J. Plant Prot. and Path., Mansoura Univ., Vol. 2 (10): 845 - 853, 2011

EVALUATION OF DIFFERENT CONTROL METHODS AGAINST RODENT SPECIES IN SOME FIELD CROPS AND DATE PALM TREES IN ASSIUT GOVERNORATE

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ABSTRACT

This study was aimed to use of some mechanical and chemical control methods to control rodent species in some field crops and date palm trees in the experimental farm of Al-Azhar University in Assiut. This study was carried out in the Wheat field as wintry crops and Maize as summary crop. The tested rodenticides were Zinc phosphide. Paraphenylenediamine (PPD) and Super caid. Mechanical control of date palm trees was done by aluminum sheet around the tree trunk, remove the weeds and destroy the rodent burrows.

Data in wheat field crop was shown that the decrease of the rodent infestation as 4.16% in zinc phosphide treatment while its was 3.39% in PPD and 2.15% in super caid treatment.

In maize crops the decrease was7.56% in zinc phosphide treatment, 4.55% in PPD and 4.11% in super caid. In date palm trees the decrease of the infestation was the highly percentage in aluminum sheet followed by zinc phosphide treatment 7.71% and 7.05%in case of PPD. The lowest decrease was in super caid 6.12% and 5.33%in the remove of weeds and destroying the rodent burrows.

Keywords*:* Paraphenylenediamine (PPD). Super caid. Zinc phosphide. Mechanical control

INTRODUCTION

After the 2nd world war, rodents started to be major pest especially in the developing counters including Middle East and petroleum countries. Since, there was tendency to avoid the application of chemicals for vector control in away to minimize environmental pollution. EL-Eraky *et al* (2000), study some mechanical control to measure the reducing of rodent population in date palm in Upper Egypt. Abdel-Gawad (2001), evaluate some chemical and mechanical methods to reduce rodent population in maize fields. SCCNFP (2002) Mentioned that acute toxicity of PPD has been investigated following oral, subcutaneous, intraperitoneal and topical application in a variety of species. The LD_{50} following oral administration was 80-100 mg/kg in the rat, 290 mg/kg in mice, 250 mg/kg in rabbit and 100 mg/kg in cats. Munday and Manns (1999), P-Phenylenediamine, together with several of its amino and alkyl derivatives, are known to be myotoxic in animals and man In the present study, it was found that 2-methoxy-p-phenylenedi-amine, a

component of oxidative hair dyes, similarly causes necrosis of skeletal muscle (gastrocnemius, diaphragm and tongue) in rat. Nozha *et al* (2006), Found in human been myocarditis induced by PPD poisoning leads to mortality in most cases, and this findings confirmed in autopsy until 2003 when the echocardiography was proposed for the first time to confirm the diagnosis of myocarditis, but what we can propose after the review of our second case is the angiocoronarography which gives more precise results concerning the aspect of the coronary vessels' abnormalities. Great effort should be done to develop rodent control programs. Control methods must be not fulfilling the requirement of protecting crops but also in a safe efficient and economic manner.

The present work was carried out to evaluate different methods in some untraditional materials as controlling rodents in wheat and maize as field crops and date palm as orchard crop.

MATEREAL AND METHODS

This study was carried out in Al-Azhar University Experimental Farm in Assiut during 2008/2009 and 2009/2010. The chosen district contained many hundred feddan cultivated with different field crops, vegetables and fruit trees, and also some sheep farms. There are many of irrigation, drainage canals, Faculty buildings and woodlands. To conduct this study three various areas were chosen every one two feddan surround with roods and irrigation canals. The first was cultivated with wintry crops (wheat), the second was cultivated with summary crops (maize) and the last one cultivated with date palm trees. Every area were divided into eight plots, each one was about 1/4 feddan (35×30 meters) for plots the first plot was treated with Zinc phosphide 2%, the second was treated with p-phenylenediamine (PPD) 4% and the third was treated with Super caid 0.005 %. The last was left without treatment as control.

The same pattern was used with the second area which cultivated with summery crop (maize). In the date palms area it was divided into sex groups each one was about 5 date palm trees which were chosen for tested mechanical and chemical control methods which carried out as follows. The first was carried out by destroying the burrows of rodent species and remove of the weeds and useless young trees. The second group was treated with aluminum sheet by rolling the sheets around the trees. The third group was treated with Zinc phosphide 2% by turned the rodenticide around the trunk trees. While the forth was treated with PPD and the fifth group was treated with Super caid 0.005 %. The last was left without treatment as control.

In every area the rodent species was determined before the treatment. Decrease of the rodent infestation was determined as follows.

Rodent survey

A: In the field crops, wheat and maize:

The samples of rodent infestation were taken from three distances 10, 20 and 30 meters from the edge or the irrigation canals. In every distance five samples were taken 50×50 cm. the infestation plants were counted as

percentage from the total examined plants, during three dates after 130 days from the wheat cultivation, 15 days between every sample and other.

The last sample was taken before one week from the harvest. In the maize the damage was determined by taken the samples 30 plants and determined the infested ear as percentage from total examined ears. The samples were taken during three dates after 75 days from the wheat cultivation, 15 days between every sample and other, and through two weeks before the harvest. This was in agreement with Korany (2006).

B: In the Date palms:

Damage was determined by taken infested clusters/total clusters in date palm trees.

Statistical analysis: All the obtained data were collected and statistically analyzed using Duncan's test for recognizing the significant among the tested treatments.

RESULTS AND DISCUSSION

Wheat:

The efficacy of chemical control on the infestation of plants/m^2 of wheat by rodents at different sampling dates and distances at Al-Azhar Univ. Exptl. Farm, Assiut, during 2009 and 2010 is shown in (Table 1).

Table (1): The efficacy of chemical control on the rodent infestation of wheat / m^2 at different sampling dates and distances.

Years of study	Sampling date (days)	Distance (m)												(2)Grand avg. Sampling date			(1)Grand avg. Years
		10.0 m				20.0 m				30.0 m							
		Treatment															
		C	Zn	PPD	S	C	Zn	PPD	S	C	Zn	PPD	S				
2009	10	4.18	1.41	1.19	1.93	2.35	0.45	0.43	0.60	1.86	0.00	0.31	0.46				2.92 A
	20	8.67	2.36	2.82	6.67	4.07	0.76	1.29	2.55	3.17	0.15	0.60	1.38				
	30	13.09	3.77	6.45	8.97	5.25	1.37	3.28	4.65	4.57	0.44	1.33	2.60	4.12 A	2.72 B	1.48 C	
2010	30	10.22	2.50	4.08	6.17	6.30	0.98	1.55	4.24	3.87	0.50	0.76	2.02				2.62 B
	20	8.24	1.51	3.73	4.36	4.97	0.65	1.09	1.72	2.68	0.31	0.61	1.01				
	10	4.99	1.02	1.89	3.42	3.26	0.51	0.77	1.41	1.83	0.00	0.45	0.73				
(3)Grand avg. Methods of control		5.20 A												2.77			
	Zn	1.04 D															
	PD	1.81 C															
		3.05 B															
(4)Grand avg. distance		4.73 A				2.27 B				1.32 C							

It is cleared from the obtained data that infestation of plants/m^2 of wheat by rodents was greatly affected by the application of chemical control of rodent. Averages of rodent infestation in wheat plant/m^2 were ranged from 5.20% in untreated area as to 1.04/m^2 of wheat in Zinc phosphide treatment. Controlling of rodent infestation by paraphenylenediamine and Super caid significantly was followed by reducing infestation of plants rather than the untreated treatment. The effectiveness at these means in controlling rodents could be arranged as follows in ascending order, using Super caid 3.05%,

paraphenylenediamine 1.81%, Zinc phosphide 1.04% while the untreated area 5.20%.

Application of Super caid gave the highest infestation compared to the other agents. The lowest rodent infestation 1.04% was recorded on areas controlled by using Zinc phosphide. Paraphenylenediamine gave a good data of rodent control than using Super caid, but not than using Zinc phosphide. In untreated area, the maximum rodent infestation 5.20% was recorded. In wheat field, it is advised to control rodents by using Zinc phosphide. There was significant different between untreated area and using Zinc phosphide as well as paraphenylenediamine and Super caid. Rodent infestation in untreated and treated of wheat crop was significantly affected by varying sampling date.

There was a gradually increase in rodent infestation in wheat plants with harvest progress. The maximum values 4.12% were recorded on 10 May. Followed by 25 April 2.72 % while the lowest infestation of wheat was recorded in 10 April 1.48%. The truth that feeding of rodent depends on the ripening stage of crops especially wheat could explain the present results.

As shown in (Table 1) rodent infestation of wheat plants was gradually decreased with increasing distance values from 10 to 30 m. The highest value 4.73% was recorded on wheat plants adjacent to rodent burrows at the ridge of the field. The lowest rodent infestation 1.32% was recorded at 30 m distance while the infestation in the case of 20 m was 2.27% infested plant/m^2. The average percentage infestation of Wheat plants gives a significant difference between tow years from study 2009 and 2010 it was 2.92% and 2.62% respectively. . These results are in agreement with data obtained by Abazaid (1997), Abdel-Gawad (2001) Embarak (1997), and Metwally et al (2008).

Maize

The rate of rodent infestation in maize in response to chemical control methods at different sampling dates and distances during 2009 and 2010 is given in (Table 2).

It is evident from the obtained data that varying methods of controlling rodents in the field was accompanied with changing infestation of ears of maize plants. Averages of rodent infestation areas to 5.48% ears /m^2 Zinc phosphide treatment different chemical control means significantly checked rodent infestation compared to non-treatment. Zinc phosphide of rodent gave the best control 5.48% followed by using paraphenylenediamine 8.49%and using Super caid ranked the last position in this respect with of Maize infestation by 8.93%.

Controlling rodent infestation by using Zinc phosphide was very effective than using Super caid. It is necessary for avoid rodent damage in maize plants by using chemical control method namely Zinc phosphide, meaning less difference on rodent infestation was detected between using Zinc phosphide and paraphenylenediamine.

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In general, it was observed from the previous results there was significant differences between all chemical control methods and non-treatment area as well as Zinc phosphide and paraphenylenediamine and between Zinc phosphide and Super caid, but there is no significant differences between using paraphenylenediamine and Super caid. Infestation of ears/m^2 of maize was varied among all dates of samples. Advancing maturity stage was followed by increasing infestation of ears/m^2 and the values were maximized 10 August 13.29%. Taking samples on 10 and 25 July resulted in infested 4.10% and 9.58 %ears/m^2 of maize, respectively. Significant differences on infestation by rodent in maize were obtained between the following dates of samples between 10 and 25 July, between 10 July and 10Agust, between 25 July and 10Agust. The great infestation on Maize with rodents was greatly associated with stage of maturity. Distance between burrows of rodents and the maize plants significantly governed the infestation and the damage caused by rodents. The adjacent plants to the burrows gave the highest value 15.71.% Values were tended to decrease with increasing distance between burrows and plants from 10 to 30 m. the lowest infestation of ears in Maize plants 2.71% was observed at the distance of 30 m. while the distance of 20m the percentage of rodent infestation in Maize plants 8.55%. These results are in agreement with data obtained by Abazaid (1997) and Abdel-Gawad (2001).

Data in (Table 2) showed that no significant difference between percentages of infestation in Maize ear plants was recorded in the two years of study 2009 and 2010 it was 8.84% and 9.14% respectively.

Date palm:

Data in (Table 3) showed the efficacy of mechanical and chemical control on the infestation of clusters/total clusters of date palm tree by rodent at Al-Azhar Univ. Exptl. Farm, Assiut district, during 2009 and 2010 seasons.

Table (3): The efficacy of chemical and mechanical control methods on the decrease of rodent infestation of Date palm.

Years		Methods of control						(1)Grand avg. Years
		C	Zn	S	PPD	Aluminum sheet	Mechanica	
2009		10.03	1.43	3.42	2.17	0.00	4.18	3.54 A
2010		8.03	1.21	2.41	1.63	0.00	3.22	2.75 B
(2)Grand avg. Methods of control		9.03 A						3.14
	Zn	1.32 C						
		2.91 B						
	PPD	1.89 C						
	luminum heet	0.00 D						
	lechanical	3.70 B						

Data concerning the effect of mechanical and chemical control clearly show that the infestation of clusters/total clusters of date palm tree by rodent was greatly varied among the means of control. The averages of infestation were ranged from 9.03% infested clusters/total clusters of date palm tree in untreated trees to 0.00% infested clusters/total clusters of date palm tree for

mechanical control methods (Aluminum sheet). Application of Zinc phosphide reducing rodent infestation in date palm trees it was 1.32% infested clusters/total clusters of date palm tree compared with the untreated trees. Low rodent infestation of clusters was observed in Paraphenylenediamine 1.89%, Super caid treatment 2.91% and mechanical control treatment (destroying of the rodent burrows, drawing out the young trees and weeds) 3.70% in descending order. One can state that, the mechanical control for rodents by Aluminum sheet under the field condition was more effective than the other mechanical and chemical methods its give complete protection in date palm trees. The maximum infestation rate 9.03% was recorded in untreated trees. Using Zinc phosphide was superior chemical application of the other chemical agent namely Paraphenylenediamine, Super caid controlling rodent infestation. Using Zinc phosphide, Paraphenylenediamine show promising effect on Protection of rodents compared to using Super caid compound in checking the infestation of rodents in date palm trees. While the mechanical control method (Aluminum sheet) was more preferable than the using of (The destroying of the rodent burrows, drawing out the young trees and weeds) it was 0.00% and 3.70% infested clusters/total clusters of date palm tree respectively. Data in (Table) shows the highest significant difference was recorded in untreated trees and all mechanical and chemical control methods, significant difference between Zinc phosphide, treatment and Super caid treatment, Zinc phosphide and Aluminum sheet treatment, Zinc phosphide and mechanical control treatment (destroying of the rodent burrows, drawing out the young trees and weeds)treatment, but there is no significant difference between treated with Zinc phosphide and Paraphenylenediamine, Super caid and mechanical control treatment (destroying of the rodent burrows, drawing out the young trees and weeds).

Data show the significant difference was recorded between rodent infestation in the two years of study 2009 and 2010, it was 3.54 and 2.75 infested percentage of total examined clusters. These results are in agreement with data obtained by Abdel-Gawad (2010).

Data in (Table 4) show that the average percentage of reduction in damage dates was 3.15 %.

Table (4):The percentage of reduction in damage due to rodent attack date palm after mechanical and chemical control methods under the field conditions.

Control methods	Weight of 100 date (gm)		
	Non-infest	Infest	% Rd
Control	1087.00	1029.00	5.33
Aluminum sheet	1073.20	1073.20	0.00
Zinc phosphide	1075.00	1050.00	2.32
PPD	1091.20	1063.80	2.52
Super caid	1163.00	1103.60	5.11
Mechanical	1060.40	1021.80	3.64
Mean	1091.63	1056.90	3.15

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مكافحة القوارض في بعض المحاصيل الحقلية ونخيل البلح في أسيوط

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الهدف من هذا البحث هو استخدام بعض الوسائل الكيماوية لمكافحة القوارض في بعض الحاصلات الزراعية حيث أخذ القمح كمحصول شتوي يعقبه الذرة الشامية كمحصول صيفى وكذلك استخدام بعض الوسائل الميكانيكية والكيماوية في مكافحة القوارض التي تصيب نخيل البلح في مزرعة كلية الزراعة جامعة الأزهر بأسيوط ولقد أستخدم لمكافحة القوارض في كل من القمح والذرة الشامية مركب البارافينيلين داي أمين (PPD) كمبيد للقوارض (غير تقليدي) مقارنة بكل من فوسفيد الزنك والسوبر كايد كمبيدات قوارض موصى بها تحت الظروف الحقلية.

كذلك استخدمت بعض الوسائل الميكانيكية مثل لف شرائح الألومنيوم حول جذوع النخيل وكذلك التخلص من الحشائش والخلفات غير الصالحة للتربية وتكسير الجحور حول أشجار النخيل .واستخدمت نفس المبيدات السابقة فى مكافحة القوارض التى تصيب أشجار النخيل وقد أعطت الدراسة النتائج التالية.

أولا: في حقول القمح والذرة الشامية.

أوضحت النتائج أن الخفض فى نسبة الإصابة الناتجة عن القوارض في حقول القمح كان مرتفعا في المناطق التي عوملت بفوسفيد الزنك حيث كانت نسبة الخفض 4.16%. في حين أن معدل الخفض في المعامل بمركب البارافينيلين داي أمين(PPD) 3.39%. ويليه السوبر كايد بنسبة 2.15%. وقد لوحظ أن معدل الخفض في الإصابة يقل تدريجيا كلما بعدنا إلي وسط الحقل. أما في حالة الذرة الشامية فكان معدل الخفض في الإصابة في حالة فوسفيد الزنك 7.56%. أما في حالة مركب البارافينيلين داي أمين(PPD) 4.55%. ويليه السوبر كايد بنسبة 4.11%. وتسلك نفس السلوك في حالة الاتجاه إلي داخل الحقل من ناحية الحافة أو من ناحية القنوات والمراوي.

ثانيا: نخيل البلح.

كانت أعلي حماية للأشجار في حالة شرائح الألومنيوم ثم المكافحة الكيماوية باستخدام فوسفيد الزنك فكان معدل الخفض 7.71%أما في حالة البارافينيلين داي امين فكانت 7.05% وفي حالة السوبر كايد كانت 6.12% وأقلها في حالة إزالة الخلفات وتكسير الجحور 5.33%. أما في حالة النسبة المئوية للحماية من الإصابة بالقوارض في وزن الثمار فكانت النسبة 19.57%.

قام بتحكيم البحث

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Table (2): The efficacy of chemical control on the rodent infestation of ears/ m^2 of maize at different sampling dates and distances.

Years of study	Sampling date (days)	Distance (m)												[(2)]Grand avg. Sampling date			[(1)]Grand avg. Years
		10.0 m				20.0 m				30.0 m							
		Treatment															
		C	Zn	PPD	S	C	Zn	PPD	S	C	Zn	PPD	S				
2009	10	10.43	7.45	7.98	7.55	6.03	4.07	4.18	3.93	4.31	0.0	0.0	0.0				8.84 A
	20	20.87	11.20	14.26	16.77	13.92	6.15	5.93	5.79	4.30	2.08	0.0	1.85				
	30	29.76	14.72	20.31	24.31	19.95	12.31	9.65	9.95	10.57	2.08	3.75	1.85	13.29 A	9.58 B	4.10 C	
2010	30	32.03	12.66	21.08	24.29	19.49	4.30	14.60	11.98	8.14	0.0	4.18	7.03				9.14 A
	20	23.33	12.45	18.70	19.69	12.07	4.30	11.82	9.60	6.06	0.0	4.18	4.65				
	10	8.70	4.94	7.03	6.56	4.86	0.0	5.34	4.99	0.0	0.0	0.0	0.0				
[(3)]Grand avg. Methods of control		13.04 A												8.99			
	Zn	5.48 C															
	PD	8.49 B															
		8.93 B															
[(4)]Grand avg. distance		15.71 A				8.55 B				2.71 C							