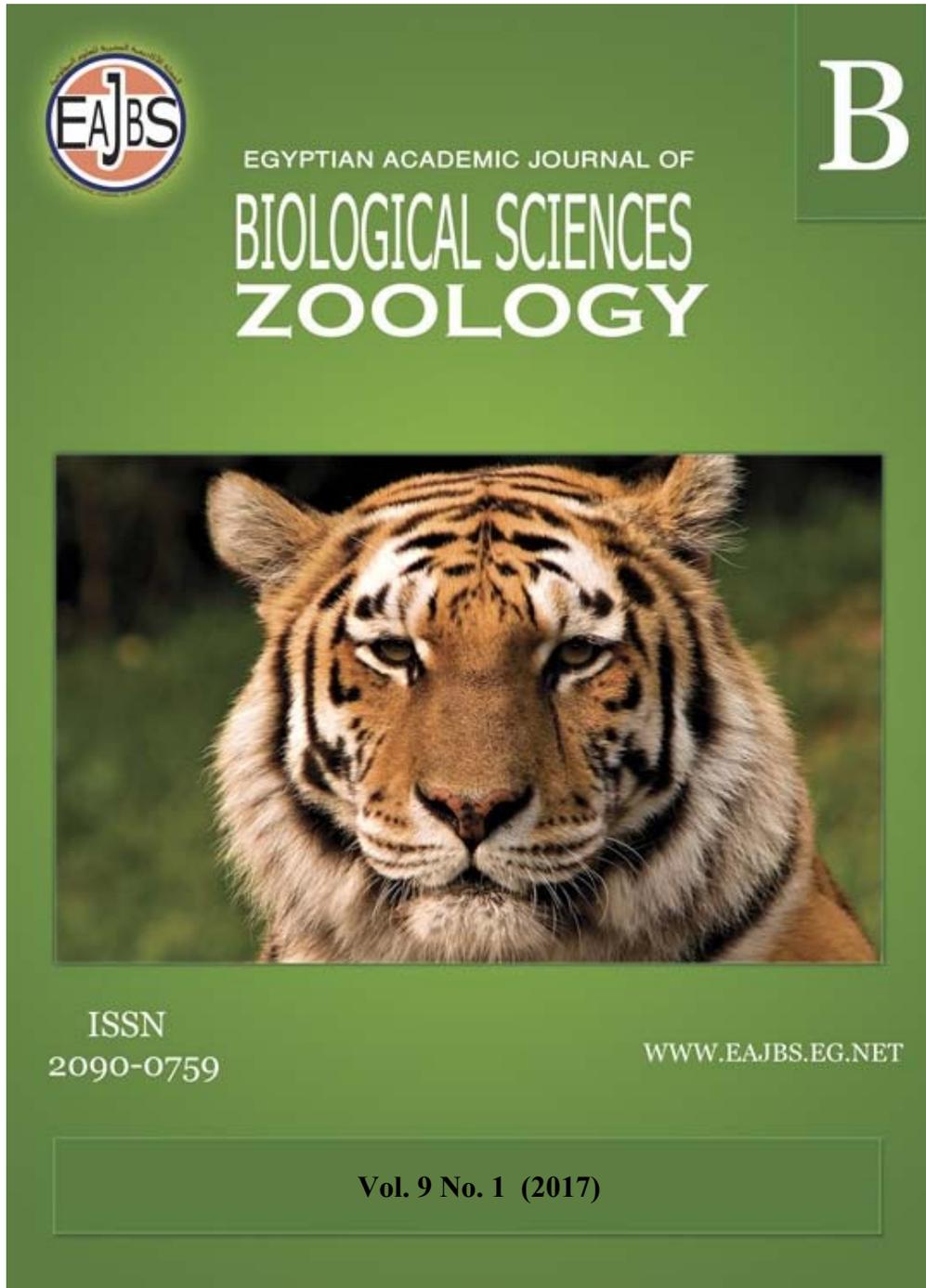


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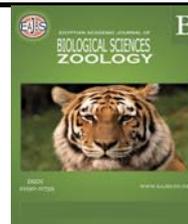


Egyptian Academic Journal of Biological Sciences is the official English language journal of the Egyptian Society of Biological Sciences, Department of Entomology, Faculty of Sciences Ain Shams University.

The Journal publishes original research papers and reviews from any zoological discipline or from directly allied fields in ecology, behavioral biology, physiology & biochemistry.

www.eajbs.eg.net

Citation: *Egypt. Acad. J. Biolog. Sci. (B. Zoology) Vol. 9(1)pp33-42 (2017)*



Survey of Rodent Species at Three Habitats and Control it by Use Change Base Carrier of Zinc Phosphide bait Technique in Sohag Governorate

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ARTICLE INFO

Article History

Received:20/1/2017

Accepted: 10/3/2017

Keywords:

Rodent Species , Control, Zinc Phosphide bait, Sohag Governorate

ABSTRACT

Rodent cause major economic losses in man food item and often hinder production also, inflict health to people and live-stock in villages. Sohag one of the upper Egyptian Governorates is similarity in weather, agriculture and housing structure and lifestyle. Rodent species survey and calculate density in three different habitats to know the distribution shape and number development beside use change the base carrier of zinc phosphide bait technique when use more time to increase effectiveness in rodent control programs. Five species at family Muridae recorded in Akhmim district (Sohag Governorate) through 2014-2016 in the tested habitats, *R. rattus*, *R. norvegicus*, *A. niloticus*, *A. cahirinus* and *M. musculus*. The average number of all rodent species at two years was 689 rats and mice, 187.5 in field crops, 180.5 in vegetable city market and 321 in countryside village. Each habitat are discrimination of one specie, *A. niloticus* in field crops, *A. cahirinus* in countryside village and *M. musculus* in vegetable city market. *R. rattus* and *R. norvegicus* spread in the three habitats, *R. norvegicus* the predominant species in field crops only and *R. rattus* in other two habitats. The highest density of all recorded species was during spring then summer, whereas autumn and winter respectively .Using technique food base carrier at zinc phosphide bait 0.5% change in the next application after 15 delayed to increase the population reduction of rodent to 88.2 % and 84.6 % when change maize bait by wheat bait compared with applied the same food carrier of crushed maize over once after 15 day the reduction were 69 % and 71.7 % in countryside village and field crops respectively. The bait shyness of zinc phosphide reduce with change food bias carrier in the next application after 15 day the bait intake were (135 and 147 (g)) compared apply the same first bait after 15 day, bait intake were 22 and 26 g to each countryside village and field crops respectively.

INTRODUCTION

Rodents are cosmopolitan in their distribution and they constitute the largest group of mammals represent nearly 40%, of all mammals living at the present time Bajomi (1982). Hoogstral *et al.*, (1963) surveyed 51 species of rodent in Egypt, belonged to sub-order; Myomorpha, eleven species fall under family Muridae, sub-family; Murinae (genera: *Arvicanthis*, *Rattus*, *Acomys*, *Mus* and *Nesoke*) are domestic and commensal animals found abundance, while five families are low abundance in desert and semi-desert. Many researchers found in Upper Egypt, Beni-Suif, El Minia, Assiut, Sohage and Qena Governorates the dominant rate species were, *R. norvegicus*, *R. rattus*, *A. cahirinus* *A. niloticus*, *M. musculus*, *Geribilus spp.* and *Juculus spp.*

The dominant species and density related to habitats, crop installation, nearly reclamation land and abundance shelter and food and seasons, Hussein (1991); El-Deeb and Lokma (1992); Emborak (1997); Abazzid (1990) and Salit *et al.*, (1982)

In spite of using zinc phosphide in rodent control up to day, bait shyness phenomenon appear after use zinc phosphide once and hinder the use of another time through the short time. Many studies have been applied to overcome this problem. Gabr and Rizk (2010), minimize the concentration of zinc phosphide up to 0.25% and 0.125% with addition octylonium bromide to enhance bait intake and mortality against *R. norvegicus*. Also, use pre-baiting technique in rodent control increase the bait intake and mortality also adding some oils or flavor as zinc phosphide mask, Bhardway and Rhan (1979). So, addition antispasmodic agent lead to prevent the pain resulting from zinc phosphide which cause bait shyness later, as spasmomen drug (EL-Deeb *et al.*, 201). This study aims to survey the rodent species and density in different habitats, field crop; vegetable city market and countryside village in Akhmim district, Sohag Governorate and control them by change food bias carrier of zinc phosphide bait technique to overcome the bait shyness and increase the population reduction .

MATERIALS AND METHODS

In this work three habitats, field crops; countryside village and vegetable city market, Akhmim district, Sohag Governorate were tested to survey the rodent species through 2014 - 2016 and control this rodent.

Tested habitats

Field crops: Zone of field crops 50 feddans existing in the old Nile Delta planted with wheat, clover, maize, sun flour and sugarcane which immersion irrigated by canals and banks were tested in this study. Lengthways canal and banks growing herbs, spread remnants plant and junk piles. In the head of each field can you viewing straw hut and clay corrals. Annually, the agriculture operation and service field applied twice or three time a year, cultivate and hoe, sandal plants, fertilization and control pests. Three feddans representative this zone was chosen to survey the rodent species and two plots, 2 feddans to controlling in two zones.

Countryside village: The tested village zone was 25 feddans approximately, near the agriculture fields and the Nile River, component of streets and residential builder. The major houses consisting of one to three floors armed concreted and the last floor roofed wood and palm fronds. On the roof rear poultry and pigeons, with storage some field products. The cattle and sheep rearing places were one room of house or near it. One plot nearly, two feddans including 23 houses were chosen to survey rodent and two plots at rodent control.

Vegetable city market: City market is wholesale market in Akhmim only were street including, shops, curtain of stoke and peddler. The different fruits and vegetable i.e., tomato cucumber, pepper, strawberry, onion, mango, grape and date bring from many fields sackcloth or plastic bag and frond or plastic cages then storage for sale. All the market was chosen to survey and record density of rodent species.

Tested bait : Two type of zinc phosphide bait 0.5 and non-poison bait prepared to this test as following .

A- The first 65 (g) crushed maize + 25 (g) ground maize + 5 (g) sugar + 5 (g) corn ail + 0.5 (g) zinc phosphide

B- The second: 65(g) broken wheat + 25 (g) ground wheat + 5 (g) sugars + 5 (g) vanilla + 0.5 (g) zinc phosphide .

C- Non poison bait: 65(g) sorghum + 5 (g) ground soya bean + 5(g) sugar+5(g) Soya bean oil

Zinc phosphide 94% (Zn₃ P₂) is an acute rodenticide obtained from K.Z. Company .

Experiments:

Survey and population density rodent species:

In all tested habitats for two years beginning Sept. 2014 to Aug. 2016, monthly fifty wire box traps, with spring door were used for three successive nights. Baited traps distributed in field crops on canals, banks and head field near rodent run ways each 10m in the chosen plot. In the street of countryside village, baited traps distributed beside wall and around reaming pals of animals and skylight to each 15 m also, 2 traps to each roof. In vegetable city market distributed in street, shops and around curtain of stock each 10m. Traps baited daily at 6 p.m. with tomato slices. Next morning traps were checked, recorded and captured rodent were identified, sexed and transferred to the basement home prepared as laboratory to reaming rodent species at Akhmim district. Relative abundance of the different species was estimated as well as rodent index, (average number of rodents / trap / night).

Controlling taste :

Two plots to each field crops and countryside treated pre-treatment with non-poison bait 200 (g) distributed in plastic pipe, (a length of 50 cm and 2.5 inches in diameter) each 15m. and inside all component for each plot for five successive days, weight daily the total amount of left and compensating the weight loss. The largest daily amount of non-poisoned bait was used as an index of the population size. The first bait of crushed maize 0.5% of zinc phosphide was distributed in the same plastic pipe for 2 days and amount of consumed bait was recorded. After seven days from the removing of the poison, the same baiting described for the pre- treatment census was run as index, to post-treatment, the percentage of population reduction was calculated. After 15 days the same poisoned bait used in one plat of each tested zones and the other plats treated with the second poisoned bait (broken wheat 0.5% zinc phosphide) and the post treatment census index account as same way previous. The population reduction was calculated as the following equation (EL-Deeb *et al.*, (1985).

Rat population reduction = %

$$\frac{\text{Pretreatment consumed} - \text{Post-treatment consumed}}{\text{Pretreatment consumed}} \times 100$$

RESULTS AND DISCUSSION

Survey and population density of rodent species:

Through two years 2014-2016, rodent species surveyed in Akhmim district, Sohag Governorate and the population density were account, where, most of the lands planted with crops and immersing irrigate. The countryside village approach from agriculture land and many farm animals breeding in houses. Surveying rodent species in these habitats showed that, five species were found in all habitats, the Nile grass rat, *Arvicanthis niloticus*; Roof rat, *Rattus rattus* and Wild Norway rat, *Rattus norvegicus* recorded in field crop. While, *A. niloticus* was absent in countryside village and Spiny mice, *Acomys cahirinus* instead of it. But, Hous mouse *Mus musculus* recorded in vegetable city market beside *R. rattus* and *R. norvegicus*. All record species belonged to sub-order: Myomorpha, Family Muridae, rodent identified according to **Osbron and Helmy (1980)**.

Field Crops habitat:

The obtained data in Table (1) clear that *R. norvegicus* the predominate rat in field crops habitat, 121 and 123 rats followed by *R. rattus* 44 and 39 rats then *A. niloticus* 26 and 22 rat in 1st and 2nd years respectively. The highest density of *R. norvegicus* were, 15 rat (9 male and 6 female) and 16 rat, (11 male and 5 female) in Aug. then recorded the lowest density, 3 rat in Mer. (3 male only) and (1 male and 2 female) to each tested year respectively. *R. rattus* record the highest number, 6 rats in Apr. and May in the tested years, then the count were lowest through Nov. and Dec. 1 male or female respectively. While *A. niloticus* reached to peak 5 rat (3 male and 2 female) in Apr. and disappear through many months from Nov. to Mar.

Table 1: The monthly numbers of rodent species trapped from field crops through Ago.2014 to Ago.2016.

Months	2014									2016								
	<i>R. norvegicus</i>			<i>A. niloticus</i>			<i>R. rattus</i>			<i>R. norvegicus</i>			<i>A. niloticus</i>			<i>A. niloticus</i>		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Aug.	9	6	15	2	0	2	4	1	5	11	5	16	0	0	0	4	1	5
Sept.	7	7	14	0	2	3	1	1	2	8	6	14	2	1	3	1	1	2
Oct	8	6	15	1	1	2	1	1	2	8	5	13	1	2	3	1	1	2
Nov.	8	4	12	1	0	1	2	0	2	10	3	13	0	0	0	0	0	1
Dec.	5	4	9	0	0	0	0	1	1	4	5	9	0	0	0	0	0	1
Jan.	4	5	9	0	0	0	2	1	3	4	3	7	0	0	0	3	1	4
Feb.	3	2	5	0	0	0	1	3	4	3	3	6	0	0	0	1	1	2
Mar.	3	0	3	3	0	3	4	2	6	1	2	3	2	0	2	2	3	5
Apr.	6	2	8	3	2	5	5	1	6	6	3	9	3	2	5	3	1	4
May	7	3	10	3	1	4	3	2	5	4	7	11	3	1	4	6	0	6
Jane	8	2	10	3	1	4	3	1	5	4	6	10	3	0	3	2	2	4
July	6	5	11	2	0	2	3	0	3	7	5	12	1	1	2	3	0	3
Total	75	46	121	17	7	26	30	14	44	70	53	123	15	7	22	28	11	39
Average	6.3	3.8	10.1	1.5	0.8	2.2	2.5	1.7	3.7	5.8	4.4	10.3	1.3	0.6	1.8	2.3	0.9	3.3

The average total number of three rodent species through two years summarized in Table (2) and Fig. (1) and the number of species were 187.5, (56.5, 56.5, 43.5 and 31 animals to summer, spring, autumn and winter), respectively.

Table 2: Average seasonal numbers of rodent species through 2014-2016 in field crops.

Season	<i>R. norvegicus</i>	<i>A. niloticus</i>	<i>R. rattus</i>	Total
Summer	40.5	6	10	56.5
Autumn	36	3	4.5	43.5
Winter	16.5	2.5	1.2	31
Spring	2.9	12.5	15	56.5
Total	122	24	41.5	187.5

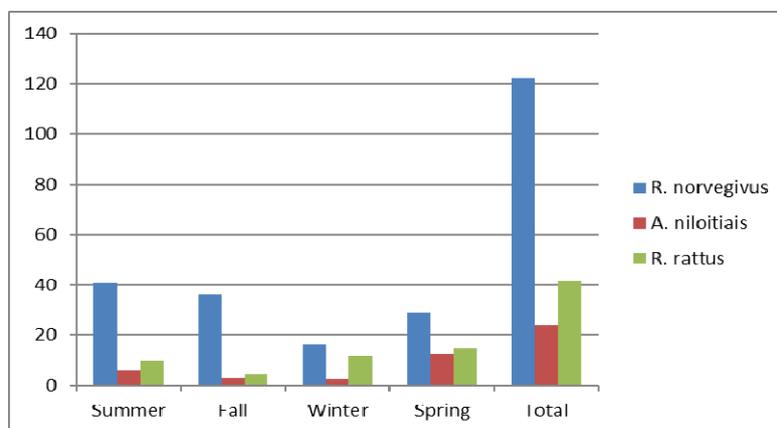


Fig. 1: Average seasonal numbers of rodent species through 2014-2016 infield crops.

The peak number of *R. rattus* 15 rat and *A. niloticus* 12.5 rat recorded through spring compared with *R. norvegicus* 36 rat in summer. The number of *A. niloticus* and *R. rattus* reduce 12 and 16 rat in autumn to each species compared of *R. norvegicus* 16.5 rats in winter.

Countryside village:

Data in Table (3) showed that through the tested years *R. rattus* was dominant species 152 and 179 rat and *R. norvegicus* recorded 123 and 132 rat, then the lowest density 23 and 33 nice to *A. cahirinus* tow each year respectively. In first year the greatest number of *R. rattus* were 21 rat, 10 male 11 female record in Aug. and 16 rat of *R. norvegicus* in Jun. and Aug. (8 male and 8 females), (10 male and 6 females) to each month and 5 nice of *A. cahirinus* in May 3 male and 2 female.

Table 3: The monthly numbers of rodent species trapped from countryside village through Ago. 2014 – Ago.2015.

Months	2014									2015								
	<i>R. rattus</i>			<i>R. norvegicus</i>			<i>A. cahirinus</i>			<i>R. rattus</i>			<i>R. norvegicus</i>			<i>A. cahirinus</i>		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Aug.	10	11	21	10	6	16	0	0	0	19	6	24	25	6	18	0	0	0
Sept.	8	8	16	7	5	12	3	0	3	11	6	17	5	7	12	1	3	4
Oct.	4	9	13	8	4	12	3	1	4	7	6	13	9	5	14	2	2	4
Nov.	3	8	11	10	3	13	1	1	2	8	6	14	10	4	14	0	0	0
Dec.	5	4	9	4	1	5	0	0	0	6	4	10	3	1	4	2	0	2
Jan.	3	3	6	2	0	2	0	1	1	5	4	9	3	0	3	2	1	3
Feb.	5	2	7	2	0	2	0	1	1	5	2	7	2	0	2	1	1	2
Mar.	8	3	12	6	2	8	2	0	2	8	4	12	3	4	7	0	2	2
Apr.	9	6	15	8	3	11	3	1	4	7	6	13	8	4	12	2	1	3
May	10	5	15	6	6	12	3	2	5	12	6	18	9	5	14	3	2	5
June	7	5	13	8	8	16	1	0	1	12	8	20	10	6	15	4	1	5
July.	7	7	14	8	6	14	0	0	0	13	8	21	10	6	16	2	0	2
Total	80	71	152	79	44	123	16	7	23	114	65	149	84	48	132	19	13	33
Average	6.6	5.9	12.6	6.5	3.6	10.2	1.3	0.5	1.9	9.5	4.4	14.9	7	4	11	1.6	1.1	2.7

The density of rodent species differ through year months and reach to the lowest in Jan. 6 rates of *R. rattus* (3 male and 3 female); 2 male only to *R. norvigicus* in Jan. and Feb., and Once of *A. cahirinus* in Jan, Dec. and Jul. The same pattern of rodent species density occur in the second year the maximum numbers to *R. rattus* and *R. norvegicus* recorded in Aug., (25 rat, 19 male and 6 female) and (18 rat, 12 male and 6 female) to each species respectively, and 5 nice of *A. cahirinus* in May and June, (3 male and 2 male, (4 male and 1 female) to each month. So, the minimize number record through Feb. 7 rat, 5 male and 2 female to *R.rattus* decreased to 2 males at *R. norvigicus* and zero mice in Aug. and Nov. at *A. cahirinus*. Table (4) and Fig. (2) revealed that the average density of total rodent species thought two tested years 321 animals, 99 in spring; 105.5 in summer; 72 in autumn and 44.5 in winter.

Table 4: Average seasonal numbers of rodent species through 2014-2016 in countryside villages.

Season	<i>R. rattus</i>	<i>R. norvegicus</i>	<i>A. chairinus</i>	Total
Summer	57	44	4.5	105.5
autumn	35	31	6	72
Winter	26.5	12	6	44.5
Spring	47	40.5	11.5	99
Total	165.5	127.5	28	321

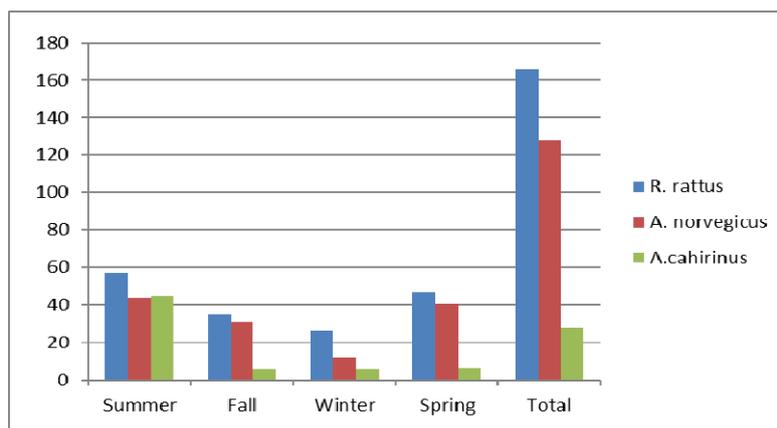


Fig. 2: Average seasonal numbers of rodent species through 2014-2016 in countryside village.

The peak number of *A. cahirinus* was 6.5 mice in spring and 57 and 44 rats at *R. rattus* and *R. norvegicus* through summer respectively. Also the lowest density of *A. cahirinus* were summer (4.5 mice) while *R. rattus* and *R. norvegicus* record the lowest number through winter 26.5 and 12 rats to each species respectively. Abdel-Azeem (2008) found that in house *R. rattus* recorded the predominant in El-Ibrahemia district, Sharkia Governorate and the maximum number of total rodent species was (69 and 56 obtained in August 2005 and 2006, respectively), while the minimum number was (13 and 9) recorded in March 2005 and 2006, respectively.

Vegetable city market:

Data in Table (5) showed that the dominant rate were *R. rattus* 112 rats, 81 male and 37 females in the first year. The highest number, 14 rats in Sep. (12 male and 2 female) and the lowest number recorded in Jan. 5 rats, (4 male and 1 female).

Table 5: The monthly numbers of rodent species trapped from vegetable city market through Aug. 2014- Aug. 2016.

Months	2014									2016								
	<i>R. rattus</i>			<i>R. norvegicus</i>			<i>M. musculus</i>			<i>R. rattus</i>			<i>R. norvegicus</i>			<i>M. musculus</i>		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Aug.	9	3	12	6	0	6	0	3	3	7	3	10	4	2	6	3	1	4
Sept.	12	2	14	2	1	3	1	1	2	8	4	12	2	0	2	2	0	2
Oct	9	1	10	2	0	2	0	1	1	7	4	11	1	0	1	0	1	1
Nov	8	0	8	2	2	4	0	0	0	5	1	6	3	0	3	0	0	0
Dec	6	2	8	2	1	3	0	0	0	7	1	8	2	2	4	1	0	1
Jan	4	1	5	2	0	2	0	0	0	4	1	5	1	1	2	0	0	0
Feb	5	2	7	1	0	1	0	1	1	4	0	4	0	1	1	0	0	0
Mar	4	4	8	1	1	2	2	1	3	6	3	9	2	1	3	0	0	0
Apr	6	5	11	1	1	2	2	0	2	7	5	12	3	0	3	2	2	4
May	8	3	11	6	1	7	2	1	3	7	6	13	5	2	7	2	0	2
Jan	5	3	8	4	4	8	1	0	0	7	3	10	4	4	8	1	1	2
Jul	5	6	10	7	3	10	1	0	0	10	4	14	7	4	11	1	0	1
Total	81	37	112	36	14	50	10	8	16	97	35	114	34	17	51	12	5	17
Average	3.2	2.5	9.3	1.6	1.8	4.2	0.8	0.5	1.3	6.7	2.9	9.6	2.8	1.4	4.2	1	0.4	1.4

R. norvegicus comes in second the density, (50 rats, 36 male and 14 female) through Jul. the count rat record the highest number 10 rats, (7 male and 3 females) and lowest count were 7 rats in Sep. only male. The population density of *M. musculus* were 16 mice, 10 male and 6 females and the number did not exceed 3 mice through Aug., Mar. and May. The second year *R. rattus* record the highest count (114 rats, 79 male and 35 female) then *R. norvegicus* (51 rats, 34 males and 17 female) and *M. musculus* (17 mice, 12 male and 5 females). The highest number was 14 and 11 rats in Jul to *R. rattus* and *R. norvegicus* respectively but *M. musculus* record 4 mice through Aug. The lowest count to *R. rattus* was 4 rats in Feb. and one rat to *R. norvegicus* in

Feb. and Oct. Also; *M. musculus* did not record through many months .The average seasonal density for three rodent species in two years showed in Table (6) and Fig. (3) Data indicate that the average number of species were 180.5 animals arranged in descending order spring 57, 5, summer 60.5, autumn 35.5 and winter 27 animals. The highest numbers of *R. rattus*, *R. norvegicus* and *M. musculus* were 35.5, 19in summer and 7.5 in spring and reduce to minimum in winter, (19.5 and 5.5 animal) one animal in fall to each species respectively. The minim number of *M.musculus* and fluting numbers paralyze with vegetables marketing and transport randomly of vegetable packages. The seasonal abundance of rodent number recorded by El Kady *et al.*, (2007) and clear that the number of rodent species ware 52 in spring, 27 in summer,39 in autumn and 17in winter and most dominant rat was *R. rattus* the *R. norvegicus* and *M. musculus* through 2007 in Talkha Center, Dakahlia Governorate.

Tab 6: Average seasonal numbers of rodent species through 2014-2016 in vegetable city market.

Season	<i>R. rattus</i>	<i>R. norvegicus</i>	<i>M. musculus</i>	Total
Summer	35.5	19	6	60.5
Autumn	35.5	8.5	1	35
Winter	19.5	5.5	2	27
Spring	32.5	17.5	7.5	57
Total	113.5	50,5	16.5	180.5

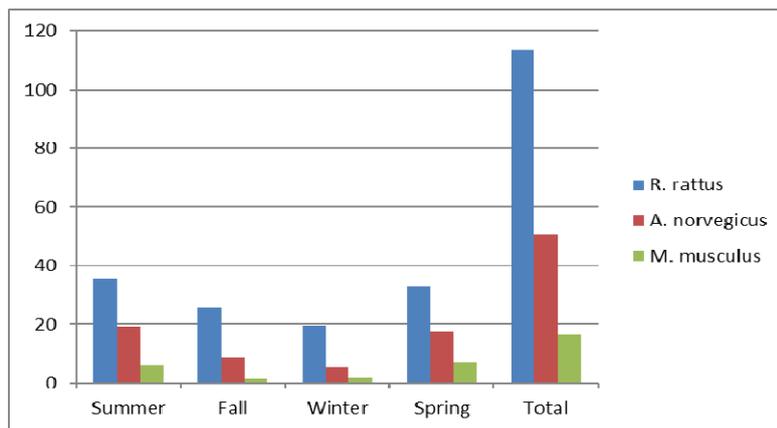


Fig. 3: Average seasonal numbers of rodent species through 2014-2016 in vegetable city market.

Results in Fig. (4) Revealed that, smallest density of rodent species record in vegetable city market then field crops because the continuous movement of the package and the events rodent of concern to them in vegetable city market. Also, the agricultural operation, serve crops and the relative use of rodenticide in field crops. But absent these reasons, with abandons food and shelter in countryside village increase rodent number. The density of rodent species was 180.5, 187.5 and 321 animals to each habitat respectively. Hegab *et al.*, (2006) clear that the houses gave the highest value of rodent number (192) followed by the citrus farm (51) and the granaries (42) in Sharkia Governorate. Generally the obtained results revealed that each habitat discrimination of one specie, *A. niloticus* in field crops, *A. cahirinus* in countryside village and *M. musculus* in vegetable city market. Wheal *R. rattus* and *R. norvegicus* spread in the three habitats, *R. norvegicus* the predominant species in field crops only and *R. rattusin* other tested habitat. The distribution and rat or mice abundance related to food and living behavior of species beside abundance food and shelter in zones. Males were more abundant than females for all species in three zones and in major months .

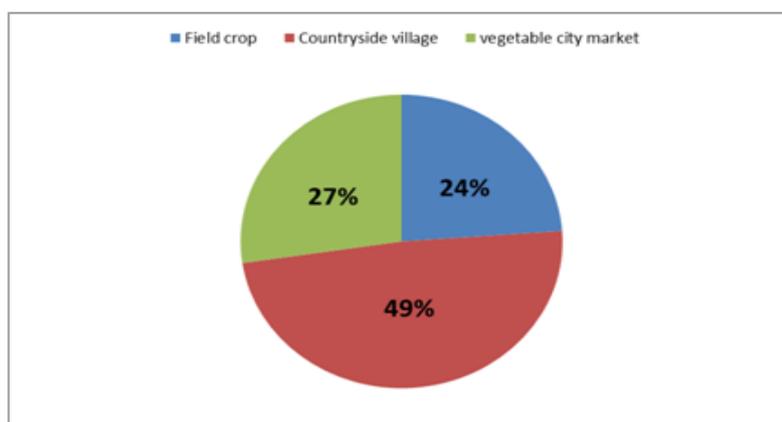


Fig. 4: The density of rodent species in vegetable city market

Efficiency of change food basis at zinc phosphide to rodent control:

Bait shyness consider major problem in zinc phosphide control because individual clan avoid zinc phosphide baits or food basis (food carrier) without poison after use bait once a long period. So that the first bait, zinc phosphide bait type 0.5% (carrier food, crushed maize, grand maize, sugar, corn oil) changed by the second bait type 0.5 % zinc phosphide (carrier food broken wheat, ground wheat, sugar, vanilla) in countryside village and field crops and the obtund data illustrated in table (7 and8) . Data in Table (7) clear that the population of rodents reduce to 63.6 % and 62.3% after use the first bait once.

Table 7: Effect of use the same bait base carrier of zinc phosphide 0.5% bait over ones against rodent species after 15 days .

Treatments habitats	Bait consumption (g)			% Population reduction	Bait consumption		% Population reduction	
	Pre- treatment	Treatment I	Post- treatment		Treatment II after 15 day	Post- treatment		
Countryside village	1053	651	358	66%	22	322	10%	69%
Field crops	1012	611	322	68%	26	286	11%	71.7%

While reduction percentage were 10 and 11 when the same bait used after 15 days from treatment and the final reduction were 69 % and 71-7% to each zone respectively. Anther hand data in Table (8) showed that, the first bait cause 63.6% and 62.3% reduction at rat population. While the population reduction were 67.6 and 59% when the first bait change with second bait after 15 days and the final reduction were 88.2% and 84.6% to each zone respectively.

Table 8: Effect of change food base carrier of zinc phosphide 0.5% bait in the next time against rodent species after 15 days.

Treatments habitats	Bait consumption (g)			% Population reduction	Bait consumption		% Population reduction	
	Pre- treatment	Treatment of maize bait	Post- treatment		Treatment of wheat bait after 15 day	Post- treatment		
Countryside village	1145	664	417	63.6%	173	135	67.6%	88.2%
Field crops	957	536	361	62.3%	182	147	59.3%	84.6%

Reordering to the previous results clear that using the same bait of zinc phosphide over once decrease the population reduction at a lower rate 10 and 11% cause the bait shyness confer with changed the bait basis in the next time the population reduction were 67% and 59.3%. Luke *et al.*, (2007) found the mean bait

uptake of zinc phosphide bait was increased by 55% through replacing maize with rice as the bait against rodent in Cambodia.

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ARABIC SUMMERY

حصر انواع القوارض فى ثلاث بينات بمركز اخميم محافظه سوهاج ومكافحتها باستخدام تكنيك تغيير ماده الحامله لفوسفد الزنك ٥٠%

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نظرا لما تسببه القوارض من خسائر اقتصاديه وفقد لغذاء الانسان وما قد ينتج عن نشاطها وسلوكها من توقف العماليات الانتاجيه من ناحيه وتأثيرها على الصحه العامه والحياه البريه من ناحيه فقد تم حصر انواع القوارض بمركز اخميم محافظه سوهاج كاحد المحافظات الممثله لمحافظة الجنوب المصرى المتشابه فى المناخ والتنوع الزراعى وشكل الابنيه السكنيه ونمط الحياه لمعرفه كثافتها وشكل توزيعها وتحركها ومكافحتها باستخدام تكنيك تغيير ماده الطعم الحامله لفوسفيد الزنك للتغلب على ظاهره النفور من الطعم وامكانيه استخدامه اكثر من مره فى برامج المكافحه . ولقد اوضحت النتائج المتحصل عليها خلال عامين فى الفتره من اغسطس ٢٠١٤ الى اغسطس ٢٠١٦ وجود خمس انواع تنتمى لعائله العضلان وهى الفار المتسلق *R. rattus* والفار النرويجى *R. norvegicus* والفار النيلى *R. niloticus* والفار الشوكى *A. cahirinus* وفؤيره المنازل *M. musculus* حيث كان متوسط الكثافه خلال سنتى الدراسه ٦٨٩ فار وفؤيره منهم ١٨٧ فى الحقول و٣٢١ فى القرى الريفيه و١٨٠٥ فى سوق خضر المدينه وتميزت كل بيئه بنوع واحد فقط الفار النيلى فى البيئه الحقلية والفار الشوكى فى بيئه القرى الريفيه وفؤيره المنازل فى بيئه اسواق الخضر بالمدينه على حين تواجد الفار المتسلق والنرويجى فى البيئات الثلاثه . ولقد ادى استخدام تكنيك تغيير ماده الحامله لطعم فوسفيد الزنك ٥٠% عند الاستخدام التالى بعد ١٥ يوم الى خفض التعداد بنسبه ٨٤٦ و ٨٨٢%مقارنه باستخدام نفس ماده الحامله فى المره التالى ٦٩ و ٧١٧%بعد ١٥ يوم كما تراجع ظاهره النفور من الطعم عند تغيير ماده الحامله حيث كان معدل الاستهلاك ١٣٥ و ١٤٧ جم مقارنه ٢٢ و ٦٢ جم عند استخدام نفس ماده الطعم فى بنتى الحقول والقرى الريفيه على الترتيب