LARVICIDAL EFFECT OF CERTAIN PLANTS ON THE EUROPEAN CORN BORER *OSTRINIA NUBILALIS* (HUBN.) IN THE LABORATORY

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Abstract

The lethal effect of *Melia azedarach, Duranta plumieri, Venca rosea, Clerodenderon inerme, Ruta graveolens, Colocasia antiquorum, Allium cepa and Allium sativum* leaves on *Ostrinia nubilalis* larvae were tested in the laboratory.

The larvae were fed either on an artificial diet containing the paste or the powder of the tested leaves or on fresh maize plants sprayed with the leaf extracts.

C.inerme, D.pulmieri, *V.rosea* and *M.azedarach* leaves showed high efficiency; killed 55-100% of the newly hatched larvae and reduced the weights of the survivals with 41.8-94.3%. On the other hand, *C.antiquorum*, A.cepa, A.sativum and *R.graveolens* leaves represented the least toxicants against *O.nubilalis* larvae.

The acetonic extracts were more toxic than those of diethylether.

INTRODUCTION

The European Corn Borer O.nubilalis is considered a serious pest which attacks maize fields in Egypt especially those of the late plantation. The use of insecticides against this pest, of course, increases its resistance in addition to the environmental pollution.

Therefore, it became an urgent requirement to search for safe substitutes for these insecticides. In this research, a laboratory trial was attempted to investigate the larvicidal effect of certain plant leaves or their extracts against this borer.

MATERIALS AND METHODS

Ostrinia nubilalis larvae used in this research were taken from a standard colony fed on fresh maize plants. Crushed leaves were mixed with an artificial diet, similar to that mentioned by shorey and Hale (1965).

The diet consisted of 100 g. soaked kindney beans, 20 g. dry Brewer's yeast, 0.5 mg. ascorbic acid, 20 g. bacto agar, 1.9 mg methyl paraben and 150 ml. water. Four grams of this diet were used for each larva (1st. instar).

Eight plant species were tested, namely *Melia azedarach, Duranta plumieri, Venca rosea, Clerodenderon inerme, Ruta graveolens, Colocasia antiquorum, Allium cepa and Allium sativum.*

A powder from each tested plant was prepared from fresh leaves dried using an electric oven (60-65^{o}C) for 24 hours, then crushed well and sieved.

A patch of fresh leaves was also cut to fine pieces using an electric machine. The obtained paste was added to the diet or soaked in a solvent (acetone or diethylether) (1:1 W/V) for 48 hours under room temperature then blended for 5 minutes and filtered through muslin cloth and squeezed to obtain the extract. Each extract was sprayed on maize cuttings (35 days old) and were offered to the larvae.

To test the toxicity of each plant, larvae of the previous insect were fed on the diet containing the paste or the powder or on fresh maize plants sprayed with leaf extract. Another group of larvae were fed on untreated diet or fresh maize plant sprayed with the solvent only as a control. All experiments were carried out at 27±1^{o}C.

Abbott's (1925) formula was used when it was necessary and the analysis of variance was also followed.

RESULTS AND DISCUSSION

1. Using the diet

The effect of six plants on *O.nubilalis* larvae is shown in Table 1. The data revealed that *M.azedarach* was the most toxicant and caused 25.0-100% death for the larvae when these leaves were added as a paste with small portions (0.5-1.6%) into the diet. It also reduced the weights of survival larvae with a range of 41.8-90.2%. The powder of this plant also showed a high toxicity effect; killed 33.3-100% and reduced the weights of the alives with 80.1-93.6%. A similar lethal effect, for

these leaves, was obtained against *S.littoralis* larvae in the laboratory by Khadr *et al.* (1995).

D.plumieri fresh leaves at 1.5-4.0% or its powder at 0.4-1.0% revealed also a high toxicity effect against the *O.nubilalis* larvae and sharply decreased their weights with a range of 90.5-94.3%, Table 1.

Data in the same table showed that, a high larval mortality with a sharp decrease in the weights were also obtained by *V.rosea* and *C.inerme* leaves at higher rates; 2.0-10.0% and 5-14% green leaves and 0.25-2.00% and 1.2-4.0% dried leaves, respectively.

Table 1. Percentage mortalities and weight reduction for *O.nubilalis* larvae fed on an artificial diet containing different rates of green dried leaf plants.

Plant	Green leaves					
	Rate	Larval death	Reduction in larval	Rate	Larval death	Reduction in larval
	%	%	wt. %	%	%	wt. %
M.azedarach	0.5	25.0	41.8**	0.3	33.3	80.1**
	0.7	35.3	71.5**	0.4	39.0	86.3**
	1.1	68.4	90.2**	0.5	54.0	93.6**
	1.6	100.0	-	0.7	100.0	-
D.plumieri	1.5	23.5	90.5**	0.4	33.3	90.5**
	2.0	47.1	92.4**	0.5	37.5	92.4**
	3.0	71.0	94.3**	0.7	70.0	92.6**
	4.0	88.9	94.3**	1.0	81.2	94.3**
V.rosea	2.0	48.0	58.4**	0.25	12.5	37.4**
	4.0	65.0	58.4**	0.5	57.9	47.1**
	6.0	85.2	62.2**	1.0	80.0	86.8**
	10.0	88.9	88.7**	2.0	100.0	-
C.inerme	5.0	33.3	92.4**	1.2	29.4	56.0**
	10.0	45.0	92.4**	1.5	33.3	64.0**
	12.0	66.7	94.3**	2.0	67.0	62.0**
	14.0	90.0	94.3**	4.0	90.0	69.8**
R.graveolens	32.0	20.8	45.0**	4.0	40.9	87.9**
	40.0	37.0	62.9**	13.0	56.9	98.6**
	50.0	63.5	77.3**	14.0	75.5	98.8**
	60.0	88.9	86.8**	20.0	100.0	-
C.antiquorum	10.0	0.0	2.7	20.0	4.8	15.6**
	20.0	6.7	24.2**	30.0	30.0	39.9**
	40.0	14.0	31.8**	40.0	36.0	53.3**
	80.0	50.0	43.1**	50.0	60.0	63.2**

* Compared with mean weight of the control larrae (58.2 mg).

R.graveolens leaves relatively had a less efficiency against the larvae and it was necessary to raise its concentration in the diet to 32.0-60.0% to gain 20.8-88.9% death and 45.0-86.8% weight reduction for the larvae. It was also needed to use high rates (4.0-20.0%) of its powder to obtain 40.9-100% death and 87.9-98.8% weight reduction Table 1.

This table showed that C.antiquorum had the least toxic property against O.nubilalis larvae. Higher rates of its fresh leaves (10.0-80.0%) or its powder (20.0-50.0%) were needed to obtain a slight effect; 0.0-50.0 and 4.8-60.0% mortality with 2.7-43.1 and 15.6-63.2% weight reduction, respectively.

It is appeared from the previous data that the effect of the leaf powder was generally higher against *O.nubilalis* larvae than that of the fresh leaves and this result disagree with that of Meisner *et al.* (1981) who mentioned that, the extracts of *C.roseus* fresh leaves were more active than the leaf powder suspensions against *S.littoralis*.

2. Using the natural food

The effect of seven leaf extracts on different ages of O.nubilalis larvae is shown in Table 2. The data in this table revealed that; C.inerme, D.plumieri, V.rosea and M.azaderach extracts had a high lethal effect against the larvae of this insect, and their toxicity, after 2 feeding days was higher, opposite to the newly hatched larvae, than to the 2 or 4-days old ones. Regardless of the solvent, the mortality of newly hatched larvae ranged 35.0-85.0, 50.0-100, 35.-100 and 25.0-75.0% in case of the previous extracts, respectively. These mortalities were 25.0-40.0, 15.0-85.0, 0.0-55.0, and 25% in case of 2-days old larvae and 5.0-25.0, 15.0-55.0, 20.0-25.0 and 35.0-40.0% in case of 4-days old ones for the same respective extracts.

It is also appeared from the data that, the extraction with aceton extract produced more toxicant filtrates, after 2 feeding days, than those of DEE except that of *A.sativum*.

C.antiquorum, A.cepa and *A.sativum* leaves gave the least effective extracts and they killed 45.0, 20.0 and 40.0% of the newly hatched larvae, respectively Table 2.

The previous results in the two tables showed that, the lethality of most the four tested leaves was generally accompanied by a pronounced abnormal larval growth particularly with a sharp weight decrease. This agrees with the findings of Mo-

hamed (1981) when he mentioned that dried plants belonging to the family Verbenaceae caused 90% feeding deterrent opposite to *S.gregaria*. Also Koul (1982) agreed with our results and reported that, plant leaves of Miliaceae and Verbenaceae families posses the most potent antifeedants against lepidopterous insects.

Table 2. Mortality percentages of O.nubilalis larvae, different ages, fed on fresh maize cuttings sprayed with different plant leaf extracts.

Extract	Solvent	Larval mortality											
		Newly hatched				2 days old				4 days old			
		2 FD*	6 FD	8 FD	Total	2 FD	6 FD	8 FD	Total	2 FD	6 FD	8 FD	Total
C.inerme	DEE	35	60	00	95	25	45	30	100	5	80	15	100
	Acet.	85	00	00	85	40	55	5	100	25	75	-	100
D.plumieri	DEE	50	10	15	75	15	70	10	95	15	50	5	70
	Acet.	100	-	-	100	85	15	-	100	55	45	-	100
V.rosea	DEE	35	30	20	85	00	65	00	65	25	10	20	55
	Acet.	100	-	-	100	50	15	15	80	20	40	25	85
M.azedarach	DEE	25	50	15	90	25	65	00	90	35	40	00	75
	Acet.	75	00	00	75	25	10	15	80	40	35	10	85
C.antiquorum	DEE	15	25	5	45								
	Acet.	35	00	00	35								
A.cepa	DEE	5	15	00	20								
	Acet.	20	00	00	20								
A.sativum	DEE	100	-	-	100								
	Acet.	40	00	00	40								

* FD = Feeding days

DEE = Diethylether

Acet. = Acetone

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التأثير الإبادى لبعض الأوراق النباتية على يرقات ثاقبة الذرة الأوربية (استرينيا نيوبلالس) فى المعمل

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أجريت هذه الدراسة المعملية لاختبار سمية أوراق بعض النباتات المختلفة (لبعض العائلات) على يرقات حفار ساق الذرة الأوربى وذلك باضافة مهروس تلك الأوراق الطازجة أو مساحيقها الجافة الى بيئة صناعية وتغذية اليرقات عليها، كما حضرت مستخلصات الأوراق ورشت على نباتات ذرة طازجة وتم التغذية أيضا عليها ... وفيما يلى أهم النتائج :

أظهرت مستخلصات أوارق كل من الزنزلخت والونكا والدورانتا والياسيمن الزفر سمية عالية على اليرقات بصفة عامة وكانت تلك السمية أعلى نسبيا فى الفقس الحديث عن اليرقات الأكبر عمرا (٢ – ٤ يوم). وعلى العكس من ذلك كان تأثير مستخلصات أوراق القلقاس والبصل والثوم.

كانت سمية مساحيق الأوراق المجففة على اليرقات واضحة عند استعمالها فى البيئة الصناعية وكانت أكبرها سمية تلك الخاصة بأوراق الزنزلخت ثم الدورانتا فالونكا والياسمين، أما سمية أوراق كل من السدب والقلقاس فكانت منخفضة بالرغم من استخدامها فى البيئة بتركيزات عالية.