

PERSISTENCE OF SOME INSECTICIDES ON POLYETHELENE AND JUTE SACKS IN THE PROTECTION OF STORED WHEAT GRAIN AGAINST SOME STORED PRODUCT INSECTS

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Abstract

Dusting of polyethelen and jute sacks with Fenitrothion 1%, Deltamethrin 1% and Bendiocarb 0.1% at the rate of 500 and 1300 mg/m² using Manual duster were carried out and stored in open shaunas up to 3 months in Ismailia and Gharbia governorates to evaluate the persistence against 4test insects (sitophilus oryzae(L.), Rhizopertha dominica(F.), Trogoderma granarium Everst and Tribolium castaneum (Herbst) adults. Considering pest mortality and germination. Results indicated that :-

- Tested insecticides were more persistence on polyethelen sacks than on Jute fabrics.
 - Protection of stored wheat graing was more succesful in Ismailia governorate than in Gharbia governorate at all storage periods and tested doses.
 - Fenitrothion insecticide was more effective in moiety in killing tested insects on the two doses and experimental sacks at the two governorates. It gave complete protection (100% mortality)
- With high dose (1300mg/m²) using polyethelen sacks for the three storage months, in Ismailia governorate However, gradual decrease in protection was occured when using Jute sacks (70/mortality)
- Residual efficiency of bendiocarb at 1300 mg/m² was the least, it gave a complete protection of grain (100% mortality) for one month only in the two governorate, and decreased after 2 and 3 on months in polyethelen sacks showing 81%, 70% and 79%, 74% in Ismailia and Gharbia governorates, respectively whereas, sharp decrease of efficiency was detected with Jute sacks, it gave 19% and 12% mortality after 3 months in the tested governorate, respectively .
 - Deltamethrin insecticide gave intermediate in its efficiency on both tested sacks and doses in the two governorates .
 - The treatments did not impair the germination of seeds under various treatments at the two tested governorates.

INTRODUCTION

It is common practice to apply insecticides on sacks of commodities to prevent re-infestation after fumigation. The effectiveness of insecticides treatments has been studied on jute bags in the laboratory and field by McFarlane (1961), and El-Rafie et al (1974) .

Many countries place restrictions on the permitted type and the amount of insecticide used for the spraying of commodities in bags in order to prevent the build up of residues to undesirable levels (wabley and Kenneth 1980).

In Egypt, however very little work has been carried out on this area and no data on long term on storage of grains or the comparative effectiveness of insecticides applied are available.

It is also, important to compare the persistence and effectiveness of insecticides on two surfaces and to determine which type of insecticide is most suitable for dusting (polyethelene or jute sacks) under laboratory and field conditions in open, shounas in both Ismailia and Gharbia governorates.

MATERIALS AND METHODS

1 – Experimented technique :

Three insecticides Dethamethrin 1%, Fenitrothion 0.1% and Bendiocarb 1% (dust) were used, at doses of 500 and 1300 mg/m². Small jute and woven polyethelen sacks (25X18 cm) were used Samples of 500 gr. of untreated wheat grain were packed in each sack then the two open ends were closed tightly to prevent any external infestation. Using an manual duster, the outer surface of each sack was dusted with each insecticide and each dose. similar untreated samples of sacks were used as control. Each treatment was replicated 10 times. Storage periods were three in months begin from July to October (2010). Sacks samples of every storage month were kept in Carton boxes 40X25X9 cm in dimation.

Hundered adults of each insect species *S. oryzae*, *R. dominica*, *T. granarium* and *T. castaneum* (2-3 weeks old) were seurttered on the outer surface of the sacks and the carton box tightly covered with mosilen cloths. The boxes were left for three days then inspection of mortality insect was recorded.

Sacks were stored at two open storage conditions, the first at Ismailia and the second at Gharbia governorate. At the end of storage period, tests were recorded for each insecticide, dose, type of sack at each shauna for each treated surface Percentage of mortalities of the four tested insects after exposure times were corrected for control response by Abbott's formula (Abbott, 1925).

Germination test

At the end of storage period (after three months) germination test were occurred. 100 seeds of stored wheat grain from each treatment together with control were replicated four times and placed in Petri dish lined with two layers cotton layer and filter paper layer, both were soaked with water . after five days, the observed percentage of germination was recorded in each petri dish.

RESULTS AND DISCUSSION

1. Ismailia governorate.

A- Residual efficiency of Fenitrothion:-

data in table 1 clearly shows that, dose of 500 mg/m² prevent the penetration of tested insects for one month of storage and decrease slightly in the third month when use polyethelen sacks. The mortality percentage was 100% 95% and 90% also, jute sacks gave only one month protection followed by pronounced sharp decreases in efficiency for the tested insects showing 100%, 60% and 44% respectively.

Complete protection was occurred with the higher dose (1300 mg/m²) using polyethelen sacks for the three storage months while, a gradual decrease in protection was occurred when using jute sacks i-e 93,84 and 70% in the three tested months, respectively. The obtained results are agree with Webley and kilminster (1980) who found that tested insecticides were found to have a much persistence on polypropylene than on jute sacks.

B- Residual efficiency of Deltamethrin :-

Table 1 revealed that polyethelen sacks at dose of 1300 mg/m² gave a complete protection (100% mortality) after one month of storage, meanwhile it gave 80% protection using jute sacks. Aradual protection of 94% and 95% was occurred with polyethelen after 2 and 3 month of storage respectively. Meanwhile respectively, jute sacks has a sharp decrease in mortality after 2 and 3 months (59% and 45% mortality).

C - Residual efficiency of Bendiocarb:-

Table 1 revealed that After one month of storage, complete protection of insect mortalities on treated polyethelen sacks was occurred for both tested doses. After 2 and 3 months of storage , gradual decrease of mortalities was detected at 500 and 1300 mg/m² showing 64% , 48% and 81% , 70% respectively. Sharp decrease of efficiency was detected with Jute sack i.e. 63% , 31% , 10% and 70%, 44% and 19% with dose of 500 mg/m² and 1300mg/ m² respectively. These results agree with Manoj et al (2003) they revealed that tested insecticides as a surface treatments will provide long-term protection up to 40 weeks against infestation by three species of stored grain insects.

2) Gharbia governorate.

A – residual efficiency of Fenitrothion F :

Results in table 2 indicated that Fenitrothion on polyethelen fabrics gave a complete protection (100% mortality) on wheat grain sacks for only one month in both tested doses, then, the mortality decreased up to 89% after three months at the highest dose (1300 mg/ m²) whereas, the activity on Jute sacks was less effective in killing tested insects. The insecticide had a sharp decrease up to 68%, and 36% after three months at 1300 and 500 mg/ m² respectively.

The above mentioned results are disagree with the results from barakat et al (1987), they reported that treatment of commercial bags with permethrin and chloropyrifos methyl preventing the infestation of wheat in Jute sack with *Tribolium confusum*

B – Residual efficiency of Deltamethin :

In case of Deltamethrin, it failed to gave complete protection on polyethylene and Jute fabrics and deteriorated up to 85% after three months at the highest dose. The corresponding data on Jute fabrics were 39%.

C – Residual efficiency of bendiocarb :-

Results showed also that, after three months, the activity of Bendiocarb was greater (100% mortality) on polyethelen and then, it had a sharp declind up to 74% at the highest dose , whereas, the deterioration was faster up to 12% in Jute fabrics after three months.

It can be concluded from the present studies that tested insecticides were more persistent on polyethelen sacks than on Jute fabrics, Due to that, no penetration of insecticide through polyethelen surface, residue can not be expected in the enclosed grain. Thus treatment of polyethelen fabrics with insecticides against infestation will proved a useful protective technique.

These results are in agreement with Mahgoub and Elsis (1991) who found that some oils were highly persistence after treatment of some surfaces against *S. oryzae* adults especially on non porous surfaces.

On the other hand, results revealed that, storage in Ismailia governorate was succeeded in protection wheat grain than in Gharbia governorate at all storage periods and tested doses.

The data on germination is presented in table (3). From the results it was showed that the treatment did not impair the germination of seeds stored under various treatments.

Table 1. Effect of surface treatment of polyethelen and Jute sacks with insecticides on the protection of stored what grain from insect infestation at Ismailia governorate.

Tested insecticides	Dose mg/m ²	Tested insects	Corrected mortality % after indicated (months)					
			Polyethelen sacks			Jute sacks		
			1	2	3	1	2	3
Fenitrothion	500	<i>S. oryzae</i>	100	100	100	100	75	60
(1% Dust)		<i>R. dominica</i>	100	100	90	100	65	45
		<i>T. granarium</i>	100	90	80	100	50	40
		<i>T. castaneum</i>	100	90	90	100	50	30
	mean		100	95	90	100	60	44
	1300	<i>S. oryzae</i>	100	100	100	100	100	70
		<i>R. dominica</i>	"	"	"	90	80	65
		<i>T. granarium</i>	"	"	"	90	75	70
		<i>T. castaneum</i>	"	"	"	90	80	75
	mean		100	100	100	93	84	70
Deltamethrin	500	<i>S. oryzae</i>	100	97	95	90	50	40
(1% Dust)		<i>R. dominica</i>	85	80	75	60	40	25
		<i>T. granarium</i>	85	85	80	40	35	30
		<i>T. castaneum</i>	85	70	70	50	20	10
	mean		87	78	80	60	36	26
	1300	<i>S. oryzae</i>	100	100	100	95	80	65
		<i>R. dominica</i>	100	100	100	80	60	45
		<i>T. granarium</i>	100	85	90	70	40	30
		<i>T. castaneum</i>	100	90	90	75	55	40
	mean		100	94	95	80	59	45
Bendiocarb	500	<i>S. oryzae</i>	100	80	60	80	40	30
(1% Dust)		<i>R. dominica</i>	100	70	60	70	30	10
		<i>T. granarium</i>	100	55	30	40	30	0.0
		<i>T. castaneum</i>	100	50	40	60	25	0.0
	mean		100	64	48	63	31	10
	1300	<i>S. oryzae</i>	100	95	80	90	90	75
		<i>R. dominica</i>	100	80	75	80	55	0.0
		<i>T. granarium</i>	100	75	65	50	30	0.0
		<i>T. castaneum</i>	100	70	60	60	55	0.0
	mean		100	81	70	70	44	19

Table 2. Effect of surface treatment of polythelen and Jute sacks on the protection of stored grain from insect infestation at Gharbia governorate.

Tested insecticides	Dose mg/m ²	Tested insects	Corrected mortality % after indicated (months)					
			Polyethelen sacks			Jute sacks		
			1	2	3	1	2	3
Fenitrothion	500	<i>S. oryzae</i>	100	100	100	85	65	50
(1% Dust)		<i>R. dominica</i>	100	80	70	95	60	40
		<i>T. granarium</i>	100	80	75	100	40	25
		<i>T. castaneum</i>	100	80	75	95	50	30
	mean		100	85	80	94	54	36
	1300	<i>S. oryzae</i>	100	100	100	100	95	75
		<i>R. dominica</i>	100	90	85	100	80	70
		<i>T. granarium</i>	100	95	90	100	75	60
		<i>T. castaneum</i>	100	83	80	90	70	65
	mean		100	92	89	98	80	68
Deltamethrin	500	<i>S. oryzae</i>	100	95	90	65	50	30
(1% Dust)		<i>R. dominica</i>	80	70	65	55	45	20
		<i>T. granarium</i>	70	60	60	65	0.0	0.0
		<i>T. castaneum</i>	79	79	75	60	0.0	0.0
	mean		80	76	72	61	24	12
	1300	<i>S. oryzae</i>	100	100	85	90	70	55
		<i>R. dominica</i>	100	90	85	75	55	35
		<i>T. granarium</i>	96	90	90	60	45	30
		<i>T. castaneum</i>	90	85	80	65	40	35
	mean		97	91	85	73	53	39
Bendiocarb	500	<i>S. oryzae</i>	85	65	60	80	25	0.0
(0.1% Dust)		<i>R. dominica</i>	85	55	55	60	25	0.0
		<i>T. granarium</i>	70	78	65	25	0.0	0.0
		<i>T. castaneum</i>	75	60	65	25	0.0	0.0
	mean		79	64	61	47	12	0.0
	1300	<i>S. oryzae</i>	100	80	75	65	60	50
		<i>R. dominica</i>	100	75	70	55	45	0.0
		<i>T. granarium</i>	100	75	70	65	35	0.0
		<i>T. castaneum</i>	100	85	80	60	45	0.0
	mean		100	79	74	61	46	12

Table 3. Efficiency of polyethelen and Jute sacks treated with insecticides on germination of wheat grains at Ismailia and Gharbia governorates at the end of storage period (after three months)

Tested insecticides	Dose (mg/m ²)	% Germination percentage at different sacks			
		Ismailia		Gharbia	
		Polyethylene sacks	Jute sacks	Polyethylene sacks	Jute sacks
Fenitrthion	500	96	96	94	95
	1300	97	95	97	96
Deltamethrin	500	95	96	97	94
	1300	96	97	95	96
Bendiocarb	500	95	95	95	95
	1300	94	93	96	96
Control	500	97	95	96	97
	1300	96	95	97	96

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بقاء بعض المبيدات علي أكياس البولي ايثلين والجوت لحماية القمح المخزن ضد بعض حشرات الحبوب المخزونة

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أوضحت الدراسة استخدام ثلاثة مبيدات هي الدلتاميثرين 1% ، الفينثروثيون 1% ، البنديوكارب 0.1% علي صورة مسحوق وذلك لمعاملة سطح نوعين من أكياس تخزين القمح وهي أكياس البولي ايثلين وأكياس الجوت حيث تم تعفيرها بجرعتين 500 ملجم/م² ، 1300 ملجم/م² وتخزينها لمدة ثلاثة أشهر في شون مفتوحة بمحافظتي الإسماعيلية والغربية ضد بعض حشرات الحبوب المخزونة (سوسة الأرز ، ثاقبة الحبوب الصغرى ، خنفساء الصعيد ، خنفساء الدقيق الكستنائية)

أوضحت النتائج أن :

- محافظة الإسماعيلية كانت أكثر نجاحاً في حماية القمح المخزن من محافظة الغربية وذلك مستوي مدد التخزين المختلفة وكذلك الجرعات المستخدمة كانت المبيدات المستخدمة أكثر بقاءً علي سطح البولي ايثلين مقارنة بسطح الجوت مبيد الفينثروثيون 1% كان أكثر المبيدات المستخدمة كفاءة في قتل الحشرات علي مستوى جرعتي الاختبار وكذلك علي نوعي الأسطح المستخدمة وذلك في كلتي المحافظتين ، حيث أعطي تركيز 1300 ملجم/م² حماية كاملة للقمح (100% موت) لمدة ثلاثة أشهر كاملة علي أكياس البولي ايثلين بينما حدث تدهور تدريجي في حماية القمح عند استخدام أكياس الجوت (70% موت).
- مبيد البنديوكارب كان أقل المبيدات المستخدمة كفاءةً وبقاءً علي أسطح الاختبار حيث أعطي حماية كاملة للقمح لمدة شهر واحد فقط (100% موت) في كلتي المحافظتين ثم حدث له تدهوراً بعد 2-3 شهور لأكياس البولي ايثلين (80% ، 70% وكذلك 79% ، 74% موت) لكل من محافظة الإسماعيلية والغربية علي التوالي أما أكياس الجوت فقد أظهرت تدهوراً واضحاً للمبيد حيث سجل 12% فقط للموت بعد ثلاث أشهر للمعاملة دلتاميثرين كان تأثيره وسطياً حيث يلي مبيد الفينثروثيون في البقاء وذلك في كلتي المحافظتين وعلي مستوى جرعتي الاختبار والأسطح المعاملة وعموماً لم يؤثر استخدام المبيدات علي حيوية التقاوي حيث لم تتأثر نسبة أنبات الحبوب بالمعاملات.