops of all kinds including wheat **Sarwar (2015).** Rodent's damage of wheat tillers was done, at different growing stages, in three locations within Sohag Governorate, Egypt Maximum damage was recorded at wheat maturity stage **(Ahmed *et al*, 2019).**

Rice yield can be estimated by farmers directly or by quadrate samples, the former being on average 20% lower than the actual yield. Integrated rodent management increased rice yields more when rats were common in both dry and wet season crops. For every 1% increase in tiller damage by rats, there was a decrease of 58 kg/ha in rice yield. The benefit-to-cost ratio for all seasons and years averaged 25:1 but varied considerably from year to year between a low of −2:1 to a high of 63:1 **(Singleton, 2003 and Singleton *et al*, 2004 and Al-Gendy *et al*, 2017).**

The present investigation aims to study losses caused by rodents in rice and wheat fields (summer and winter crop) in Al-Mahala El-Koubra district at El-Gharbia governorate.

## MATERIALS AND METHODS

These studies were conducted at the selected experimental area under wheat and rice cultivation in five fields in Al-Mahala El-Koubra district at El-Gharbia governorate, Egypt (30.9687°N - 31.1665°E). In this work, two Feddans were chosen, in each fields rice crop and wheat crop between November to September during 2018-2020.

a- Rat individuals were captured using wire-box traps of the usual spring door type. Traps were distributed in the evening in rice and wheat fields. Bait materials were consisting of tomato slices and lanshon. Traps were distributed at 10 meters distance beside rodent's runways and active burrows. Every morning, traps were checked to collect trapped rodents. The collected rodents were identified using the keys given according by **Arafa (1968) and (Osborn and Helmy 1980).**

b- Estimate the loss caused by rodents in some economic crops (rice and wheat crops). The damage assessment technique caused by the Norway rat, *Rattus norvegicus* Berk., and *Rattus rattus* (Linn.), was caught from rice fields (as summer crop) and wheat fields (as winter crop) Al-Mahala El-Koubra district at Gharbia governorate were chosen as experimental area. The field trials continued for two successive seasons for rice crop and wheat crop between November to September during 2018-2020.

Techniques used by many authors **Hamelink (1981) and Poche *et al*., (1982)** as follows: five rice fields each of two feddans were chosen. In each field 25 samples were investigated by using quadrate wooden frame (40×40cm) on the diagonal of the field at fixed distance according to it was length. The number of damaged and undamaged tillers inside the frame for every single spot were counted. The damage percentage was calculated according to **Poche *et al*. (1982)** by equation:

$$\% \text{ damage} = \frac{(\text{number of damaged tillers})}{\text{total number of tillers counted}} ?? 100$$

The assessment of damage in wheat crop follows the same steps previously mentioned with rice crop.

**Statistical analysis:** The data were subjected to standard analysis of variance technique as proposed by **Steel and Torrie (1984)**. Duncan's new multiple range tests was performed to compare the means of different treatments by using the computer software Spss v20. All the results and confidence limits are given at 0.5% level of significance.

## RESULTS AND DISCUSSION

This work proved the presence of two species the Norway rat, *Rattus. norvegicus* Berk, and *Rattus rattus* (Linn.), was recorded in El-Mahala El-koubra distract at El-Gharbia governorate from family Muridae, according to the full description of rodent species of Egypt adopted by **(Osborn and Helmy (1980))**.

Data in Table (1) and Figures (1) showed that the common rodent species in the study area for the rice and wheat crops were the Norway rat, *Rattus norvegicus* Berk., [( 221 individuals and percentage 74.41% in 2019) and (294 individuals and percentage 78.82% in 2020)] and clamp rat *Rattus rattus* (Linn.), [( 76 individuals and percentage 22.59% in 2019) and (79 individuals and percentage 21.81% in 2020)] during the two seasons in rice and wheat field crops respectively.

**Table (1): Number of rodent species caught from Rice and Wheat crops.**

| Area | Study of year | Species / year | *Rattus norvegicus* | | *Rattus rattus* | |
|---|---|---|---|---|---|---|
| | | | No. | % | No. | % |
| Field crops (Rice and Wheat) | 1st Year | 297 | 221 | 42.91 | 76 | 49.03 |
| | 2nd Year | 373 | 294 | 57.09 | 79 | 50.97 |
| Total | | 670 | 515 | 100 | 155 | 100 |

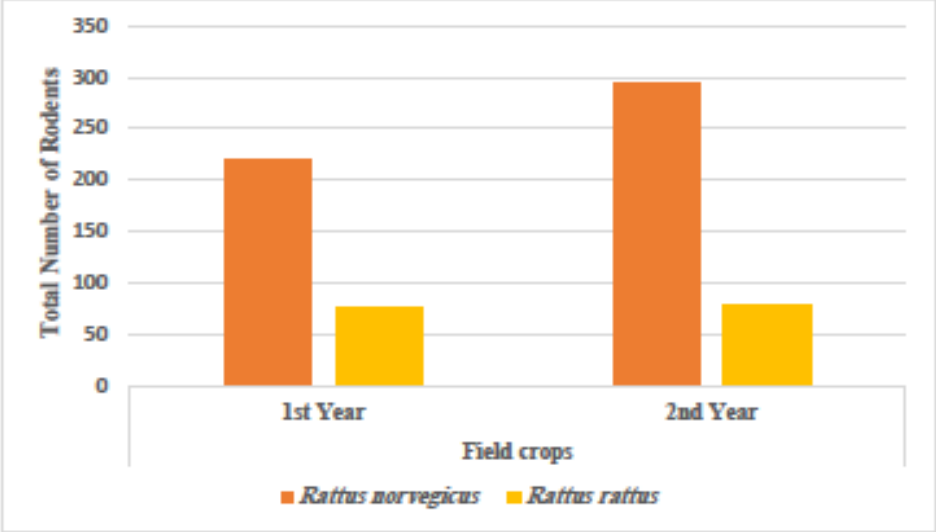


**Fig (1):** Number of rodent species caught from fields Rice and Wheat crops.

**Rice crop (summer crop):**

Data in Table (2) and Figures (2) indicated that infestation of damage caused by *R. norvegicus* Berk., in rice (*Oryza sativa*) as Summer crop from Al-Mahala El-Koubra district at Gharbia Governorate during two consecutive agriculture season.

In the first season, the results showed that no significant differences between experimental fields except field number 3. The second field recorded the highest mean infection 5.3% (6.6 ± 1.16) while the fourth field recorded the lowest mean infection 4.3% (5.1 ± 0.98).

In the second season, data showed that, no significant differences between experimental fields except field number 5. The fourth field recorded the highest mean infection 8% (7.9 ± 0.49) while the third field recorded the lowest mean infection 6.7% (7.3 ± 0.52).

On the other hand, the analysis of variance between the first and the second season showed that significant differences between experimental fields.

**Table (2): Damage caused by *Rattus. norvegicus* Berk and *Rattus rattus*. in Rice crop.**

| Field No | The first season | | | Damage | | The second season | | | Damage | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Whole Litters | Undamaged Litters | Damaged Litters | % | Mean ± S.E. | Whole Litters | Undamaged Litters | Damaged Litters | % | Mean ± S.E. |
| 1 | 1995 | 1906 | 89 | 4.5 | 5.5a±0.83 | 1839 | 1705 | 134 | 7.3 | 7.1a±0.74 |
| 2 | 1806 | 1711 | 95 | 5.3 | 6.6a±1.16 | 1713 | 1587 | 126 | 7.4 | 7.3a±0.54 |
| 3 | 1988 | 1890 | 98 | 4.9 | 4.6b±0.64 | 1661 | 1539 | 122 | 6.7 | 7.3a±0.52 |
| 4 | 2151 | 2059 | 92 | 4.3 | 5.1a±0.98 | 1933 | 1778 | 155 | 8.0 | 7.9a±0.49 |
| 5 | 1738 | 1650 | 88 | 5.1 | 5.6a±0.78 | 1733 | 1614 | 119 | 6.9 | 6.8b±0.55 |

**Mean values in each column have different superscript (a and b) are significantly different.**

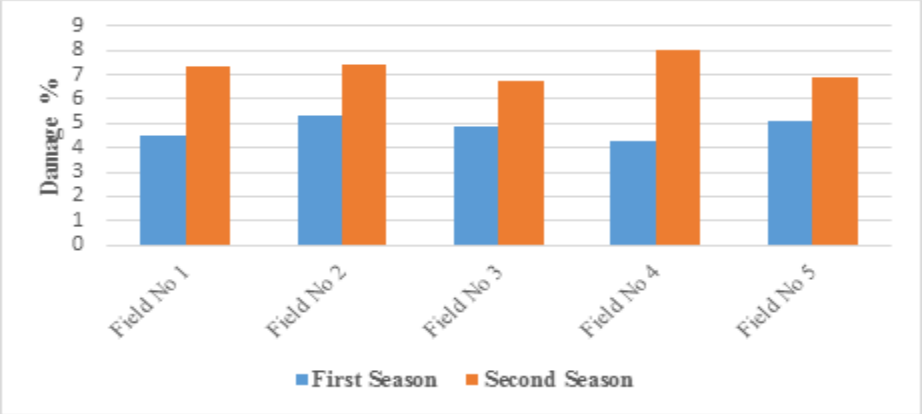


**Fig (2):** Damage percentage caused by common rodents in Rice crop.

## Wheat crop (winter crop):-

Data in Table (3) and Figures (3) showed that, the losses by *R. norvegicus* Berk., in the dough stage and the mature stage wheat crops.

A comparison was made between the two stages in the percentage of loss. The mean value and standard Error (± SE) of the wheat (*Triticum* spp) as winter crop in five fields during two consecutive agriculture seasons, there were no significant differences between the fields of 2,4 and 5. The percentage of loss in the fields of 2,4 and 5 during the dough stage were recoded 4.7%, 7.8% and 8.8%. while in the mature stage were recorded 9.4%,11.0% and 10.7% respectively. In the second season, there was no significant difference between the fields 2,4 and 5 compared to the dough stage and the maturity stage, and the percentage loss in the dough stage was 8.5%, 8.8% and 7.8% respectively, while in the maturity phase it was 12.1%, 10.7 % and 9.2 respectively. The reason for the increase in infection in field number 2 is due to its proximity to the housing environment while fields number 4 and 5 were near water channels and trees.

**Table (3): Damage caused by *Rattus. norvegicus* and *Rattus rattus*. in wheat crop.**

| Seasons | Field No | Dough Stage | | | | Mature Stage | | | | Mean ± S.E. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Undamaged Litters | Damaged Litters | Whole Litters | Damage % | Undamaged Litters | Damaged Litters | Whole Litters | Damage % | |
| The first season | 1 | 1127 | 98 | 1226 | 8.0 | 950 | 119 | 1069 | 11.1 | 3.87 b ±1.66 |
| | 2 | 1533 | 75 | 1610 | 4.7 | 967 | 100 | 1067 | 9.4 | 4.27 a ±1.18 |
| | 3 | 1319 | 122 | 1444 | 8.4 | 1020 | 122 | 1142 | 10.7 | 1.91 b ±1.21 |
| | 4 | 1324 | 113 | 1441 | 7.8 | 978 | 121 | 1099 | 11.0 | 1.84 a ±1.39 |
| | 5 | 1063 | 103 | 1171 | 8.8 | 996 | 119 | 1115 | 10.7 | 1.5 a ±1.55 |
| The second season | 1 | 1080 | 115 | 1196 | 9.6 | 1021 | 124 | 1145 | 10.8 | 1.09 b ±1.3 |
| | 2 | 1434 | 134 | 1570 | 8.5 | 1044 | 144 | 1188 | 12.1 | 2.87 a ±1.27 |
| | 3 | 1265 | 121 | 1389 | 8.7 | 1072 | 130 | 1202 | 10.8 | 1.98 b ±1.18 |
| | 4 | 1174 | 113 | 1291 | 8.8 | 981 | 118 | 1099 | 10.7 | 1.08 a ±1.45 |
| | 5 | 1023 | 87 | 1115 | 7.8 | 1003 | 102 | 1105 | 9.2 | 1.71 a ±1.74 |

**Mean values in each column have different superscript (a and b) are significantly different.**

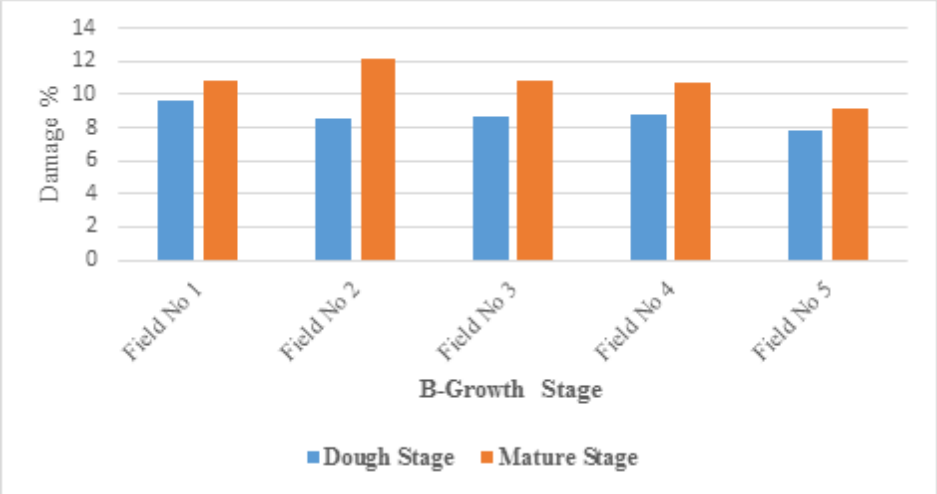


**Fig (3):** Damage percentage caused by common rodents in Wheat crop.

**Brown (2005)** mentioned that house mice, *Mus domesticus*, cause significant damage to wheat crops in Australia by digging up and eating newly planted seeds, or by cutting stems and eating developing grain. The authors conducted this study to determine how wheat compensates for damage by physically cutting tillers to simulate mouse damage. Tillers were cut at five intensities: 0%, 5%, 10%, 25%, and 50% at each growth stage of emergence, tillering, booting, and ripening.

## CONCLUSION

The present study Estimated the loss caused by rodents in some economic crops (rice (as summer crop) and wheat (as winter crop) crops). In the rice crop the analysis of variance between the first and the

second season showed that significant differences between experimental fields. In the wheat crop The reason for the increase in infection in field number 2 is due to its proximity to the housing environment while fields number 4 and 5 were near water channels and trees.

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# تقييم الخسائر التي تسببها القوارض الشائعة على محاصيل الأرز والقمح بمركز المحلة الكبرى بمحافظة الغربية.

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** معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي جيزة

أجريت دراسة هذه التجربة في خمسة من حقول القمح والأرز بمركز المحلة الكبرى بمحافظة الغربية. تم اختيار عدد 2 فدان من نفس حقول القمح والأرز لمدة موسمين ابتداء من شهر نوفمبر الى شهر سبتمبر خلال عامي 2018 – 2020.

كانت أنواع القوارض الشائعة في منطقة الدراسة لمحاصيل الأرز والقمح هي الفئران النرويجية، *Rattus norvegicus* Berk.، ))]221 فردا ونسبة 74.41٪ في عام 2019) و (294 فردا ونسبة 78.82٪ في عام 2020)] الفار المتسلق ((Linn.) *Rattus rattus*، )]76 فردا ونسبة 22.59٪ في عام 2019) و (79 فردا ونسبة 21.81٪ في عام 2020)] خلال الموسمين في محاصيل حقول الأرز والقمح على التوالي.

تقدير الخسارة الناجمة عن القوارض في بعض المحاصيل الاقتصادية (محاصيل الأرز والقمح). تم تقييم الأضرار الناجمة عن الجرذ النرويجي، *Rattus norvegicus* Berk.، و(Linn.) *Rattus rattus*، من حقول الأرز (كمحصول صيفي) وحقول القمح (كمحصول شتوي).

لا توجد اختلافات كبيرة بين الحقول التجريبية باستثناء الحقل رقم 3. سجل الحقل الثاني أعلى متوسط للخسارة 5.7٪ (6.6 ± 1.16) بينما سجل الحقل الرابع أدنى متوسط للعدوى 4.3٪ (5.1 ± 0.98) في حين لم تكن هناك اختلافات كبيرة بين الحقول التجريبية باستثناء الحقل رقم 5. سجل الحقل الرابع أعلى متوسط للعدوى 8٪ (7.9 ± 0.49) بينما سجل الحقل الثالث أدنى متوسط للعدوى 6.7٪ (7.3 ± 0.52) في محاصيل الأرز.

لا توجد اختلافات كبيرة بين مجالات 2 و4 و5. تم إعادة ترميز النسبة المئوية للخسارة في الحقول البالغة 2 و4 و5 خلال مرحلة العجين 4.7٪ و7.8٪ و8.8٪. بينما في المرحلة الناضجة تم تسجيل 9.4٪ و11٪ و10.7٪ على التوالي. في الموسم الثاني، لم يكن هناك فرق كبير بين الحقول 2،4 و5 مقارنة بمرحلة العجين ومرحلة النضج، وكانت نسبة الخسارة في مرحلة العجين 8.5٪ و8.8٪ و7.8٪ على التوالي، بينما في مرحلة النضج كانت 12.1٪ و10.7٪ و9.2 على التوالي في محاصيل القمح.