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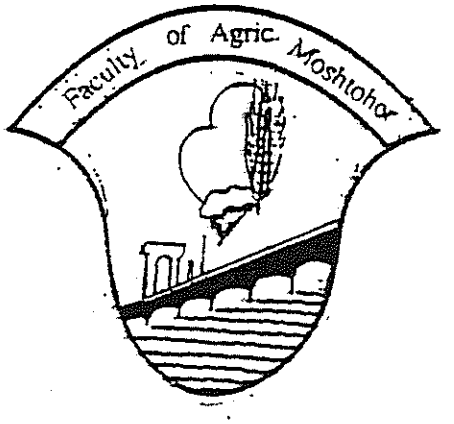

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EFFECT OF CHINABERRY TREE (*Melia azedarach*) FRUITS AGAINST THE COWPEA BEETLE . (*Callosobruchus maculatus* F.)

BY

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ABSTRACT

The Chinaberry tree *Melia azedarach* fruits as powder and as extracts in petroleum ether and acetone were evaluated for mortalities, reduction in F_1 progeny and repellency effect against the cowpea beetle *Callosobruchus maculatus* adults at the following concentrations (8, 4, 2 and 1% for powder and 10, 5, 2.5 and 1.25% for the extracts).

Results revealed that petroleum ether extract of the fruits was more toxic to *C. maculatus* adults than the powder and acetone extract. Reduction in F_1 progeny was much higher than mortalities at all tested concentrations.

Mortalities increased with increasing the concentration. After 7 days, percentage mortality was 70.7; 93.8, and 63.4% at the highest concentration for the powder, petroleum ether and acetone extracts, respectively.

Complete reduction in F_1 progeny (99.5-100%) was recorded at the highest two concentrations of the extracts, and it was with the powder between 49-67%. Results of average repellency recorded during the observation period of 21 days ranged from 9.5-28% ; 7.3-22.3%, and 12-26% for the powder, extracts of petroleum ether and acetone, respectively.

INTRODUCTION

Cowpea is one of the most important legume crops in the world and it is used in the developed countries as a human feed (Hawtin and Habblethwaite 1983).

The cowpea seeds are subject to heavy attack by cowpea beetle, *C. maculatus* (F.). particularly during storage. Natural plant products are presently in the focus of research efforts because of their mammalian safety and efficacy

(Tanzubil 1987). Chiu (1989) mentioned that fruits of. *Melia azedarach* from southern china possess fairly high toxicity to insects. A 1% chloroform extract of the fruits showed very high feeding repellency for fourth instar larvae of *Spodoptera litturalis* in a none-choice test. He showed also (1993), that 1% methanol extracts of the seed kernels of *Melia azedarach* gave more than 80% inhibition of ear cutting cutterpiller feeding for the first and second instar larvae of *Epilachna variestis*.

El-Lakwah *et al.* (1993) evaluated the effect of Neemazal-F a powder of a botanical insecticide contains 33% Azadirachtin obtained from the neem tree, *Azadirachta indica*, a dose obtanical sulative of *Melia azedarach*. This experiments showed acceptable results on *S. oryzae*, *T. castaneum* and *R. dominica* in terms of mortality, reduction of F1 and repellencey.

The present work was designed as a trial on chinaberry tree *Melia azedarach*, a local abandantly growing species for its effects on economic pest *C. maculatus*.

MATERIALS AND METHODS

Insects:

The cowpea beetle (*Callosobruchus maculatus* Fab.) was reared under laboratory conditions at 26±1°C and 60±5% RH at the stored product laboratory of the Faculty of Agriculture, Moshtohor, Zagazig University.

Materials and toxicity test:

Melia azedarach fruits were collected from the trees in Kalyubia region dried for 3 weeks at room temperature and ground in an electric mill into a fine powder.

The powder of Chinaberry tree fruits was extracted with acetone and petroleum ether at 50°C under reduced pressure as described by Helen (1985). Concentrations of 10, 5, 2.5 and 1.25 % (w/v) were prepared from the stock solution, and used in the tests. The concentrations of the powder were 8, 4, 2, and 1%.

The prepared concentrations from the stock solution or dust were added to 10 gm cowpea seeds in plastic jars and thoroughly mixed:

Batches of 30 adult insects (2 days old), were transferred to the jars containing cowpea seeds. Three replicates for each concentration were used. The

% Reduction = [No. of emerged adults in control - No. of emerged adults in treatment)/No. of emerged adults in control)] X 100

Repllency test:

Repellency was carried out using an apparatus described by Helen (1989, with some modifications. A metalic ring (6 cm diameter X 0.5 cm height) was placed in the center of petri-dish (11 cm diameter X 3 cm height). Ten grams of the treated cowpea seeds were placed inside the ring which act as a barrier for the insects. Twenty adults (2 days old) were introduced to the apparatus and then the petri-dish was covered with glass lid. The dishes were kept at 26±1°C and 60±5% RH. Repellency was recorded after 2, 7, 14. and 21 days from treatment according to the number found inside and outside the ring. At each of these various intervals, new adults were used.

RESULTS AND DISCUSSION

Results concerning the toxic effect of the Chinaberry tree (*Melia azedarach*) fruits as powder and extracts on mortalities and reduction in F_1 progeny of *C. maculatus* are given in Tables 1-3.

Effect of the powder:

The effect of the powder on *C. maculatus* adults is summarized in Table (1). Low mortalities were observed 2 days after treatment. After 7 days, mortality was increased with increasing the concentration to reach 46±2.9 % ; 52.3±2.8 % ; 61.3±0.9 % , and 70.7±1.1 % at 1, 2, 4 and 8 %, respectively, compared with 8.8±1.6% of the control.

Probit analysis (Finney, 1971) of time versual corrected mortality for the concentration of 8% revealed that LT_{50} 6.12 with upper limit of 6.65 days and a lower of 5.64 days (Fig. 1).

Reduction in F_1 progeny after 90 days ranged between 25.4 and 67.3% within the different concentrations.

Results of the repellency effect of the powder against *C. maculatus* adults are shown in Table 4.

Data indicated that repellency was concentration dependant. Average repellency achieved during 21 days was in range from 9.5-28% at the used concentrations, meanwhile it was 7% for the control. This may be taken as an indications that repellencey was not the major effect, and to the presence of an outhentic antifeedant in the dust.

Table (1): Effect of *Melia azedarach* fruits powder on mortalities and reduction in F1 progeny of *C. maculatus* adults.

Concentration (%)	Adult mortalities % ± S.D. after indicated period (days)				F_1 progeny after 90 days	Reduction % of F_1
	2	3	5	7		
1	0.0 ±0.0	3.3 ±0.0	16.5 ±2.7	46.0 ±2.9	131.0 ±40.3	25.4
2	1.1 ±1.6	4.4 ±1.6	17.6 ±1.6	52.3 ±2.8	165.0 ±24.3	32.0
4	1.1 ±1.6	5.6 ±1.6	21.5 ±1.2	61.3 ±0.9	123.0 ± 8.8	49.3
8	2.2 ±1.6	6.7 ±0.0	30.1 ±4.6	70.7 ±1.1	79.3 ± 6.9	67.3
Control	0.0 ±0.0	0.0 ±0.0	2.2 ±1.6	8.8 ±1.6	242.7 ±10.1	0.0

Table (2): Effect of petroleum ether extract of *Melia azedarach* fruits on mortalities and reduction in F1 progeny of *C. maculatus* adults.

Concentration (%)	Adult mortalities % ± S.D. after indicated period (days)				F_1 progeny after 90 days	Reduction % of F_1
	2	3	5	7		
1.25	8.9 ±1.6	12.2 ±4.1	36.3 ±2.5	53.3 ±2.7	19.7 ±12.8	81.7
2.5	11.1 ±3.1	20.9 ±1.6	38.7 ±3.9	82.7 ±2.9	11.0 ±13.5	89.8
5	18.1 ±8.7	30.0 ±0.0	60.0 ±2.8	89.9 ±7.2	0.0 ±0.0	100.0
10	22.1 ±5.7	53.3 ±7.2	70.5 ±6.3	93.8 ±6.5	0.0 ±0.0	100.0
Control	2.2 ±3.2	10.0 ±0.0	13.3 ±0.0	13.3 ±0.0	107.7 ±9.9	0.0

Table (3): Effect of aceton extract of *Melia azedarach* fruits on mortalities and reduction in F1 progeny of *C. maculatus* adults.

Concentration (%)	Adult mortalities % ± S.D. after indicated period (days)				F_1 progeny after 90 days	Reduction % of F_1
	2	3	5	7		
1.25	0.0 ±0.0	1.1 ±1.6	5.5 ±1.6	14.4 ±1.5	173.3 ± 2.1	11.3
2.5	0.0 ±0.0	1.1 ±1.5	11.1 ±3.1	19.8 ±4.8	115.0 ±30.6	41.1
5	2.2 ±1.6	3.3 ±0.0	15.4 ±1.6	37.3 ±3.7	1.0 ± 0.8	99.5
10	4.4 ±1.6	4.4 ±1.6	26.0 ±3.1	63.4 ±9.5	0.3 ± 0.5	99.8
Control	0.0 ±0.0	0.0 ±0.0	4.4 ±1.6	11.1 ±1.6	195.3 ± 7.7	0.0

Table (4): Repllency of *Melia azedarach* fruits powder on *C. maculatus* adults.

Concentration (%)	% adult repellency ± at indicated periods after treatment (days)				Average repellency (%)
	2	7	14	21	
1	10±4	8±3	13±4	7±2	9.5
2	13±3	16±4	14±2	12±3	13.8
4	12±3	20±2	16±4	23±3	17.8
8	23±6	35±4	28±4	26±5	28.0
Control	6±2	8±3	6±3	8±4	7.0

Table (5): Repellency of petroleum ether extract of *Melia azedarach* fruits on *C. maculatus* adults.

Concent-ration (%)	% adult repellency ± at indicated periods after treatment (days)				Average repellency (%)
	2	7	14	21	
1,25	8±2	6±3	5±1	10±3	7.3
2.5	10±4	12±4	13±3	8±2	10.8
5	13±2	11±1	14±2	16±4	13.5
10	28±4	23±4	20±6	18±7	22.3
Control	6±2	5±4	6±1	8±3	6.3

Table (6): Repellency of aceton extract of *Melia azedarach* fruits on *C. maculatus* adults.

Concent-ration (%)	% adult repellency ± at indicated periods after treatment (days)				Average repellency (%)
	2	7	14	21	
1.25	17±4	12±3	8±4	11±4	12.0
2.5	18±2	21±6	11±5	18±3	17.0
5	23±4	17±5	16±4	20±5	19.0
10	31±3	33±4	18±6	22±7	26.0
Control	2±1	8±3	5±3	6±2	5.3

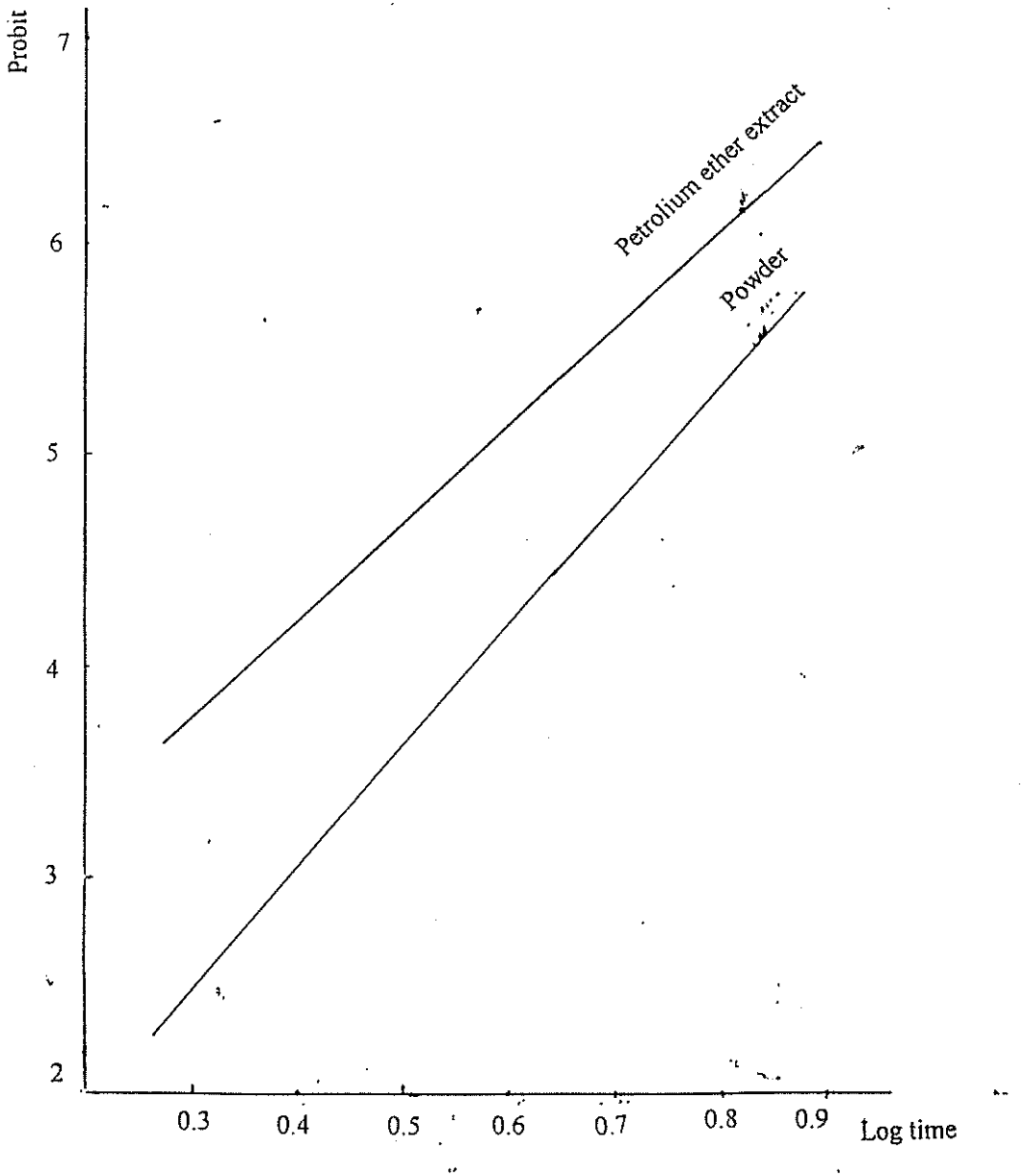

Fig. (1): LT-P lines for *Callosobruchus maculatus* F. exposed to powder and petrolium ether extract of *Melia azedarach*.

Mortality increased with increasing the concentrations to reach 53.3±2.7 %: 82.7±2.9 % ; 89.9±7.2 % and 93.8±6.3 % at 1.25, 2.5, 5, and 10% after 7 days, respectively. Probit analysis of time versus corrected mortality for the concentration of 10% revealed that LT_{50} was 3.73 days (Fig. 1).

Concerning reduction in F_1 progeny, it ranged from 81.7 and 100% within the tested concentrations.

Results of repellency effect of petroleum ether extract against *C. maculatus* adults shown in Table 5 indicated that repellency increased with increasing the concentration. Average repellency obtained during 2 days was in range from 7.3-22.3% in comparison with 6.3% of the control, emphaticaly the an observation that the effect was largely antifeedant.

Effect of acetone extract on mortalities and reduction in F_1 progeny against *C. maculatus* adults demonstrated in Table 3 revealed that very low mortalities were found after 2 and 3 days of treatment. These values were much higher after 7 days and ranged between 14.4±1.5-63.4±9.5% in comparison to 11.1±1.6 % of the control.

Reduction in F_1 progeny was from 11.3-99.8 % at various concentrations.

Results of repellency effect of acetone extract against *C. maculatus* adults shown in Table 6 indicate that average repellency increased and was between 2-26 % within the various concentrations.

Data obtained from this study revealed that the petroleum ether extract of the Chinaberry tree fruits was more toxic to *C. maculatus* adults than the powder and acetone extract.

Reduction in F_1 progeny was much higher than mortalities at all tested concentrations.

This effect could be due to the fact that Melia azedarach seeds contains azadirachtin or similar terpenoids which possess antifeedant activity (Champagne *et al.* 1989).

Kraus *et al.* (1987) mentioned that M. azedarach fruits contain several compounds which give strong antifeeding activity. It may inhibit the life cycle (Oviposition, hatchability, moulting of the larval instars..... etc.). The higher

The main effect of Azadirachtin and similar triterpens from the viewpoint of pest control is on the endocrine system, it leads to a moulting disturbance which is often lethal. To a great extent it appears that the active compounds present in *M. azedaracht* in a similar way.

Also the fecundity of many insects species is reduced. These effects are mainly caused by the reduction of ecdysteroid titres and also of Juvenile hormone (Rembold *et al.*, 1984). According to Rembold (1989) the corpus cardiaca is the main target of azadirachtin.

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تأثير ثمار شجرة الزنزلخت *Melia azedarach* على حشرة خنفساء اللوبيا

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لقد تم دراسة تأثير مسحوق ومستخلص الأثير البترولى والأسيتون لثمار شجرة الزنزلخت من النوع *Melia azedarach* بتركيزات ١، ٢، ٤، ٨٪ للمسحوق، ١,٢٥، ٢,٥، ٥، ١٠٪ لمستخلص الأثير البترولى والأسيتون على نسبة الموت ومقدار الأنخفاض فى تعداد الجيل الأول وكذلك التأثير الطارد على الحشرات الكاملة لخنفساء اللوبيا.

وقد أظهرت النتائج أن مستخلص الأثير البترولى لثمار شجرة النيم من النوع *Melia azedarach* كان أكثر سمية على الحشرات الكاملة لخنفساء اللوبيا من المسحوق ومستخلص الأسيتون ووجد أن نسب الأنخفاض فى تعداد الجيل الأول للحشرة كان أعلى من نسب الموت مع جميع التركيزات المستخدمة.

وأشارت النتائج الى أنه بزيادة التركزات تزيد نسب الموت وذلك بعد ٧ يوم من المعاملة وتراوحت نسب الموت بين ٧٠,٧، ٩٣,٨، ٦٣,٤٪ للتركيزات العالية مع كل من المسحوق، مستخلص الأثير البترولى ومستخلص الأسيتون على التوالى.

وسجلت النتائج أن نسب الأنخفاض فى تعداد الجيل الأول تراوح ما بين ٩٩,٥-١٠٠٪، ٤٩-٦٧٪ للمستخلص والمسحوق مع أكبر تركيز على التوالى.

وسجلت ثمار شجرة الزنزلخت تأثيرا طاردا بنسب تراوحت ما بين ٩,٥-٢٨٪، ٧,٣-٢٢,٣٪، ١٢-٢٦٪ وذلك للمسحوق ومستخلص الأثير البترولى ومستخلص الأسيتون على التوالى.

حوليات العلوم الزراعية بمشتهر

كلية الزراعة بمشتهر — جامعة الزقازيق / فرع بنها

المجلد الثاني والثلاثون . العدد الرابع — ديسمبر ١٩٩٤