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# Survey and control of rodents and their ectoparasites under field conditions in Assiut Governorate

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**Abstract:**

This study was carried out in new cultivated lands located at the eastern north of Assiut City (Wady El-Assiuty), after the harvest of wheat crop during 2012 year. Two Methods of controlling rodents and their ectoparasites were conducted. The first was fumigation with Fostoxeen tablets inside the active burrows and the second one was the poison baits by using the anticoagulant rodenticide (Ratak) outside the rodent active borrows.

Three species of rodents were found in the study areas, *Arvicanthis niloticus, Rattus rattus frugivorius* and *Rattus rattus alexandrinus.* The reduction of the rodent population in the Fostoxeen treatment were 79.3%, The second treatment with Ratak had given 78% while the decrease of untreated areas was 2.2%.

The study of flea population showed that with Fostoxeen treatment had given reduction in the flea rat index with 72.9% while in the second treatment Ratak it was give an increase with 41.6%. The reduced in untreated areas were 14.5%.

Generally,the use of Fostoxeen inside the active burrows can be decrease the rat flea index beside the decrease of rodent population while the use of Ratek didn't affected of the flea population and control the rodent only.

**Keywords:** Fumigation pesticides–Active burrows – Rodent control – Rat flea index – Anticoagulants.

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**Introduction:**

Rodent is one of the most important mammalian orders which have a great effect on the environment. Directly through their destructive feeding habits and indirectly as stable food items for many predators in the food chain. In Egypt, changes in the agroecosystem during the last of field rodent population and their ectoparasites **(Singleton and Brown, 1999) El-sherbiny, 1987 and Abdel Gawad, 2010a).**

Thus great efforts should be done to develop rodent control programs and rodent ectoparasites control. Rodent control methods must be not only faithful the requirement of the protecting crops but also efficient and economic manner **(Abdel Gawad 2001b).**

Bubonic plunge in man and epizootic rats are chiefly transmitted by the oriental rat flea *Xenopsylla cheopis*. In addition to 24 species were found on rodents which are expected to have some role vectors, **(Keshta, 2003)**. The main objective of these studies to develop on effective strategy of rodent control programs in the cultivated agroecosystem in Egypt by using two different methods. The first use fumigation pesticides (Fleas) in the rodent active burrows. The second was used anticoagulant Rodenticides (Ratak) outside the active burrows and estimated the reduction of the flea population beside the rodent control in the two methods.

**Materials and methods:**

**1 – Study areas**

This study was carried out in the new cultivated lands (Wady El-Assiuty) 20 km. eastern north of Assiut City. These areas were about 30 Fadden divided into ten plots every one about 3 Faddens, with barriers and roods. The study area was planting with wheat as winter crops. The steps of the study beginning after the harvest of wheat and before the enter migration of rodent to the other standing crops.

**2 – Estimation of rodent species and rat flea index:**

In every plot from the study area twenty rodent traps were distributed daily along ten days. The rodent cashed were collected daily and identification into species and subspecies as percentage from the total capture in the end of the ten days. The rodent was Anesthetized and brushed to extract the fleas and the rodent was released to the capture plot. The flea index was estimated percentage by divided the number of fleas on the total number of rodent captured.

**3 – Active burrows estimation:**

To estimate the active burrows in every plot the open burrows are count and closed with the marking dust (Slaked lime) for ten days. After ten days the open burrows in every plot count in every plot as active burrow and the total active burrows were estimated as percentage from the first count and the count was considered the initial active burrows.

**4 – Rodents control:**

This study of rodents control was carried out by using two controlling methods:

The first was the fumigation by using the pesticide tablets (fostoxeen) inside the active burrows and closed. Then after ten days from treatments the open burrows were counted and the percentages of active burrows were calculated.

The second was the poison baits distribution by using the anticoagulant (Ratak), outside the active burrows, then closed and marking with staked line. After ten days from the poison bait distribution.

Control plots were left without any rodenticide treatments. The active burrows and rodents captured were determined the treated areas, before and after treatments.

The estimating of the rat index, flea index, active burrows were carried out as follows.

$$\text{Domination percentage} = \frac{\text{No. rodent species}}{\text{Total rodents captured}} \times 100$$

$$\text{Trap index} = \frac{\text{No. rodents captured}}{\text{Total trap distributed}} \times 100$$

$$\text{Flea index} = \frac{\text{No. flea counted}}{\text{Total rodent captured}} \times 100$$

$$\text{Population of active burrows} = \frac{\text{No. Active burrows}}{\text{Total burrows examined}} \times 100$$

## Results and Discussion

Data in table (1) show the distribution of rodent species captured from the experiential areas. Before the treatment with Rodenticides the rodent species which captured were three rodent species raked as followed. The first one was the Nile grass rat, *Arvicanthis niloticus* it was consisted of 72% from the total population. The second species was the white bellied rat, *Rattis rattus frugivorus* with 19% and the late percentage was the grey bellied rat *Rattus rattus alexandunus* with 9%. The first species was dominant in the field crops.

Its burrows were concentrated in the land which cultivated with wheat, while the second species was found the areas which planting with date palm trees and the third species was in the farmer houses. This data were agreement with **Abdel-Gawad, (2010a) and Bakri and Al Gendy, (2007).**

From the same table the determination of flea index which was found on the rat body show that the high flea index before the treatment with Rodenticides was 5.9 flea/ rat in the first area, 6.0 flea/rat in the second area which treated with Ratak. The third area without treatment as control was 6.1 flea/ rat.

The determination of the active burrows in the study area show that the open burrows in this area were 1915 burrows while the active burrows before the treatment with Rodenticides were 1045 with 54.6% percentage.

Data in table (2) revealed the rodent distribution in the experimental areas after the treatment with the Rodenticides (Fosotxeen and Ratak). Data in this table show that the distribution of ro-

dent species in the areas studies. The same ranked of the rodent species in the experimental areas. The percentage of *A. nilotocas* in the areas treated with Fostoxeen was 57.1% while in the areas treated with Ratak was 55.9% from the total rodent captured after the treatment.

The rodent population of the third area which left without treatment as control the total rodent which captured after the treated with Rodenticides were 70.2% from the total rodent captured after the treatment for the study of the flea index from this table showed that the low index was observed in the area treated with Fostoxeen tablets in the active burrows with mean of 1.6 flea/rat while in the areas treated with Ratak were 8.5 flea/rat and in the control areas were 5.4 flea / rat respectively.

From table (2) the active burrows counted after the Rodenticides treatment was 53.2% from the total open burrows after the treated with Fostoxeen, while it was 48.7% in the treated area with anticoagulant Rodenticides (Ratak). And 50.8% in the third untreated area control, with total percentage active burrows 50.9%.

Data in table (3) showed the percentage of reduction of the rodent population comparing with the rodent captured before treatments, the untreated areas. From the same table data showed that the population of rodent species was 72.4% *A. Aniloticus*, 19.0% in case of *Rattus rattus frugivorus* and 8.6% in case of *Rattus rattus alexandrinus*.

Table (3) indicated that the reduction of the rodent capture in the areas treated with Fostoxeen was 84.1, 80.2% and 75.2% by mean 79.3% while in the areas treated with Ratak were 87.3%, 74.8 and 74.8% by means with 78.5% the comparison with the two treated areas with the untreated areas -9.5%, -6.6% and +8.5% by means -2.2% clearly the highly significant between the two treated area with Rodent-

icides and untreated areas (control).

The study of the reduction of the rat flea index before and after the treatments showed that the reduction of the first treated areas with Fostoxeen was 61.4, 73.8, and 76.4% by mean 72.9% rat flea index. While the reduction in the treated areas with Ratak were +106.2, 27.5 and +15.4 by mean + 41.6% compared these data with the reduction of the rat flea index in the untreated areas were 33.0, 1.7 and 4.7% by mean 14.0% respectively.

From table (3) the data cleared that the reduction of the active burrows after the treatments showed the area treated with Fostoxeen were reduced the active burrows count 89.9, 89.0 and 89.1 by mean with 89.3%. While in case of Ratak treatment it was 84.3, 88.5 and 86.9 with mean 86.7% the compared with untreated area, (Control) showed highly significant difference, the reduction were 8.8, 4.5 and 10.5% by mean 14.5%.

Generally data showed that the rodent species composition in the new cultivated land were the Nile grass rat *A. niloticus,* white beilled rat *Rattus rattus frugivorus* and the house grey rat *Rattus rattus alexandrunus.* This data was agreement with **Abdel-Gawad (2010b) and Salit *et al*. (1982).**

The use of fumigation tablets for Fostoxeen controlling the rodents and their ectoparasites in the rodents active burrows after the wheat harvest decrease the flea population with 72.9% while in the treatment with anticoagulant Rodenticides (Ratak) outside the rodent active burrows give increase of the flea population with + 41.6%.

This may due to the dead of the rodents in the areas treated with Ratak and did not afford with the fleas or the low effect on them. The decreased of the rodent population made an increase of the rat flea index. The increasing of the rat flea index in the untreated areas was low com-

pared with the increased of the areas treated with Ratak.

However, the used of the fumigation pesticide for controlling rodent in their active burrows can be used a double method for control both rodent and their ectoparasites especially fleas. This method was effect more than the use anticoagulant Rodenticides outside the burrows. **Abdel-Gawad (2001).**

**Table (1) total rodent captured and identification percent age of rodent, total flea index and percentage of the active burrows before the treatment with fostoxeen and ratak.**

| | | **Rodent capture and identification before** | | | | | | | **Total flea before** | | **Burrow before** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | A.n | | R.x | | R.f | | No. | Index | Burrow exam | Active burrow | %Active burrows |
| | | No. | No. | % | No. | % | No. | % | | | | | |
| **fostoxeen** | 1 | 113 | 82 | 72.5 | 23 | 20.3 | 8 | 7.1 | 465 | 5.7 | 211 | 128 | 60.7 |
| | 2 | 126 | 78 | 61.9 | 14 | 11.1 | 34 | 27.0 | 816 | 6.5 | 318 | 173 | 54.4 |
| | 3 | 165 | 110 | 66.6 | 15 | 9.1 | 40 | 24.2 | 916 | 5.5 | 222 | 142 | 63.9 |
| | **Total** | **404** | **270** | **66.8** | **52** | **12.8** | **82** | **20.3** | **2377** | **5.9** | **751** | **443** | **58.9** |
| **ratak** | 1 | 124 | 91 | 73.9 | 18 | 14.6 | 15 | 12.1 | 898 | 6.4 | 197 | 89 | 45.2 |
| | 2 | 151 | 117 | 77.5 | 2 | 1.3 | 32 | 21.2 | 936 | 6.2 | 185 | 104 | 57.5 |
| | 3 | 115 | 84 | 73.9 | 8 | 6.4 | 23 | 20.0 | 599 | 5.2 | 193 | 99 | 51.3 |
| | **Total** | **390** | **292** | **44.9** | **28** | **7.2** | **70** | **17.9** | **2333** | **6.0** | **575** | **292** | **50.8** |
| **Control** | 1 | 127 | 97 | 76.4 | 4 | 3.1 | 26 | 20.5 | 906 | 7.1 | 219 | 126 | 52.5 |
| | 2 | 138 | 111 | 80.4 | 7 | 501 | 20 | 14.5 | 795 | 5.8 | 195 | 89 | 45.6 |
| | 3 | 141 | 99 | 70.2 | 12 | 8.5 | 30 | 21.2 | 899 | 6.4 | 175 | 95 | 54.3 |
| | **Tota** | **406** | **307** | **75.6** | **23** | **5.7** | **76** | **18.7** | **2600** | **6.4** | **589** | **310** | **54.6** |
| | G.Total | 1200 | 869 | 72.4 | 103 | 8.5 | 228 | 19.0 | 6310 | 6.1 | 1915 | 1045 | 54.6 |

**Table(2) Rodent captured identification, rat flea index, open and active burrows after the treated of with fostoxeen and ratak.in the study area.**

| | | Rodent capture and identification before | | | | | | | Rat flea index | | Burrow | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | A.n | | R.x | | R.f | | No. | In-dex | Bur-row open | Ac-tive bur-row | %Ac tive bur-rows |
| | | No. | No. | % | No. | % | No. | % | | | | | |
| **fostoxeen** | 1 | 18 | 10 | 55.5 | 2 | 11.1 | 6 | 33.3 | 40 | 2.2 | 25 | 13 | 52.0 |
| | 2 | 25 | 15 | 60.0 | 4 | 16.0 | 6 | 27.0 | 43 | 1.7 | 38 | 19 | 50.0 |
| | 3 | 41 | 23 | 56 | 6 | 14.6 | 12 | 29.3 | 53 | 1.3 | 29 | 17 | 58.6 |
| | **To-tal** | **84** | **48** | **57.1** | **12** | **14.3** | **24** | **24.3** | **136** | **1.6** | **92** | **49** | **53.2** |
| **ratak** | 1 | 19 | 9 | 47.4 | 3 | 15.8 | 7 | 36.8 | 250 | 13.2 | 21 | 14 | 66.6 |
| | 2 | 36 | 23 | 63.9 | 4 | 11.1 | 9 | 25.0 | 286 | 7.9 | 16 | 12 | 70.6 |
| | 3 | 29 | 15 | 51.7 | 5 | 17.2 | 9 | 31.0 | 175 | 6.0 | 42 | 13 | 30.9 |
| | **To-tal** | **84** | **47** | **55.9** | **12** | **14.3** | **25** | **29.8** | **711** | **8.5** | **80** | **39** | **48.7** |
| **Control** | 1 | 115 | 95 | 82.6 | 5 | 4.3 | 10 | 87 | 450 | 4.7 | 210 | 115 | 54.7 |
| | 2 | 129 | 108 | 83.7 | 4 | 31 | 17 | 13.2 | 735 | 5.7 | 178 | 93 | 52.2 |
| | 3 | 153 | 118 | 77.1 | 21 | 7.8 | 23 | 15.0 | 92.8 | 6.1 | 195 | 88 | 45.1 |
| | **To-tal** | **397** | **321** | **80.8** | **30** | **7.6** | **50** | **12.6** | **2203** | **5.5** | **583** | **296** | **50.8** |
| | G.Total | 565 | 416 | 73.6 | 54 | 9.5 | 100 | 17.7 | 30.50 | 5.4 | 755 | 384 | 50.9 |

**Table(3) Percentage of rodent population, reduction of rodent population, reduction of flea index and reduction of the active burrows in the experimental areas after the treated with ratak and fostoxeen**.

| | | Rodent capture and identification before | | | | | | | Reduction of flea index | | Reduction Active burrows | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A.n | R.x | R.f | before | after | reducation | before | after | Reduct | befor | after | Reduct |
| | | % | % | % | No. | No. | % | index | index | % | No. | No. | % |
| **fostoxeen** | 1 | 75.5 | 20.3 | 7.1 | 113 | 18 | 84.1 | 5.6 | 2.2 | 61.4 | 128 | 13 | 89.9 |
| | 2 | 61.9 | 11.1 | 27.0 | 126 | 25 | 80.2 | 6.5 | 1.7 | 73.8 | 173 | 19 | 89.0 |
| | 3 | 66.6 | 9.1 | 24.2 | 165 | 41 | 75.2 | 5.5 | 1.3 | 76.4 | 142 | 17 | 89.1 |
| | **Total** | **66.8** | **12.8** | **20.3** | **404** | **84** | **79.3** | **5.9** | **1.6** | **72.9** | **443** | **49** | **89.3** |
| **ratak** | 1 | 73.9 | 14.5 | 12.1 | 124 | 19 | 87.3 | 6.4 | 13.2 | 106.2 | 89 | 14 | 84.3 |
| | 2 | 77.5 | 1.3 | 21.2 | 151 | 29 | 74.8 | 6.2 | 7.9 | 27.5 | 194 | 12 | 88.5 |
| | 3 | 73.0 | 6.9 | 20.0 | 115 | 29 | 74.8 | 5.2 | 6.0 | 15.4 | 99 | 13 | 86.9 |
| | **Total** | **74.9** | **7.2** | **17.9** | **390** | **84** | **78.5** | **6.0** | **8.5** | **41.6** | **292** | **39** | **86.7** |
| **Control** | 1 | 76.4 | 3.1 | 20.5 | 12.7 | 115 | -9.5 | 7.1 | 4.7 | 33.0 | 126 | 115 | 8.8 |
| | 2 | 80.4 | 5.1 | 14.5 | 138 | 129 | -6.6 | 5.8 | 5.7 | -1.7 | 89 | 93 | 4.5 |
| | 3 | 70.2 | 8.5 | 21.2 | 141 | 153 | +8.5 | 6.4 | 6.1 | -4.7 | 95 | 85 | 10.5 |
| | Total | **65.0** | **5.7** | **18.3** | **406** | **397** | **-2.2** | **6.4** | **5.5** | **14.0** | **310** | **296** | **14.5** |
| | G.Total | 72.4 | 8.6 | 19.0 | 1200 | 565 | 52.9 | 6.1 | 3.1 | 49.2 | 1045 | 384 | 63.2 |

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# حصر ومكافحة القوارض وطفيلياتها الخارجية تحت الظروف الحقلية في محافظة اسيوط

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تهدف الدراسة الى استخدام المواد المدخنة (Fumigation pesticides) داخل جحور القوارض بهدف مكافحة القوارض وطفيلياتها الخارجية وخاصة البراغيث على اعتبار انها من اهم ناقلات الامراض الوبائية للانسان والحيوان مقارنة بالمبيدات المانعه للتجلط التى تستخدم على صورة طعوم سامه خارج جحور القوارض وحول الجحور النشطة.

تم اختيار التجربة فى 9 قطع تجريبية كل منها حوالى ثلاثة افدنة يفصلها طرقات وحواجز طبيعية وذلك عقب حصاد محصول القمح خلال عام 2012 وتم تقدير كثافة الجحور النشطة فى كل قطعه كذلك تم قياس الكثافة العددية بواسطة المصايد وايضا النسبة النوعية لكل نوع من القوارض وكذلك معاملة ثلاثة قطع تجريبية عشوائيا بمادة الفوستوكسين Fosotxeen على صورة اقراص وضعت فى جحور القوارض النشطة وتم اغلاقها معلمة بالجير المطفأ كمادة تميز الارض وتم معاملة الثلاث قطع الاخرين بطعوم سامه من مادة الرتاكRatak كمبيد مضاد للتجلط وترك الثلاثة قطع البينية بدون معاملة control واعطت التجربة النتائج الاتية:

اظهرت النتائج المتحصل عليها:

من حصر انواع القوارض وجد انها ثلاثة انواع وهى جرذ الحقل النيلى والجرذ ذى البطن البيضاء (جرذ النخيل) والجرذ ذو البطن الرمادى( الجرذ السكندري) مع اعلى كثافة لجرذ الحقل النيلى ومن دراسة انخفاض التعداد فى القوارض وجد ان نسبة الخفض فى المعاملة الاولى 79.3% وفى المعاملة الثانية 78.5% اما فى حال الكونترول فكانت 2.2% من دراسة انخفاض كثافة البراغيث وجد ان المعاملة الاولى كانت 72.9% والمعاملة الثانية اعطت زيادة بنسبة 41.6% ويعزى ذلك الى موت الفئران مع عدم موت البراغيث اما المعاملة الثالثة فكانت 14.00% ومن دراسة الجحور النشطة وجد ان المعاملة الاولى اعطت انخفاض قدره 89.35% والمعاملة الثالثة اعطت خفض 86.7% فى حين ان الكونترول اعطت خفض بما يعادل 14.5%.

من النتائج السابقة يمكن القول بان استخدام المدخنات فى جحور القوارض يؤدى الى مكافحة القوارض والبراغيث اما استخدام الطعوم من مضادات التجلط اعطت نسبة خفض فى كثافة القوارض فقط كمبيدات متخصصه لمكافحة القوارض لذلك نوصي باستخدام طريقة المدخنات لمكافحة القوارض وطفيلياتها معا.