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EFFECT OF SOME PLANTS POWDER AND INSECTICIDES ADMIRAL AND RUNNER AGAINST SAW-TOOTHED GRAIN BEETLE *ORYZEAPHILUS SURINAMENSIS* L. (SILVANIDAE: COLEOPTERA)

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Abstract

Leaves Powders of the plants *Conyza discorides, Cymbopogon nardus spreng* and *Moringa. oliefera*, together with the IGR Admiral and Runner insecticides, were evaluated on the mortality and F1 progeny of *O.surinamensis*, and the weight of wheat grains .Results showed that the best plant powders effected on the mortality of the insects (78.89%) was C. *discorides* . Percentage of loss weight of the grains was highest with *M. oliefera* extract (3.05%) followed by C. *nardus spreng* (2.76), however, *C. discoridis* was the highest deterrent reached 98.95 bat concentration 1g/5 gm (W/W) of wheat comparative with *C. nardus spreng* with 10.46. Results of insecticides showed that the highest the concentration the higher the mortality percentage was recorded for both insecticides, however Admiral was the most effective recorded mortality percentage of 33.33.% comparing with the Runner insecticides which resided of 13.33%. On the hand, using insecticide as spray was more effective than using it with the grains. Results on the negative effect of the insecticide on the number of adults emerged after 40 days, when using grains mixed with insecticide, was significant with both insecticide, as they caused reduction in F1 progeny reached 97.22 and 93.70 for Admiral and Runner respectively, while by using spraying method mortality reached 95.58 and 97.87% for the admiral and Runner respectively. Plant powders were not significantly affected on wheat germination.

Keywords : Plants powder, insecticides, *Oryzeaphilus surinamensi.*

Introduction

The saw-toothed grain beetle *Oryzaephilus surinamensis* L. (coleoptera: Silvanidae) is one of the importance stored grain pest occurred worldwide (Rossiter *et al*., 2001; Hashem *et al.*, 2012). It can feed on different stored product commodities such as cereals, flours, bran, dried meat and fruits nuts, dough, suger, tabacco, and number of plant products meant for human consumption (Barnes, 2002; Vanzyle *et al*., 2006) Various methods and strategies were implemented in order to control stored product insects such as chemical insecticides. Fumigants are mostly used against stored grains insect pests because of their broad activity spectrum as well as their penetrating power on the treated products such as methyl bromide and phosphine used long period of time might cause the appearance of resistant strains, environmental pollution, toxicity to non–target organisms and pesticide residues on treated stored products (Benhalima *et al*., 2004; Collins *et al.*, 2005; Jovanovic *et al.,* 2007). Such that, alternative strategies have included the search for new type of pesticides of botanical origin, which are often effective against a limited number of specific target species are biodegradable into nontoxic products and suitable for use integrated pest management program (Yousif and Taha, 2016).

Several studies report the used of plant extracts having insecticidal properties which are relatively cheaper than synthetic insecticides (Shadia, 2011). A number of plants have been reported having bioactive metabolites showing repellent and toxic properties on a wide range of insect pests (Kachhwaha *et al.*, 2015; Javed *et al.,* 2016). The use of plant extracts as insecticides is very promising due to their diverse advantages like high effectivity, cheep and safe for human and the environment (Ivbijaro, 2012), for example efficacy of extracts of *Pisum* in management of *O. surinamensis* (Kumar *et al*., 2015), Yousif and Taha (2016) studies three plant extract these were Usher (*Calotropis procera*, Argel (*Solenostemma argel*), Datura (*Datura stramonium*) against adult of *O. surinamensis*.

Present study was conducted to investigate the efficiency of three plant powder*, C.discorides, C. nardus spreng and M. oliefera* against the insect of stored products *O. surinamensis* using it by mixed with wheat method with the respected to adult mortality and progeny reduction and effect the plant powder on germination of wheat grains and used tow type of insecticides Pyrethroids Admiral 10 Ec%. and Runner 24 Sc%.

Materials and Method

Collection, identification and rearing of *O. surinamensis* (L).

The saw toothed grain beetles O. *surinamensis*, was collected from different parts of Basrah province, particularly seeds stores. Insects samples were brought to entomological research lab, at biology Dept. College of Science, Basrah University, for identification and rearing. Identification was done by Prof. Dr. Kadhim Al-Hadlag of insects' taxonomy lab. at some dept. mentioned above.

In order to get big culture of the insects, a series of 2 kg capacity glass jars, were prepared, each jar containing an adequate amount of mixture of sterilized oats , wheat and yeast in ratio of 1:5:5 respectively (Hassan, 1983), kept previously, in frozen for 3 days (Aref and Valizadegan, 2015). For each jar about 50 insects (Male and female) were introduced**,** the jars were closed with fine cloth, tight with rubber band. Then kept in incubator at 27±2 C and 60±10% Rh.

Plant collection and identification

All plant leaves namely, *Conyza dioscorides* family: Asteracae, *Cymbopogon nardus* spreng family: poacaece, and *moringa oliefera* family: Morngacae, were collected from different parts of Basrah province, plant were identified by Prof. Dr. Taha Aladani, of plant protection dept. college of Agriculture, Basrah university. Leaves were washed with tap water, then dried under laboratory condition, and ground using J-sonic jermany machine then kept in jars till used.

Mortality of O. *surinamensis*

Effect of plants powder and insecticides on mortality, on F1, on grain weight, and on seed germination.

(i) Effect of plants powder on mortality

3 groups (3 tubes for each group), i.e. a total of 9 tubes, were prepared, for each tube of group one, *C. dioscoridis* powder in a ratio of 0.25, 0.5, 1 gms), also for *C. nardus* spreng, and *finally,* for each tube of group three 5 gms of wheat together with the leaf powder of *M. oliefera* were added. A drop of water was added to homogeneous the powder with wheat grain. for each tube, 10 insects (5 male+5 female) of 1-2 weeks old were introduced, then closed with cloth and fixed with rubber band. All tubes kept at 27±2C and 60±10 % RH.

(ii) Effect of plants powder on F1

From above experiment, live insects collected from all treatment and kept under condition of 27±2 C and 60±10 R.H. After 40 days individuals of F1 was collected, percentage of reduction was counted according to El-lakwah *et al.* (1996)

$$\%\ \text{reduce of F1} = \frac{\text{No. of adult in control - No. of adult in treatment}}{\text{No. of adult in control}} \times 100$$

Loss in Grain weight

Rate in grain weight loosing, was calculated from (a). which resulted from feeding index on grain for 10 days depending on equation

$$\%\ \text{grains weight loss} = \frac{\text{Initial weight - final weight}}{\text{Initial weight}} \times 100$$

Feeding deterrence was calculated by using the feeding deterrent index (Isman *et al.*, 1990; Akhtar *et al.,* 2015)

$$\text{FDI}(\%) = \frac{C - T}{C} \times 100$$

C main = weight loss in control wheat, T = weight loss in the treated wheat

Seed germination

Evaluation of the effect of plant extracts on seed germination, was investigation, 60 seeds (20 seeds for each plant) were treated with the specific plant powder (*C. dioscoridis*, *C. nardus* spreng and *M. oliefera*) and then put each 20 seeds in a petri dish. percentage of seed germination was count after 3, 7 days (Patel, 2001).

$$\text{Germination percentage} = \frac{\text{Number of seeds germination}}{\text{Total number of seeds}} \text{x}100$$

Effect of insecticides (Admiral and Runner) on mortality of adult *O. surinamensis* by wheat treated method

Insecticide (Admiral and Runner) were prepared by dissolving 1 ml of the insecticide in a 0.999 liter of water to get 0.001 concentration of the insecticide. To prepare 2 ppm, 4 ppm and 6 ppm of the insecticide, 2 ml, 4 ml and 6 ml of the row concentration (0.001) were dissolved in 98, 96 and 94 ml of water respectively.

One ml of prepared concentration were added to 5 gram wheat variety (Iba, 99) mixed well in the cup (8× 4) cm stayed to dry and 10 insect (5 female and 5 male) of 1-2 weeks old were introduced in to each vail and covering with muslin cloth and control treatment, than introduce into incubator every treatment replicate three time, mortality of insects was counted at 3,7 and 10 days respectively by the following Abott, (1925) formula. After treatment died insects were removed and the live insects in each of treatment were kept under the condition 27±2 ºC. for 40 days, for counting F1 of insect and counted the % of reduce of generation and by following formula (El-Lakwah *et al*., 1996)

Statistical analysis

Statistical analysis of variance was carried out with the Statistical (gen stat) using a factorial completely randomized design (CRD). Treatment means showing significant difference ($p<0.05$) were analyze by using L.S.D

Result and Discussion

Table (1) showed the effect of leaf powder of C. *dioscoridis, C. nardus-spreng and M. oliefera* on the adults of *O. surinamensis* mortality. Results indicate that there is a significant difference between the different powders. powder of *M. oliefera* coming first with 78.89 % mortality followed by *C. nardus-spreng* with 60% mortality, while *C. dioscoridis* coming the last with 35.18%, on the other hand, results also showed the effect of period of exposure. the long the period of exposure, the higher the mortality percentage. Also, concentrated of the extracts play good role on mortality percentage, on the higher concentrated, the higher mortality. This study agreed with Malgorzata and Anna (2015) mentioned that powdered plants of different species *Mentha pipertia* L., *Artemisia abinthium* L. *Salvia officinalis* L. and *Allium sativum* L. were the most effective in the highest concentration caused the highest mortality in the saw-toothed grain beetle .The report by Karso (2018) the dry powder of *Mentha piper* L. gave the highest mortality percentage in *O. surinamensis* which reached 78.55%

Table 1 : Effect of plants powder on adult mortality percentages of *O. surinamensis*

Plants powder	Mount w/w	%mortality time			Mean effects of plants powder
		3 days	7 days	10days	
C. dioscoridis	1	30	50	53.33	35.18
	0.5	26.67	50	50	
	0.25	13.33	20	23.33	
C.nardus spreng	1	36.67	66.67	100	60
	0.5	33.33	60	90	
	0.25	10	53.33	90	
M. oliefera	1	66.67	83.33	100	78.89
	0.5	53.33	76.67	100	
	0.25	53.33	76.67	100	
Control		0	0	0	
Mean effect of time		59.63	35.33	78.51	
L.S.D_0.05 0f plants powder =10.7 L.S.D_0.05 of mount =10.7 L.S.D_0.05 of plants powder*mount = 18.6					

On the other hand, effect of plant extracts on the reduction of progeny of adults (Table 2), showed that *C. dioscoridis* was the highest (92.93) followed by *C. nardus-spreng* (88.68), while *M. oliefera* coming the last with 70.8 mean of percentage.

The effect of extract on grain weight loss, was showed in (Table 3), once against with C. *dioscoridis* get the lowest percentage of weight loss while *M. oliefera* was the highest with 3.05.

Table 2: Effect of plants powder reduction in progeny of saw-toothed *Oryzaephilus surinamensis*

Plants powder	No. of emerged adult after 40 days			Mean of mount	Reduction in F1 progeny			Mean of plants powder
	1g	0.5g	0.25g		1g	0.5 g	0.25g	
C. dioscoridis	0.3	1	1	0.8	96.96	90.91	90.91	92.93
C. nardus –spreng	1.3	0.6	1,6	1.17	87.87	93.93	84.24	*88.68*
M. oliefera	1.6	4	3.67	3.09	84.84	61.81	65.75	70.8
Control	11	11	11	11				
Mean of mount	4.6	5.2	5.42		86.36	77.87	74.99	
L.S.D. -0.05 plants powder =1.5 L.S.D -0.05 plants powder* mount = 2.6 L.S.D._0.05 mount = 1.5					L.S.D. -0.05 plants powder =14.15 L.S.D -0.05 plants powder* mount =24.5			

Table 3 : Mean weight loss (%) of wheat treated with plant powders

Plants powder	Mean weight loss% of wheat			Mean effect of Plants powder
	1g	0.5 g	0.25g	
C. dioscoridis	0.06	0.57	0.42	0.35
C.nardus spreng	2.70	2.73	2.84	2.76
oliefera. M.	2.76	3.15	3.23	3.05
Mean of effect mount	1.84	2.15	2.16	Mean of effect mount
L.S.D._ 0.05 of plants powder = 0.8 L.S.D. _0.05 of mount = 0.8 L.S.D. _0.05 of plants powder* mount = 0.14				

Table (4) showed that powder of plants *C. dioscoridis* was more effected of on the *O. surinamensis* for feeding deterrence reached 93 .63 while the *C. nardus –spreng* was the lowest FDI reached 11.16. Results showed that the higher mount more the effective than the lower mount with mean 53.45 and 48.67 respectively.

Table 4 : Mean feeding deterrence index *O. surinamensis* on wheat treated with different plants powder

Plants powder	%FDI			Mean effect of plants powder
	0.25 g	0.5 g	1g	
C. dioscoridis	91.66	90.27	98.95	93.63
C.nardus spreng	10.34	13.07	10.07	11.16
M. oliefera	44	45.33	51.33	46.89
Mean effect of mount	48.67	49.56	53.45	
L.S.D_0.05 plants powder =3.26 L.S.D_0.05. plants powder *mount = 5.65 L.S.D_.0.05mount = 3.26				

Effect of insecticides on adult *O. surinamensis*

(i) Effect of insecticides by treated wheat grain

Table (5) showed the results of effect of insecticide treated with wheat grain, it's clear that admiral insecticide was more effective than Runner for three concentration with a mean 9.3 and 3.33 respectively. Results showed that the higher the concentration the more the effective on insect's mortality, the effective was clear after 7 day and 10 days.

Table 5: Effect of insecticides in mortality of *O. surinamensis* by treated wheat grain.

Insecticides	Con.	%Mortality			Mean of insecticide * con	Mean of con.	Mean of insecticides
		3 days	7 days	10 days			
Admiral	2ppm	3.33	6.67	10	6.67		9.3
	4 ppm	0	3.33	30	11.11		
	6ppm	13.33	26.67	43.33	27.78		
Runner	2ppm	0	3.33	3.33	2.22	4.44	3.33
	4 ppm	0	0	6.67	2.22	6.67	
	6ppm	0	3.33	13.33	5.55	16.67	
Control		o	0	0			
Mean of time		2.8	7.22	17.8			
L.S.D _0.05 of insecticides = 6.2 L.S. D _ 0.05 of insecticides* con. = 10.72 L.S.D _0.05 of con. = 7.7 L.S.D _0.05 of time = 7.7							

(ii) Effect of insecticides on adult mortality using spraying method

Table (6) Show that insecticide was more effect on the mortality of the insects when using it as spray but not extract. This could be explained by the easily penetrate of the insecticide through the insect's cuticle. However, admiral once again was stronger, with mortality percentage of 46.29%, than runner insecticide which recorded of 25.18% mortality.

Table 6 : Effect of insecticides on adult mortality percentages of *O. surinamensis* spray treatment

Insecticides	Con.	Mortality %			Mean of con *insecticides.	Mean of con.	Mean of insecticides
		3 days	7 days	10 day			
Admiral	2ppm	13.33	36.67	56.67	35.55		46.29
	4 ppm	33.33	43.33	63.33	46.66		
	6ppm	36.67	66.67	66.67	56.67		
Runner	2ppm	13.33	13.33	20	13.33	25.56	25.18
	4 ppm	13.33	13.33	26.67	13.33	29.99	
	6ppm	3.33	60	83.33	46.66	52.78	
		0	0	0			Control
		15.56	38.89	52.77	Mean of time		
L.S.D _0.05 of insecticides* con. = 4.3. L.S.D _0.05 of insecticides = 2.5 L.S. D _0.05 of insecticides*con*.time =10.5 L.S.D _0.05 of con. =12.4							

(iii) Effect of insecticides on progeny

Result of insecticide in progeny of adult insects were showed in table 7. Admiral insecticide was more effect and the percentage of reduction was 97.87% while Runner insecticide with 96.58% in the spry treatment, this is not significant in the progeny reduction between the Admiral and Runner. Also in the wheat treatment that significant difference between the Admiral and Runner in progeny reduction were reached 97.22 and 93.70 % respectively showed in the table 8. Showed that insecticides IGR do not exhibit quick knock –down in the insects or caused mortality but the long time exposure to these compounds largely stops the population growth as result of effects mentioned in both the parents and progeny (Mondal and Parween, 2000).

Table 7: Effect of insecticides reduction in progeny of saw-toothed *O. surinamensis* spray treatment

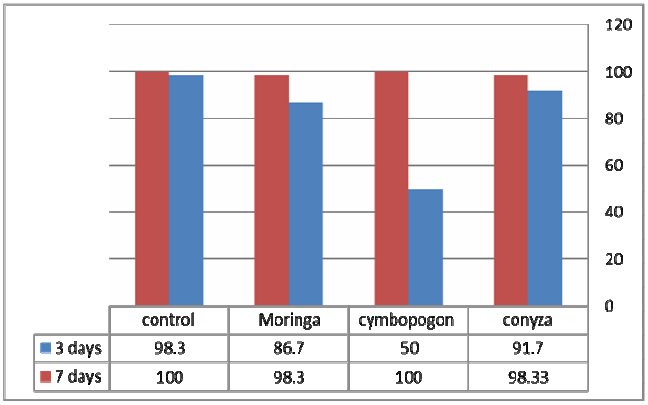
Name of insecticides	No. of emerged adult after 40 days			Mean of insecticides.	Reduction in F1 progeny%			Mean of effect insecticides
	2pppm	4ppm	6ppm		2ppm	4ppm	6 ppm	
Admiral	3.33	6.67	0	3.33	95.83	93.93	100	96.58
Runner	3.33	3.33	0	2.22	96.96	96.66	100	*97.87*
control	11	11	11	11				
Mean of con.	5.89	7	3.67					.
L.S.D. _ 0.05 insecticides* concentration =10. 9 L.S.D. _ 0.05 insecticides = 6.3					L.S.D. _ 0.05 insecticides* concentration= 1.7 1. 009 =L.S.D. _ 0.05 insecticides			

Table 8: Effect of insecticides reduction in progeny of saw-toothed wheat treatment *O. surinamensis*

Name of insecticides	No. of emerged adult after 40 days			Mean of insecticides.	Reduction in F1 progeny%			Mean of effect insecticides
	2 pppm	4 ppm	6 ppm		2 ppm	4 ppm	6 ppm	
Admiral	0	6.67	0	0.02	100	91.66	100	97.22
Runner	0.33	1.33	0	0.55	96.96	84.16	100	*93.70*
control	9.67	9.67	9.97	9.97				
Mean of con.	3.33	3.89	3.22		98.48	87.91	100	.
L.S.D. _ 0.05 insecticides* concentration =17.9 L.S.D. _ 0.05 insecticides = 10.4.					L.S.D. _ 0.05 insecticides* concentration= 1.1 1.9 =L.S.D. _ 0.05 insecticides			

Effect of various plants powder on seed germination

Figure (1) showed the highest germination which reached 100% after seven days in all the plants powder *C. dioscordis*, *C. nardus-spreng* and *M. oliefera* and control treatment. significant differences were observed after three days of treatment reached 50% in. *C. nardus-spreng* followed by *M. oliefera* reached 86.67 %. these plants powder were not affected of germination of wheat.



L.S.D plant powders _0.05 = 2.56 L.S.D. time _0.05 = 1.85

L.S. D. plant *time _0.05= 3.63

Figure (1) effect of plant powders in germination of wheat

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