BIOLOGICAL ACTIVITY OF CERTAIN SOIL FERTILIZERS AND INORGANIC SALTS AGAINST COTTON LEAFWORM, *SPODOPTERA LITTORALIS* (BOISD)

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Abstract

Two different experiments were conducted to evaluate the toxicity of soil fertilizers: Ammonium sulfate, potassium sulfate and super phosphate and two inorganic salts: ammonium oxalate and potassium bromate against larval and pupal stages of cotton leafworm, *Spodoptera littoralis* (Boisd.) infested cotton plants.

Obtained results of dilution and spraying the tested material at 2.0, 1.0 and 0.5% on cotton plants against larval stage indicated that all material showed low initial toxic effect but they proved latent effect since the death of larval stage increased as time after treatment with continuous feeding. Potassium bromate showed the highest effect followed by potassium oxalate and super phosphate since they gave the lowest percent of resulted pupae.

On the other hand, super phosphate was the highest toxic material against pupal stage (63.3 mortality %) followed by potassium bromate (56.1 mortality %), potassium sulfate and ammonium oxalate while ammonium sulfate showed the least toxic effect.

Results indicated that all treatments cause reduction in both fecundity and fertility. Potassium bromate was the most effective material for reducing the number of eggs deposited /female followed by super phosphate and potassium sulfate compared with untreated one.

INTRODUCTION

Chemical fertilizers widely used in the 20th century as nutrient for plants. They basically contained (NPK) elements= nitrogen, phosphorous and potassium.

Chemical fertilizers presented as inorganic salts and used as soil treatment for feeding plants. However, the pesicidal activities of these fertilizer were conducted by several workers against cotton leafworm (El-Sisi and Farrage, 1989, Abdel-Wahab and El-Sisi, 2001) and snail (Nakhla and El-Sisi, 1995) and sucking pierce pests (Mousa and El-Sisi, 2000) also the studies of foliar fertilizers proved their effect against sucking piercing pests (El-Sisi and Mousa, 2001) and cotton leafworm (Sondos *et al.*, 2001)

The aim of the present work was directed to study the toxicity of some soil fertilizers and two inorganic salts contained nutrient moiety against larval and pupal stage of cotton leafworm, *S. littoralis*.

MATERIALS AND METHODS

Three soil fertilizers were used: Ammonium sulfate: contained nitrogen nutrient element. Potassium sulfate: contained potassium nutrient element and Super phosphate: contained phosphorus nutrient element. Two inorganic salts were used: Ammonium oxalate: contained nitrogen nutrient element. Potassium bromate: contained potassium nutrient element.

Determination of the toxicity and latent effect against larval stage:

Each material was diluted with water and sprayed at concentrations 0.5,1.0 and 2 % using knapsack sprayer on cotton plants 2 months age, planted at Giza region. Randomly samples were taken for each treatment directly after spraying. Dryness of leaves were daily introduced to three replicate each has 15 individual of 2^{nd} instar larvae of cotton leafworm till pupation. Dead and alive larvae was recorded after 1, 3, 5, 7, 9, and 12 days from application. The rate of pupation was also considered.

Determination of the toxicity and latent effect of the tested material.

Three pots have surface area 91 cm^2 and contained clay soil were used for each treatment. Water field capacity was determined for pots equal to 150 ml / pot. Amount of each material achieved rate of 20 kg/feddan was calculated for pots = (0.433g), prepared from stock solution of each material and completed to 150 ml with water and added to each pot infested with 10 pupal stage.

Pupal mortality, moth emergence, malformation of moths were recorded. Also, number of eggs laid and its hatchability of mating moths were determined compared with untreated one.

RESULTS AND DISCUSSION

The effect of tested materials against larval stage

Data in Table (1) indicated that all tested material gave low initial toxic effect up to 3 days after treatments. The toxic effect increased as time after treatment, with continuous feeding on treated leaves was increased. The latent toxic effect against larval stage clearly obtained after 5 days of treatment specially in those treated with potassium bromate and ammonium oxalate to reach high toxic effect at the end of larval stage. However the other tested fertilizers showed lowest latent toxic effect . All treatments decreased In this respect potassium bromate showed the highest effect followed by ammonium oxalate, ammonium sulfate at 1%, potassium sulfate at 0.5% and super phosphate. The obtained results are in harmony with those recorded by **El-Sisi and Farrage, 1989**.

Reviewing the obtained results it could be proved that, the effect of low concentration was more than high concentration, this may be due to the material of high concentration had repellent effects, and this led to decrease the quantity of material taken by feeding then reducing the toxic effect (Nakhla and El-Sisi, 1995).

The latent effect on pupal and adult stages

Data in Table (2) indicated that the tested material showed toxic effect against pupal stage with decreasing emergency of adult stage when they applied as soil treatments. Super phosphate gave the highest toxic effect followed by potassium

bromate, potassium sulfate and ammonium oxalate while ammonium sulfate showed the lowest effect in this respect.

Data also showed the considerable effects of fertilizers on fecundity of mated female moths when compared with the untreated one .Potassium bromate gave the highest effect followed by super phosphate and potassium sulfate. The same trend was obtained with the effect on egg fertility.

The influence of the inorganic salts is due to their effect as stomach poison as retaining of midgut epithelium protoplasm (Spencer, 1968, Gleason *et al.*, 1969, Tomlin, 1994). Also, the effect may be due to losing a part of insect water content as a result of osmotic force (Steward, 1958).

Table 1. Effect of soil fertilizers and inorganic salts against cotton leafworm larvae.

Treatment	Conc. (%)	Alive number and reduction percent (R%) after spraying at indicated days													
		Larvae												Pupae	
		1		3		5		7		9		12			
		No.	R%	No.	R%	No.	R%	No.	R%	No.	R%	No.	R%	No.	R%
Ammonium sulfate	2	45	0	43	0	41	0	39	0	38	2.6	27	25	27	18.18
	1	45	0	43	0	35	14.6	34	12.8	34	12.8	20	44.4	20	39.39
	0.5	44	2.2	40	6.98	37	9.8	36	7.7	35	10.3	21	41.7	21	36.36
Potassium sulfate	2	45	0	42	2.3	35	14.6	34	12.8	34	12.8	32	11.1	27	18.2
	1	44	2.2	42	2.3	39	4.9	34	12.8	33	15.4	33	8.3	25	24.2
	0.5	44	2.2	38	11.6	33	19.5	31	20.5	31	20.5	28	22.2	21	36.4
Super phsphate	2	45	0	40	6.98	37	9.8	37	5.1	34	20	32	11.1	22	33.3
	1	44	2.2	42	2.3	38	7.3	37	5.1	36	7.7	31	13.9	22	33.3
	0.5	45	0	42	2.3	32	21.95	30	23.1	30	23.1	30	16.7	26	21.2
Ammonium oxalate	2	44	2.2	41	4.7	12	70.7	11	71.8	10	74.4	9	75	3	90.9
	1	45	0	42	2.3	36	21.2	30	23.1	29	25.6	29	19.4	13	60.6
	0.5	43	4.4	39	9.3	26	36.6	22	43.6	22	43.6	20	44.4	11	66.7
Potassium bromate	2	44	2.2	39	9.3	18	56.1	7	82.1	3	92.3	2	94.4	1	97
	1	45	0	42	2.3	34	17.1	23	41	16	59	7	80.6	2	93.9
	0.5	43	4.4	42	2.3	37	9.8	35	10.3	33	15.4	29	19.4	2	93.9
Control	water	45	-	43	-	41	-	39	-	39	-	36	-	33	-

Table 2. Effect of soil fertilizers and inorganic salts against pupal and adult stages of the cotton leafworm *S. littoralis*.

Treatment	Total No. of treated pupae	Pupal mortality %	Emergence %	Emergence reduction %	No. eggs laid	Fertility %
Ammonium sulfate	30	16.7	83.3	3.8	1158	98.6
Potassium sulfate	30	40	60	30.8	1089	66.3
Super phosphate	30	63.3	36.7	57.7	861	63.9
Ammonium oxalate	30	30	70	19.2	3047	98.8
Potassium bromate	30	56.7	43.3	50	780	74.6
Control	30	13.3	86.7	0.0	2756	92.7

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النشاط الحيوي لبعض الأسمدة الأرضية و الأملاح المعدنية ضد دودة ورق القطن

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تم تنفيذ تجربتين لتقييم سمية الاسمدة الارضية : سلفات النشادر ، سلفات البوتاسيوم والسوبر فوسفات و اثنين من الاملاح غير العضوية: أوكسالات الامونيوم و برومات البوتاسيوم ضد طوري اليرقة والعذراء لدودة ورق القطن. دلت نتائج تخفيف المواد و رشها لمكافحة اليرقات بتركيزات ٢ و ١ و ٠,٥ % علي نباتات القطن تشير النتائج المتحصل عليها أن كل المواد أعطت تأثيرا ابتدائيا منخفضا لكنها أظهرت تأثير سمي متأخر ، ارتفعت معدلات الموت في الطور اليرقي مع زيادة المدة بعد المعاملة واستمرار التغذية علي الورق المعامل. أظهرت برومات البوتاسيوم أعلي تأثير يليها أوكسالات الامونيوم و السوبر فوسفات حيث تحققت أعلي نسبة موت لليرقات و أقل نسبة في خروج العذارى. من ناحية أخرى دلت النتائج المتحصل عليها أن سماد السوبر فوسفات كان الأعلى في مستوي السمية ضد طور العذراء (٦٣,٣%) يليه برومات البوتاسيوم (٥٦,١%) يليهما سلفات البوتاسيوم ، أوكسالات الامونيوم بينما أعطى سلفات النشادر أقل تأثير. دلت النتائج علي أن كل المعاملات قللت عدد البيض و نسبة الفقس وكانت برومات البوتاسيوم هي الأفضل في تقليل عدد البيض يليها السوبر فوسفات ، سلفات البوتاسيوم مقارنة بغير المعامل.