LABORATORY EVALUATION OF SOME PLANTS AND INSECTICIDES AGAINST THE BEETLE *CALLOSOBRUCHUS MACULATUS* F. INFESTING STORED PRODUCTS.

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Abstract

Petroleum ether extracts of fleabane leaves (*Inula Conysoides*), dill seeds (*Anethum graveolens* L.) and their powders, also two insecticides Neemazal-F (liquid formulation contains 5% Azaderachtin) and Actellic (pirimiphos methyl E.C. 50%) were evaluated for mortality and reduction in F1 progeny against *Callosobruchus maculatus* F.infesting the cowpea seeds.

Results showed that mortality and reduction in F1 progeny were achieved using the extract of fleabane leaves or the dill seeds. Also, powders of the two plant species revealed toxic effect on this pest infesting the cowpea seeds, but lower mortality values were obtained as well as the reductions in F1 progeny. Reductions in F1 progeny were very high in case of dill seed extracts.

The insecticides of Neemazal-F. and Actellic showed high mortalities and reduction in F1 progeny. However, Actellic surpassed Neemazal in its effect against *Callosobruchus maculatus* F.

INTRODUCTION

Today, attention has been focused to the control of stored product insects with other alternative agents such as plant leaves, flower or seed extracts or their dusts (Ivbijaro, 1984; Helen 1985; Nora and Clifton, 1986; Abo El-Ghar and El-Sheikh, 1987; El-Lakwah et al. 1989) which are characterized by their toxicity, repellency or protective effects against some pests.

Yadav (1973), in a study on the efficacy of chinceberry kernel as a protectant for different leguminous seeds against *Callosobruchus chinensis* and *Callosobruchus maculatus*, found that there was no progeny of *Callosobruchus chinensis* even 12 months after it was released on treated masur or, lentil seeds. The author attributed this to inhibition of oviposition. There was no damage to seeds of chickpea or pigeon pea for up to 12 months after treatment with 20g. Kernel powder/100g seeds. In Khesari, protection was provided for up to 9 months treatment with 1.0 g kernel powder/100 seeds.

Many investigators have studied the effectiveness of organophosphorous insecticides against stored product insects, e.g. Abo-Ghar and Badawy (1961), Godavari et al (1964), Strong et al. (1969), williams et al. (1978) and Patourel and Goyeb (1988).

The present work aimed to study the toxicity of two (leaves and seeds) plant species extracts and their powders compared with two insecticides Neemazal F (liquid formulation contains 5% Azaderachtin) and Actellic (Primiphos methyl E.C. 50%) against the cowpea beetles *Callosobruchus maculatus*.

MATERIALS AND METHODS

The cowpea beetle, *Callosobruchus maculatus* F. was reared under laboratory conditions at 26 ± 1°C and 60 ± 5% R.H. at the stored product laboratory of the Plant Protection Research Institute, Agricultural Research Centre, Dokki.

Plant extracts and powders of dill seeds (*Anethum graveolens* L.) and fleabane leaves (*Inula conyzoides*) were tested against *Callosobruchus maculatus*. The fleabane leaves were dried for one week at room temperature then ground in a mill into a fine powder. The powders of dill seeds and fleabane leaves were extracted with petroleum ether at 50°C under reduced pressure as described by Helen (1985). Concentration of 10, 5, 2.5 and 1.25% were prepared from the stock solution. The concentrations of the powder were 8, 4, 2 and 1%.

Two insecticides were used, Neemazal-F (EC 5% Azadirachtin), provided by Trifolio-MGmbH Company, Germany and Actellic (Pirimiphos Methyl E.C. 50%). Prepared concentrations ranged between 62.5-500 ppm were used. One ml of each of the prepared concentrations from the two insecticides were added to 10 gm cowpea seeds in jars of about 250 ml and left for 24 hours to evaporate the water.

Batches of 30 newly hatched adult insects were confined in the jars containing the treated cowpea seeds under room temperature. Three replicates for each concentration were used. Mortality were recorded 2, 3, 5 and 7 days post treatment. After 45 days of treatment, reduction in F1 progeny was calculated according to following equation:

$$\% \text{ Reduction} = \frac{\text{No. of emerged adults in the control-No. of emerged adults in treatment}}{\text{No. of emerged adults in the control}} \times 100$$

RESULTS AND DISCUSSION

Toxic effect of plant extracts

The toxic effects of fleabane leaves and dill seeds extracts against *Callosobruchus maculatus* are given in Table 1. Results showed clearly that moderate mortality values were recorded after 2 days from treaatment. Mortality increased with increasing values were recorded after 2 days from treatment. Mortality increased with increasing concentration and exposure periods. After seven days, mortality percentages were very high. For the extract of the plant leaves and seeds of various concentrations are shown in the same table.

It is apparent that the dill seeds extracts were slightly more toxic than the fleabane leave extract. Mortalities were 87 ± 6, 72 ± 8, 63 ± 6, and 57±3% 1.25% and 72±11, 67±10, 62±12 and 53±2% for the concentration 10, 5, 2.5 and 1.25% of the dill and fleabane extracts, respectively.

Reduction in F1 progeny was very high (94.4, 87.9 and 85%) at 10.5 and 2.5% concentrations in case of dill seed extract and it was 78.9 and 72.8% at 10 and 5% concentrations of fleabane leave extracts.

These results revealed that *Callosobruchus maculatus* was most susceptible to dill extract, followed by the fleabane petroleum ether extract.

Toxic of powders

Results concerning the toxic effects of fleabane and dill seeds powders against *Callosobruchus maculatus* are summarized in Table 2, which showed clearly high effect in case of dill seed powder than fleabane leave powder.

Recorded mortalities after 7 days from the treatment were in range from 43±2-76±3% and 36±2-58±4% for the dill seed and fleabane powders, respectively.

At the highest concentration (8%) reduction in F1 progeny was 73.8 and 33.1% for the dill seed and flea powders, respectively.

The obtained results indicate that petroleum ether extract was more toxic than powders, especially of the dill seed extract.

Toxic effect of insecticides

The effect of neemazal-F and pirimiphos methyl 50% E.C. on mortalities and reduction in F1 progeny of *Callosobruchus maculatus* were illustrated in Table 3.

Table 1. Effect of fleabane leaves and dill seeds extracts on mortalities and F1 progeny of cowpea seeds infested with *Callosobruchus maculatus*.

Treatment	Concentration %	% Mortality after indicated periods (days)				F1 Progeny	Reduction % of F1 Progeny
		2	3	5	7		
Fleabane leaves	10	32±9	42±7	57±10	72±11	38±5	78.9
	5	29±7	32±6	42±12	67±10	49±4	72.8
	2.5	27±2	29±4	36±2	62±12	73±12	59.4
	1.25	25±2	28±8	32±8	53±2	117±21	35.0
Dill seeds	10	35±8	58±2	66±3	87±6	10±0	94.4
	5	30±2	47±4	56±2	72±8	22±5	87.8
	2.5	26±4	35±6	42±3	63±6	27±2	85.0
	1.25	20±6	27±9	37±1	57±3	59±6	67.2
Control	control	8±2	9±1	10±2	10±4	180±10	0

Table 2. Effect of fleabane leaves and dill seeds powders on mortalities and reduction F1 progeny of cowpea seeds infested with *Callosobruchus maculatus*.

Treatment	Concentration %	% Mortality after indicated periods (days)				F1 Progeny	Reduction % of F1 Progeny
		2	3	5	7		
Fleabane leaves	8	23±8	35±6	48±5	58±4	115±21	33.1
	4	17±2	27±5	33±2	46±7	137±8	20.3
	2	15±4	22±6	27±5	38±5	142±21	17.4
	1	13±2	18±10	25±3	36±4	160±32	7.0
Dill seeds	8	37±12	53±8	62±2	76±3	45±2	73.8
	4	23±6	38±8	44±2	64±3	82±21	52.38
	2	12±3	27±2	36±8	52±2	120±43	30.2
	1	8±5	18±4	28±5	43±2	150±44	12.8
Control	Control	5±2	7±3	9±4	10±5	172±10	0

Table 3. Effect of Neemazal-F and Actellic 50% on mortalities and reduction in F1 progeny of cowpea seeds infested with *Callosobruchus maculatus*.

Treatment	Concentration ppm	% Mortality after indicated periods (days)				F1 Progeny	Reduction % of F1 Progeny
		2	3	5	7		
Neemazal-F 5%	500	42±5	85±11	90±6	92±7	91±1	59
	250	23±2	65±4	78±8	82±3	103±7	53.6
	125	15±0	55±11	62±6	67±7	146±10	34.2
	62.5	10±0	63±15	42±3	64±7	176±12	20.7
Actellic 50%	500	100±0	100±0	100±0	100±0	3±2	98.6
	250	100±0	100±0	100±0	100±0	18±1	91.9
	125	100±0	100±0	100±0	100±0	24±1	89.2
	62.5	100±0	100±0	100±0	100±0	26±14	88.3
Control	Control	8±3	8±4	10±1	10±4	222±6	0

Results of Neemazal-F revealed that mortalities after 2 days were low at all concentrations, except the highest one (500 ppm). It raised after 3 and 5 days, while after 7 days they ranged between 65-93% within 62.5 - 500 ppm of the tested media. Reduction in F1 progeny was moderate and amounted (20.7 - 59%) for all concentrations.

Complete mortalities were achieved for Actellic 50% E.C. against *Callosobruchus maculatus* and from 2 days to 7 days at all tested concentrations when compared with Neemazal-F. Also, reduction in F1 progeny was higher and ranged between (88.3 - 98.6%) for 62.5 -500 ppm concentrations, respectively.

The results showed that Actellic 50% was highly toxic than Neemazal-F E.C. 5% and the plant extracts of petroleum ether, and their powders. Thus, obtained results showed clearly that Actellic 50% was more effective against *Callosobruchus maculatus* than Neemazal-F 5% when compared with the petroleum ether extract of fleabane leaves and dill seeds, where there were no significance between them and effect of insecticides, while the powders were less effective. These results are in harmony with the findings of other investigators (Su, 1977 and 1989; Ahmed, 1983; Helen, 1985 and 1989; Darwish, 1992; El-Lakwah et al. 1989, 1994 and 1995).

Therefore, it could be recommended for use in an integrated pest management programme against the forementioned stored product insects.

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التقدير المعملى للتأثير السام لبعض المستخلصات النباتية ومساحيقها مقارنة ببعض المبيدات الحشرية ضد خنفساء اللوبيا

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أجريت هذه الدراسة بغرض تقييم التأثير السام لكل من مستخلص أوراق البرقوق وبذور الشبت ومساحيقها، وكذلك النيمازال – ف (فى صورة محلول يحتوي على ٥٪ Azadirachtin) والأكتليك (بريميفوس مثيل ٥٠٪) على نسب الموت ومقدار الانخفاض فى تعداد الجيل الأول ضد خنفساء اللوبيا C.maculatus .ولقد وجد من النتائج أن نسب الموت قد ارتفعت بزيادة التركيز ومدة التعريض، فبعد ٢ ، ٥ يوما من المعاملة كانت نسبة الموت معتدلة ولكن إرتفعت من ٧٢ – ٨٧٪ بعد ٧ أيام على مستوى أعلى تركيز (١٠٪) لكل من مستخلص ورق البرقوق وبذور الشبت على التوالى.

وكان مقدار الإنخفاض فى تعداد الجيل الأول عالى جداً فكان ٩٤,٤ ، ٨٧,٨ و ٨٥٪ على مستوى التركيز ١٠ ، ٥ ، ٢ ٪ لمستخلص الشبت وكان الإنخفاض التعدادى ٧٨,٩ و ٧٢,٨٪ على مستوى التركيز ١٠ ، ٥٪ فقط لمستخلص أوراق البرقوق.

كما أثبتت النتائج ان التأثير السام لمسحوق هذه النباتات على نسب الموت كان منخفضا بعد يومين من المعاملة ولكن ارتفعت نسب الموت من ٥٨ – ٧٦٪ لكل من مسحوق أوراق البرقوق وبذور الشبت على التوالى وذلك بعد ٧ أيام على مستوى أعلى التركيز وهو ٨٪، بينما كانت نسبة الخفض فى تعداد الجيل الأول تتراوح بين ٧ – ٣٣٪، ١٢,٨ – ٨، ٧٣٪ لهذين المسحوقين تحت الاختبار على التوالى.

ووجد ان التأثير السام للنيمازال – ف على نسب الموت كان عاليا وقد تتراوح ما بين ٦٤ ± ٧ – ٧٢ ± ٧٪ على مستوى التركيزات المختلفة وهى تبدأ من ٦٢,٥ – ٥٠٠ جزء من المليون وكان نسبة الأنخفاض فى التعداد ٧ ، ٢٠ – ٥٩٪ على مستوى التركيزات المبينة.

أما بالنسبة لمبيد الاكتليك ٥٠٪، فقد كان تأثيره على نسب الموت ١٠٠٪ ضد حشرة خنفساء اللوبيا ، وكذلك كانت نسبة الانخفاض فى التعداد مرتفعة جدا على مستوى التركيزات المختلفة لهذا المبيد.