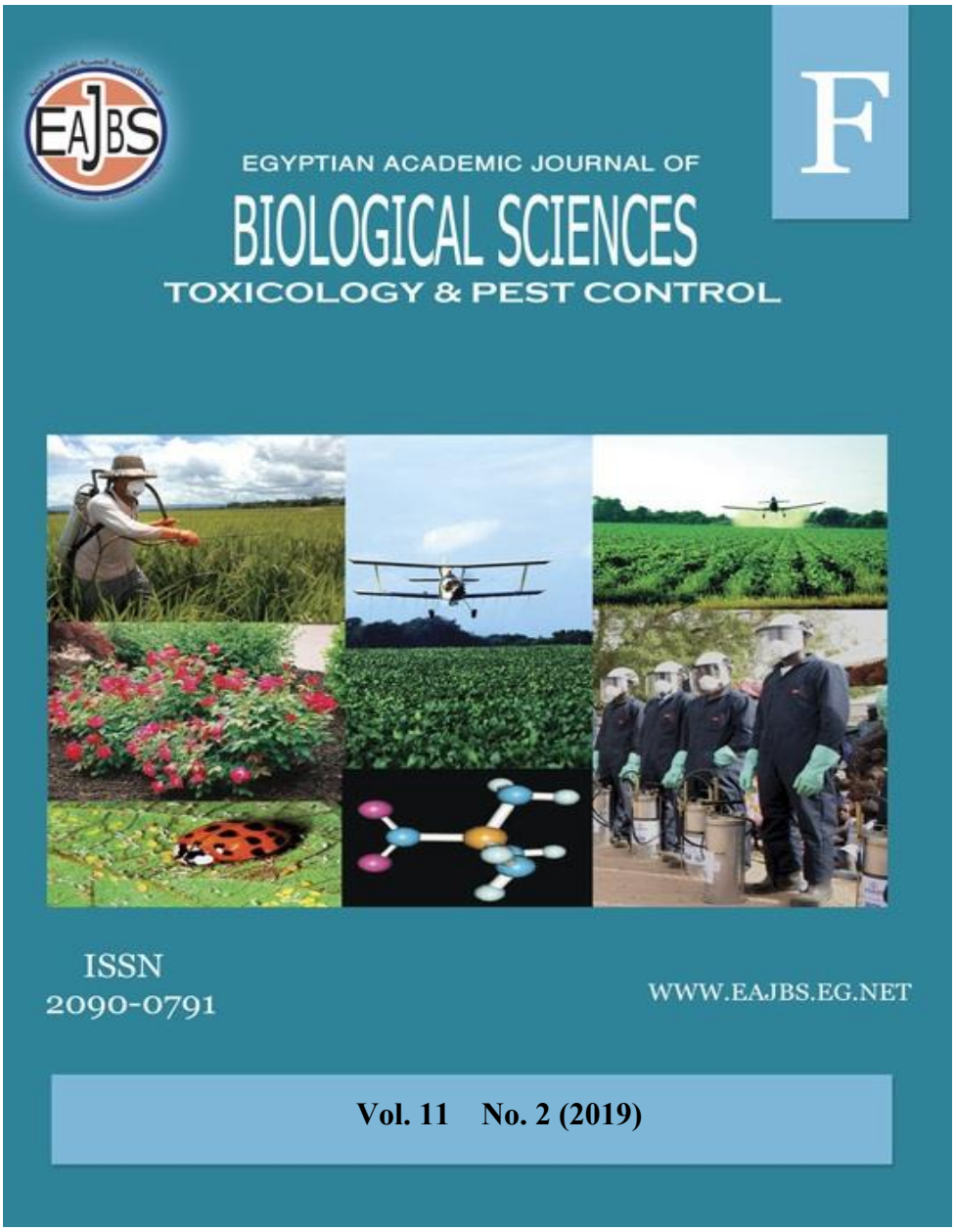

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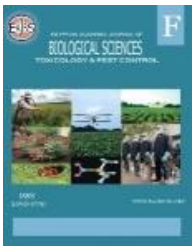

Insecticidal and Growth Inhibition Activity of Some Medical Plants against Cotton Leaf Worm, *Spodoptera littoralis* (Boisd).

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ABSTRACT

This paper presents the results of phytochemical screening of plant extracts obtained from *taxodium, erythrine, melaleuca, and terminalia* plant species for chronic toxicity and larval growth inhibition in the cotton leaf worm, *Spodoptera littoralis*. the photochemical screening of the tested plants investigated that carbohydrate was identified as the major compound in *Taxodium distichum , Terminalia arjuna , Melaleuca cajuput* while flavonoids, flavonoid glcosides ,flavonols, Chalcones, tannins, sterols and/or triterpenes and alkaloids or nitrogenous were found to be the second main compounds in *Taxodium distichum* but the second main compounds *in Terminalia arjuna and Melaleuca cajuput* were flavonoids,flavonols, tannins ,sterols and/or triterpenes and alkaloids or nitrogenous. On the other hand, *Terminalia arjuna* was rich with saponins. The insecticidal properties of the tested plants extract each in ethanol and chloroform was evaluated at the concentrations of (10 to 0.625%). There was a positive correlation between the concentration and the percentage of larval mortality and malformed pupae and adult. All the concentrations showed significant differences in mortality of *Spodoptera littoralis* as compared to control. The reduction in F_1 progeny, elongation of the larval duration, and pupal period at any of the tested concentrations were noticed. There was a moderate gradient reduction in the pupation percentage of the different treatments compared with control treatment. Moderate fluctuation observed among sex ratio. Percentage of adult emergence and growth was inhibited with increasing the concentrations as observed in four plant extracts compared to control.

INTRODUCTION

The cotton leaf worm, *Spodoptera littoralis* (Boisd.) (Lepidoptera: Noctuidae) is a polyphagous insect pest widely distributed throughout Egypt. It has a wide range of hosts, feeding on 112 plant species worldwide, of which 100 species are known in Egypt (Dutton and Komblas 1989). A large number of natural products is produced by arid land plants, including species of the Cactaceae. These compounds, which are stored in roots and aerial parts, include terpenoids, alkaloids, phenolics and amino acids. Some of the compounds that occur in the leaves and stems have an ecological role that is related to defense against phytophagous insects and pathogens. Interest in the application of these

compounds or plant secondary metabolites for insect pest management has led to search for new environmentally friendly and biodegradable, but biologically active, natural products with low mammalian toxicity in order to avoid some of the deleterious effects on the environment produced by synthetic pesticides (Kubo, 1997; Gonza´lez and Estevez-Braun, 1998; Ce´spedes *et al*., 2000, 2001a, b, 2004; Torres *et* al., 2003). Some previous studies have focused on nor-triterpenoids (limonoids) from the family Meliaceae because of their potent effects on insect pests linked to low toxicity (Kubo and Klocke, 1982; Champagne *et al.*, 1989; Klocke *et al*., 1989; Carpinella *et al*., 2002, 2003). One such compound, gedunin (Arnason *et al*., 1987), has proven to have excellent properties (Ce´spedes *et al*., 2000, 2004). Other triterpenoids with insect growth regulator activities are phytoecdysteroids such as b-ecdysone, ajugasterone C, and cyasterone (Kubo *et al*., 1981, 1983, 1987; Kubo and Klocke, 1983; Zhang *et al*., 1992). Sterols and triterpenes have an important biological function as key compounds in the acquirement of cholesterol by insects. Mammals obtain cholesterol either by dietary absorption or by biosynthesis from mevalonate. Because insects have no capacity for sterol synthesis, they rely exclusively on exogenous sources for their normal growth, development, and reproduction (Ikekawa *et al*., 1993). Research on the site and mechanism of action of allelochemicals responsible for insect control indicates that many terpenoid compounds are involved in insecticidal and insect growth regulation (IGR) activities. Hence, the present study was conducted to evaluate the phytochemical and inhibitory effect of plant extracts from the *taxodium, erythrine, melaleuca,* and *terminalia* on certain developmental aspects of *Spodoptera littoralis.* These abstracts were produced by using ethanol, chloroform and water extract.

MATERIALS AND METHODS

Preparation of Plant Extracts:

Terminalia arjuna (White marudah) , *Erythrine caffra* (Flamingo flower), *Taxodium distichum L. Rich* (Bald cypress), *Melaleuca cajuputi* (cajuput tree) leaves were selected on the basis of previous work of many investigators. Hashem *et al*., (1994); Schmidt *et al*, (1997) and El-Naggar and Abdel-Fattah, (1999). The four mentioned plant organs were dried for 2-3 weeks at room temperature and ground in an electric mill into fine powder. 200 g of the powder plant materials were soaked in the solvent (ethanol and chloroform in a large flask for 72 hrs). The flask was then shaken for 30 min in a shaker and its contents were filtered. The solvent was evaporated at 50^{o} C under reduced pressure using a rotary evaporator. The extract, which was in the form of a crude gum, was weighed and redissolved in the solvent to give 20% (W/V) stock solution. Concentrations of 10, 5, 2.5, 1.25 and 0.625% (W/V) were prepared by diluting the stock solution in the solvent.

Methods of Application:

Fourth instar larvae of *S. littoralis* (Boisd.) were fed on Ricinus plant leaves treated with tested plant extracts dissolved in petroleum ether and ethanol at concentrations of 10, 5, 2.5, 1.25 and 0.625 using the leaf dipping technique (El-Kady *et al.*, 1990).

The growth inhibition (GI) =number of surviving larvae /total larvae used and relative growth index (RGI) = GI treatment/ GI control

Percentages of reduction in F_1 –progeny were calculated according to the following equation:

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

Growth index = % of adults emergence / Total period

Preliminary Phytochemical Screening Tests:

The tests were performed using the three plant extracts *Terminalia arjuna, Taxodium distichum* and *Melaleuca cajuputi*, extracted successively with three different solvents (chloroform, ethanol and water). Those are the same mentioned plant extracts that were previously used to study the preliminary toxic activities against *Spodoptera littoralis* larvae. The air-dried powders of these plants were analyzed to detect carbohydrates and /or glycosides, flavonoids, saponins, tannins, sterols and /or triterpenes and alkaloids or nitrogenous basses.

Statistical Analysis:

Mean separation was determined by **Duncan's (1955)** multiple range test at P = 0.05.

RESULTS AND DISCUSSION

1- Biological Effects of Chloroform Extracts:

Biological effects of chloroform extract of the four plants on the 4 th instar larvae of *S. littoralis* were summarized in table (1,2).The crude of chloroform plant extracts was resolved on water with plant extracts except for *Erytherina* which was resolved in chloroform

Results revealed that the highest larval mortality was (36.7%) resulted from the larvae fed on leaves treated with 10% concentrations of *Taxodium* extract while the lowest larval mortality was (11.1%) recorded by *Melaloica* and *Erytherina* extracts at the concentration of 0.625%. The percentage of dead pupae are defined as the pupae which did not emerge as an adult. Also, the highest mortality of pupae (33.3%) resulted from the larvae fed on leaves treated with 10% concentrations of *Melaloica* extract and the lowest record was (14.4%) dead pupae in case of treatment with 0.625 concentrations of *Termenalia extracts*.

Data given in Tables (1,& 2) indicate that the percentage of total mortality until the adult stage was increased with the increase of concentration compared with the control treatment. It was increased at the concentration of 10% to 73.3, 63.3, 55.00 and 51.00 % in *Taxodium, Melaloica Terminalia* and *Erytherina*, respectively. But the lowest mortality percentages 44.4, 27.7, 26.6and 25% resulted from the application with the concentration of 0.625% of *Terminalia, Metallica*, *Erytherina,* and *Taxodium* extracts, respectively. El-shall *et al*., (2005) on *Spodoptera littoralis* found that the extracts of *Eucalyptus camaldulensis* on *Spodoptera littoralis* increased the percentage of larval and pupal mortality as compared to the control treatment. The average developmental period of surviving 4th instar larvae to pupae greatly prolonged and the larval period ranged from 15.08- 19.70 days at concentration of 10% in case of the treatment with *Erytherina* and *Taxodium* extracts, respectively and to 13.12, 13.8 days in case of treatment with *Taxodium* and *Ertherinia* extracts, respectively at concentration of 0.625%.

Results in Tables (1 & 2) and Figure (1) also showed that all plant extracts at any concentrations elongated the larval period comparing with control treatment which recorded 13.3days. Pupal durations were extremely affected in both males and females at all tested concentrations of all plant extracts in comparison with control. Similar results were obtained by Wigglesworth (1972), who mentioned that the progressive development of immature (larval and pupal characters) and mature stages are controlled by the hormonal balance between both Ecdyson and juvenile hormones, causing morphogenetic defects in the developmental sequence.

The results in the same tables indicated that all the treatments with plant extracts produced lower percentages of pupation than control. The data given revealed that the increase in adult emergence related to the decrease of concentrations of the four tested

plants. Reduction of adult emergency also stated by Rashad *et al.,* (1991) on *E. insulana* and *P. gossyliella* and Abo El -Ghar *et al.,* (1994) on 4th instar *A. ipsilon* larvae. Also, Shaurub *et al.,* (1998) elucidated a similar reduction in the adult emergence of *S. littoralis* larvae treated with *S.terebinthefolius.*

Table (1): Effect of *Terminalia*, *Melaleuca* and *Taxodium* chloroform extracts on some biological aspects of the as4th larval instar cotton leaf worm *Spodoptera littoralis*.

Plant Extracts	Conc. %	Dead larvae %	Dead Pupae %	Total Mortality %	Mean of developmental period (day) ±S.E.				Pupation %	Adult emergence %	Growth index
					Larvae	Pupae		Average Period of larvae and pupae			
						Male	Female				
Control solvent Water	0	5	4	9	12.2±0.06	11.18±0. 02	11.30±0.03	23.4	94.40	95.20	4.06
Terminalia arjuna	10	35.0	30.0	55.00	16.40±0.03	12.86±0.02	12.7±0.02	29.18	74.40	67.20	2.30
	5	22.2	24.4	46.60	15.50±0.09	12.70±0.03	12.6±0.04	28.15	77.80	68.60	2.40
	2.5	20.0	17.8	37.80	14.91±0.02	12.10±0.02	12.5±0.02	27.20	80.0 0	77.70	2.90
	1.25	13.3	16.6	29.90	14.40±0.06	11.91±0.03	11.2±0.07	26.45	86.70	80.80	3.05
	0.625	12.2	14.4	26.60	14.20±0.09	11.11±0.07	11.0±0.01	25.25	87.80	82.30	3.30
Melaleuca cajuputi	10	30.0	33.3	63.30	16.95±0.03	15.42±0.09	15.0±0.01	32.15	70.00	52.4	1.63
	5	27.8	28,9	56.70	16.80±0.04	15.90±0.08	15.2±0.03	30.55	72.20	60.00	1.90
	2.5	23.3	26.6	49.90	16.51±0.04	15.50±0.05	15.4±0.02	31.05	76.66	65.60	2.10
	1.25	16.6	20.0	36.60	15.60±0.06	14.91±0.03	13.7±0.01	30.3	83.30	74.66	2.46
	0.625	11.1	16.6	27.70	15.50±0.09	14.71±0.07	14.4±0.03	30.05	88.80	81.25	2.70
Taxodium distichum	10	36.7	36.6	73.30	19.70±0.05	13.58±0.02	13.40±0.02	33.19	63.30	57.80	1.7
	5	34.4	26.6	61.00	17.60±0.03	13.30±0.03	13.10±0.04	30.80	65.50	62.70	2.03
	2.5	32.2	23.3	55.50	15.32±0.04	12.90±0.02	12.50±0.05	28.02	67.70	65.57	2.30
	1.25	27.8	22.2	50.00	15.25±0.06	11.57±0.03	11.50±0.03	26.75	72.20	69.20	2.58
	0.625	22.2	22.2	44.40	13.12±0.04	10.74±0.01	10.60±0.01	24.25	77.70	71..40	2.90

Table (2): Effect of *Erythrine* chloroform extracts on some biological aspects of the as 4th larval instar cotton leaf worm *Spodoptera littoralis*.

Plant Extracts	Conc. %	Dead larvae %	Dead pupae %	Total Mortality %	Mean of developmental period (days)±S.E.				Pupation %	Adults emergence %	Growth index
					Larvae	Pupae		Average Period of larvae and pupae			
						Male	Female				
Control solvent Water	0	5	4	9	12.2±0.06	11.18±0. 02	11.30±0.03	23.4	94.40	95.20	4.06
Control solvent Chloroform	0	8	5	13.00	14.2±0.14	11.98±0. 02	11.82±0.04	26.1	91.10	93.90	2.9
Erythrina caffra	10	28.8	22.2	51.00	15.08±.056	13.04±0.04	13.00±0.05	28..10	71.10	68.80	2.40
	5	24.4	22.2	46.60	14.80±.030	12.6±0.03	12.50 ±0.02	27.35	75.55	70.60	2.58
	2.5	15.6	22.2	37.80	14.04±0.02	11.40±0.06	11.20±0.03	25.34	84.40	73.70	2.90
	1.25	11.1	20	28.00	13.90±0.02	10.26±0.07	10.20±0.06	24.18	88.80	77.50	3.20
	0.625	11.1	16.6	25.00	13.80±0.09	10.18±0.04	10.04±0.07	23.90	88.80	81.25	3.40

The reduction in the adult emergence may be attributed to the pupal death and the formation of (pupa-adult) intermediates (PA). The latent effect of plant extract in the resulting pupae may lead to pupal death either by its poisoning effect or by its disturbing effect on the hormonal balance which prevented the pupae from achieving their development. The growth index was gradually reduced by increasing concentration in all treatment with four plant extracts. Similar results were obtained by Hazaa *et al* (2005) who found that treatment of 4 th larval instar *Spodoptera littoralis* with *Eucalyptus camaldulensis* extract obviously decreased its growth index than control.

The data in table (3) indicated that the sex ratio was shifted in favour of males as observed in four plant extracts at all concentrations where it was 1.5:1 (male : female) at the highest concentration while it was 1.03:1 at the lowest concentration. Mostly the sex ratio was around 1: 1 (male: female) as was obtained in control treatment. The shortage in adult longevity was observed at the highest concentration 10% where it was (7.50, 7.20) days for male and female, respectively. The reduction in F_1 progeny was increased by increasing concentration at all plant extracts compared with the control treatment. Many

authors obtained similar results for the reduction in F1 progeny El-lakwah *et al.*, *(*1996) on *Rhizopertha dominica* who found that the reduction in F_1 progeny increased by increasing concentration of plant extract used. Roshdy (2005) on *Agrotis ipsilon* who reported that the reduction in F1 progeny increased by increasing concentration in all plant extracts tested.

Table (4) showed that both growth inhibition and relative growth index were decreased by increasing concentration as observed in four plant extracts *Melaloica, Taxodium, Erytherina* and *Termenalia* chloroform extracts. These results agree with the result of Ce´spedes *et al*., (2005) on *Spodoptera frugiperda* and *Tenebrio molitor* who found that growth inhibition decreased by increasing concentration. The data in table (4) also showed that larval feeding on four plant extracts resulted in a gradual decrease in the average weight of larval. This decrease in larval weight was obvious in the highest concentration. Alm El-Din (2005) who studied the effect of *Eucalyptus camaldulensis* on 4th instar larvae of Spodoptera *littoralis* and found that the average weight of larvae and pupae decreased by increasing concentration. The data in table (4) also, showed that four plant extract treatments decreased the survival percentages than that in the control. For example, the survival percentages were greatly decreased to (36.60), (36.66), and (50.00) in the case of the treatment with chloroform extracts of *Taxodium, Melaloica* and *Termenalia*, resolved in water respectively.

Table (3): Effect of *Terminalia*, *Melaleuca Taxodium* and *Erytherina* chloroform extracts on some biological aspects of 4th larval instar of the cotton leaf worm *Spodoptera littoralis*.

Plant Extracts	Conc. %	Sex ratio		Adult longevity(day) Mean ±S.E.		Reduction in F_1 progeny
		Male	Female	Male	Female	
Chloroform	0	1.3	1	11.00±0.06	11.45±0.05	0
Control (water)	0	1	1	11.5±0.06	11.00±0.09	0
Terminalia arjuna	10	1. 5	1	07.50±0.05	08.10±0.02	45.80
	5	1.2	1	08.20±0.04	08.40±0.05	42.20
	2.5	1.2	1	09.16±0.07	09.20±0.03	32.50
	1.25	1.5	1	09.20±0.07	09.50±0.03	24.09
	0.625	1.2	1	10.60±0.04	10.00±0.04	21.70
Melaleuca cajuputi	10	1.4	1	8.50±0.07	7.90±0.07	60.24
	5	1.2	1	8.10±0.09	8.00±0.05	53.01
	2.5	1.2	1	9.30±0.03	9.50±0.03	45.78
	1.25	1.3	1	9.80±0.02	9.90±0.07	35.50.
	0.625	1.03	1	9.90±0.06	10.01±0.02	21.60
Taxodium distichum	10	1.2	1	07.60±0.08	07.20±0.07	60.24
	5	1.3	1	08.60±0.07	08.20±0.08	55.42
	2.5	1.2	1	08.90±0.04	08.30±0.05	51.80
	1.25	1.6	1	09.16±0.08	09.10±0.06	45.78
	0.625	1.1	1	10.40±0.03	10.00±0.03	39.75
Erythrina caffra	10	1.1	1	07.9±0.02	07.40±0.02	42.90
	5	1.2	1	08.05±0.05	08.40±0.07	35.06
	2.5	1.2	1	08.16±0.06	08.50±0.04	27.30
	1.25	1.4	1	09.15±0.04	09.04±0.06	19.50
	0.625	1.4	1	09.80±0.08	09.50±0.03	15.60

Table (4): Effect of *Terminalia*, *Melaleuca Taxodium* and *Erytherina* chloroform extracts on some biological aspects of 4th larval instar of the cotton leaf worm *Spodoptera littoralis*.

Plant extracts	%Conc.	GI	RGI	Mean Larval weight (g)	Mean Pupal weight (g)	Pupation %	Survival %
Chloroform	0.0	0.91	0.97	0.180	0.310	91.10	85.55
(Control water)	0.0	0.94	1.00	0.340	0.323	94.40	90
Melaleuca cajuputi	10	0.70	0.75	0.190	0.180	70.00	36.66
	5	0.72	0.77	0.200	0.260	72.20	43.30
	2.5	0.77	0.82	0.210	0.270	76.66	50.00
	1.25	0.83	0.88	0.230	0.290	83.30	62.20
	0.625	0.89	0.95	0.260	0.320	88.80	72.20
Terminalia arjuna	10	0.74	0.79	0.083	0.170	74.40	50.00
	5	0.78	0.83	0.090	0180	77.80	53.00
	2.5	0.80	0..85	0.100	0.190	80.0 0	62.20
	1.25	0.87	0.93	0.130	0.230	86.70	70.00
	0.625	0.88	0.94	0.150	0.250	87.80	72.20
Taxodium distichum	10	0.63	0.67	0.150	0.260	63.30	36.60
	5	0.66	0.70	0.160	0.270	65.50	41.10
	2.5	0.68	0.72	0.190	0.275	67.70	44.40
	1.25	0.72	0.77	0.230	0.290	72.20	50.00
	0.625	0.78	0.83	0.250	0.330	77.70	55.50
Erythrina caffra	10	0.71	0.78	0.090	0.170	71.10	48.44
	5	0.75	0.82	0.096	0.180	75.55	55.50
	2.5	0.84	0.92	0.130	0.190	84.40	62.20
	1.25	0.89	0.98	0.150	0.190	88.80	68.80
	0.625	0.89	0.98	0.200	0.220	88.80	72.20

GI= growth inhibition **RGI= Relative growth inhibition**

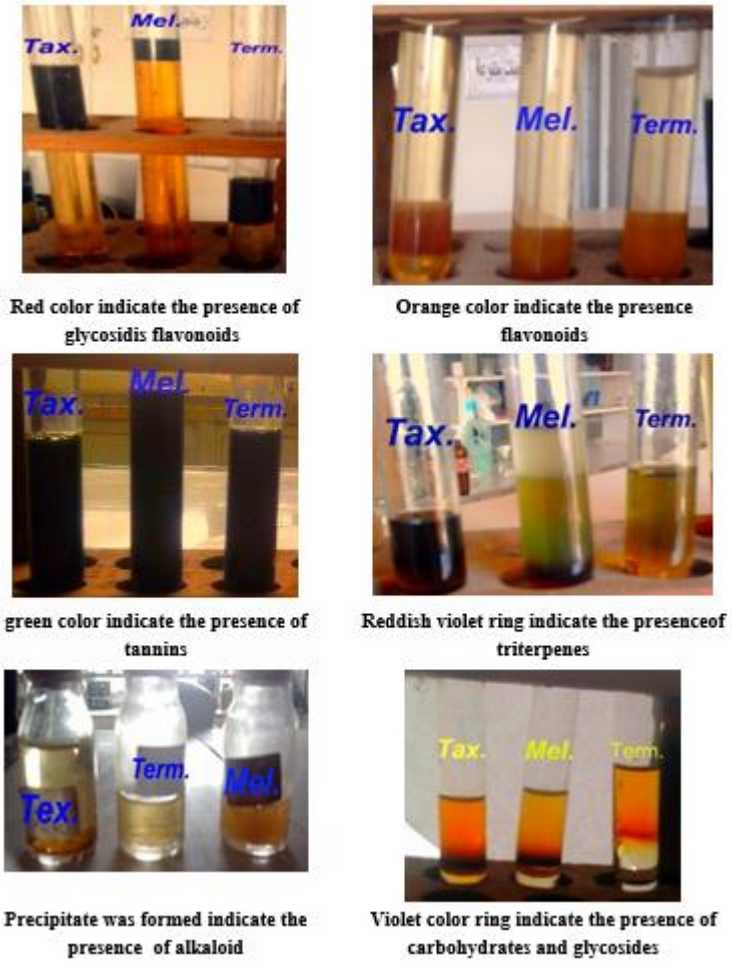

Fig. 1 :Preliminary phytochemical screening

2-Biological Effects of Ethanol Extracts:

Data in Tables (5&6) showed the biological effects of ethanol extracts on 4th larval instar of *Spodoptera littoralis.* The results in these tables discussed what happens when resolved the crude of ethanol plant extracts on water. Ethanol as an extract was more active than chloroform in extracting the toxic components from the plant and this appears in the mortality percentages. Regarding the effects of ethanol extracts, mortality among the fed larvae was varied from plant extract to another and from concentration to another. Results showed that all the concentrations of the four studied plant extracts have a toxic effect on larvae of *Spodoptera littoralis* compared with the control treatment. The highest mortality (85.8%) and (73.3%) were obtained with 10% *Taxodium* and *melaloica* extract. All concentrations of *Taxodium* and *Melaloica* gave more mortality than concentrations in *Terminalia a*nd *Erytherinia*. The lowest percentage of total mortality was recorded with *Terminalia* extract at 0.625% concentration which gave 26.2%. Many authors obtained similar results for the mortality and survival of lepidopteran insects as a result of the treatment of plant extracts Rashad *et al.,* (1991) on *Earias insulana* and *Pectinophora gossypiella;* Osman (1996) on *Agrotis ipsilon* and Abd-El-Zaher (1998) on *Spodoptera littoralis* and *P. gossypiella.* Also Sileem (2004) who found that the treatment with *Melia azedrach* fruits or *Schintis terebinthifdies* leaves extract to *Agrotis ipsilon* reduced the development of larvae and pupae and inhibited adult emergence. El-shall *et al.,* (2005) found that the treatment of *Spodoptera littoralis* with the extracts of *Eucalyptus camaldulensis* increased the mortality percentage of larvae and pupae as compared to the control. There is a big variation between means of larval developmental period at all treatments. All treatments elongated the larval period especially at 10% concentration where it reached 19.10 days compared with 12.2day in control treatment .The data in the same table also showed that pupal durations were extremely affected in both males and females at all tested concentrations of all plant extracts compared with the control treatment. By comparing pupation percentages of all plant extracts (Tables 6, 7) it may be concluded that *Eyrtherinia* produced the lowest pupation percentage 64.44% but in the case of *Taxodium* it was 88.8% compared with 94.4% in the case of control treatment.

Regarding the percentage of emergence, the lowest percentage of adult emergence was (45.3 %) resulted from the treatment of *Taxodium* extract at concentration (10%) and this reduction may be due to the increase in mortality percentage , While the highest percentage of emergence was 89.23% resulted from the application of 0.625% of the *Eyrtherina* extract.

The data given in Table (7) showed that the sex ratio among the concentrations of all extracts seemed about 1.6:1 (male: female). While there was fluctuation in the sex ratio among the concentrations of *Melaloica* and *Erytherina* extracts. It was in favour of the males at all concentrations of all plants. Also, the adult emergence inversely proportional to concentrations applied. The longevity was decreased by increasing concentration of all plant extracts. The reduction in F_1 progeny was increased by increasing concentration in all plant extracts.

Table (5): Effect of *Melaleuca* and *Taxodium* Ethanol extracts on some biological aspects of 4th larval Instar of the cotton leaf worm Spodoptera *littoralis*.

Plant Extracts	Conc. %	Dead larvae %	Dead Pupae %	Total mortality %	Mean of developmental period (day)±S.E.				Pupation %	Adults emergence %	Growth index
					Larvae	Pupae		Average Period of larvae and pupae			
						Males	Females				
Control solvent Water	0	5.6	4.7	10.3	12.2±0.06	11.18±0. 02	11.30±0.03	23.4	94.40	95.20	4.06
Control solvent Ethanol	0	8.9	6.1	15.00	14.2±0.14	11.98±0. 02	11.82±0.04	26.1	91.10	93.90	2.9
Melaleuca cajuputi	10	22.2	51.4	73.60	16.20±0.06	15.08±0.04	15.00±0.01	31.24	77.70	48.60	1.55
	5	18.9	46.6	65.50	16.23±0.04	14.20±0.06	14.10±0.06	30.38	81.10	53.40	1.75
	2.5	16.7	42.7	59.30	15.80±0.05	13.60±0.05	13.50±0.04	29.35	83.30	57.30	1.95
	1.25	13.3	37.2	50.50	15.20±0.01	13.50±0.05	13.40±0.01	28.65	86.70	62.80	2.19
	0.625	11.1	31.25	42.35	15.08±0.03	12.40±0.04	12.00±0.06	27.28	88.80	68.75	2.50
Taxodium distichum	10	31.1	54.7	85.80	19.10±0.04	17.50±0.02	16.10±0.02	35.90	71.10	45.3	1.30
	5	26.7	45.5	72.20	18.10±0.02	17.40±0.03	17.00±0.01	35.30	73.30	54.50	1.50
	2.5	22.2	40	62.20	17.68±0.02	15.24±0.08	15.00±0.05	32.80	77.80	60.00	1.83
	1.25	16.7	33.3	50.00	16.07±0.08	15.50±0.02	15.30±0.03	31.47	83.30	66.66	2.12
	0.625	12.2	27.8	40.00	15.80±0.04	14.70±0.01	13.20±0.07	29.75	87.78	72.15	2.43

Table (6): Effect of *Terminalia* and *Erythrine* Ethanol extracts on some biological aspects of 4th larval instar of the cotton leaf worm *Spodoptera littoralis*.

Plant Extracts	Conc. %	Dead larvae %	Dead Pupae %	Total mortality %	Mean of developmental period (day)±S.E.				Pupation %	Adults emergence %	Growth index
					Larvae	Pupae		Average Period of larvae and pupae			
						Male	Female				
Control solvent	0	5.6	4.7	10.3	12.2±0.06	11.18±0. 02	11.30±0.03	23.4	94.40	95.20	4.06
Control solvent Ethanol	0	8.9	6.1	15.00	14.2±0.14	11.98±0. 02	11.82±0.04	26.1	91.10	93.90	2.9
Terminalia arjuna	10	27.8	30.70	58.50	14.76±0.06	12.90±0.02	12.63±0.01	27.53	72.20	69.23	2.50
	5	26.7	27.70	54.40	14.70±0.08	12.63±0.03	12.00±0.05	27.10	73.33	72.72	2.70
	2.5	20	22.20	44.20	14.50±0.09	12.36±0.02	11.87±0.09	26.60	80.0 0	77.70	2.90
	1.25	16.7	13.30	30.00	14.38±0.05	12.00±0.03	11.59±0.04	26.20	83.30	86.66	3.30
	0.625	14.4	11.8	26.20	14.25±0.09	11.59±0.05	11.60±0.05	25.80	85.60	88.31	3.40
Erythrina caffra	10	35.6	22.4	58.00	14.52±.08	12.93±0.04	12.90±0.05	27.40	64.44	77.58	2.80
	5	33.3	16.6	49.90	12.93±.06	12.75±0.06	12.60 ±0.07	25.60	66.66	83.33	3.30
	2.5	32.2	13.1	45.30	12.90±0.05	12.52±0.01	12.20±0.07	25.25	67.77	86.88	3.40
	1.25	30	12.7	42.70	12.80±0.09	11.95±0.02	11.80±0.03	24.60	70.00	87.30	3.60
	0.625	27.8	10.8	38.60	12.68±0.03	11.30±0.04	11.20±0.07	23.90	72.22	89.23	3.70

Table (7): Effect of Melaleuca*, Taxodium*, *Terminalia* and *Erytherine* Ethanol extracts on some biological aspects of 4th larval instar of the cotton leaf worm *Spodoptera littoralis*.

Plant extracts	Conc. %	Sex ratio		Longevity of adult (day)±S.E.		Reduction in F_1 progeny
		Males	Females	Males	Females	
Control solvent (ethanol)	0	1	1	12.00±0.07	11.00±0.05	0
Melaleuca cajuputi	10	1.10	1	7.60±0.03	6.90±0.04	59.04
	5	1.80	1	8.50±0.09	8.00±0.05	53.01
	2.5	1.90	1	9.20±0.07	9.10±0.06	48.19
	1.25	1.10	1	9.50±0.07	9.20±0.07	40.96
	0.625	1.01	1	10.00±0.03	9.70±0.04	33.73
Taxodium distichum	10	1.2	1	07.60±0.08	07.20±0.07	65.06
	5	1.3	1	08.60±0.07	08.20±0.08	56.62
	2.5	1.2	1	08.90±0.04	08.10±0.05	49.39
	1.25	1.6	1	09.16±0.08	09.10±0.06	39.75
	0.625	1.1	1	10.40±0.03	10.00±0.03	31.33
Terminalia arjuna	10	1. 2	1	11.30±0.06	11.20±0.04	45.80
	5	1.1	1	11.30±0.05	11.00±0.05	42.20
	2.5	1.2	1	11.60±0.07	11.50±0.08	32.50
	1.25	1.3	1	11.60±0.07	11.40±0.05	24.09
	0.625	1.3	1	12.0±0.08	11.60±0.06	21.70
Erythrina caffra	10	1.8	1	06.30±0.04	05.60±0.02	45.80
	5	1.8	1	06.30±0.04	05.60±0.03	39.76
	2.5	1.6	1	07.60±0.03	06.50±0.04	36.14
	1.25	1.4	1	07.90±0.05	07.30±0.06	33.73
	0.625	1.1	1	08.00±0.07	07.30±0.05	30.12

The data in table (8) showed that the growth inhibition and relative growth inhibition was decreased by increasing concentration as observed in four plant extracts *Terminalia, Taxodium, Melaloica a*nd *Erytherina* ethanol extracts . These results agree with the result of Cespedes *et al*., (2005) on *Spodoptera frugiperda* and *Tenebrio molitor* who found that growth inhibition decreased by increasing concentration. The data in table (8) also showed that larval feeding on four plant extracts resulted in a clear decrease in the average weight of larvae .This decrease in larval weight was high as observed in the highest concentration. Consequently, the average pupal weight was decreased in four plant extracts.

The data summarized in table (8) show that the four plant extract treatments obviously decreased the survival percentages than that in the control.

ve results, it was clear that the polar extract (ethanol extract) of the plants were more toxic than non - polar chloroform extracts this result agreement with Abo El -Ghar *et al.,* (1994) who suggested that the growth disruption and fecundity deterrent effects against *Agrotis ipsilon* were found in the polar (acetone, ethanol, and water) extracts than rather than the non-polar (petroleum ether) extracts.

Table (8): Effect of Melaleuca, *Erytherine, Terminalia* and *Taxodium* Ethanol extracts on some biological aspects of the th larval instar of the cotton leaf worm *Spodoptera littoralis*.

Plant extracts	%Conc.	GI	RGI	Mean Larval weight (g)	Mean Pupal weight (g)	% Pupation	% Survival
Control solvent (ethanol)	0	0.94	1.00	0.340	0.323	94.40	90
Melaleuca cajuputi	10	0.70	0.74	0.220	0.290	70.00	37.77
	5	0.72	0.77	0.250	0.290	72.20	43.33
	2.5	0.77	0.82	0.260	0.298	76.66	47.77
	1.25	0.83	0.88	0.270	0.300	83.30	54.44
	0.625	0.89	0.95	0.290	0.310	88.80	61.11
Erythrina caffra	10	0.64	0.68	0.130	0.230	64.44	50.00
	5	0.67	0.71	0.133	0.250	66.66	55.55
	2.5	0.68	0.72	0.140	0.260	67.77	58.88
	1.25	0.70	0.74	0.150	0.270	70.00	61.11
	0.625	0.72	0.77	0.170	0.270	72.22	64.44
Terminalia arjuna	10	0.72	0.77	0.145	0.240	72.20	50.00
	5	0.73	0.78	0.150	0.250	73.33	53.33
	2.5	0.80	0..85	0.170	0.260	80.0 0	62.22
	1.25	0.83	0.88	0.190	0.270	83.30	72.22
	0.625	0.86	0.91	0.220	0.290	85.60	75.55
Taxodium distichum	10	0.71	0.76	0.150	0.220	71.10	32.22
	5	0.73	0.77	0.160	0.230	73.30	40.00
	2.5	0.78	0.82	0.190	0.250	77.80	46.66
	1.25	0.83	0.88	0.200	0.270	83.30	55.55
	0.625	0.88	0.94	0.230	0.280	87.78	63.33

GI= growth inhibition **RGI= Relative growth inhibition**

3-Preliminary Phytochemical Screening:-

The plants which were tested for the insecticidal activities of their extracts on 4th instar larvae of cotton leaf worm *S. littoralis* were screened phytochemically.

Air-dried powders of the different plant samples were phytochemically screened for their constituents of carbohydrate and/or glycosides flavonoids, saponins, tannin, sterols and/or triterpenes and alkaloids or nitrogenous bases and the results were recorded in table (9).

The phytochemical investigation of *Taxodium distichum, Terminalia arjuna*, *Melaleuca cajuput* illustrated that they were rich in carbohydrate and *Taxodium distichum* was rich in flavonoids, flavonoid glycosides ,flavonols, Chalcones, tannins ,sterols and/or triterpenes and alkaloids or nitrogenous. *Terminalia arjuna, Melaleuca cajuput* were rich in flavonoids, flavonols, tannins, sterols and/or triterpenes and alkaloids or nitrogenous. On the other hand, *Terminalia arjuna* was rich in saponins.

Table (9): Preliminary phytochemical screening of dried powder of the tested plants.

Teasted phytochemical	*Taxodium distichu*	*Terminalia arjuna* ,	*Melaleuca cajuputi*
Carbohydrate and/or glycoside	(++)	(++ +)	(++ +)
Tannins	(+ + +)	(+ + +)	(+ + +)
Flavonoides	(+ + +)	(+ + +)	(+ + +)
Flavonoide glycosides	(+ + +)	(-)	(-)
Flavonols	(+ + +)	(+ + +)	(+ + +)
Chalcones	(+ + +)	(+ + +)	(+ +)
Triterpenes and/or sterols	(+ + +)	(+ + +)	(+ + +)
Alkaloids and/or nitrogen bases	(+ +)	(+ + +)	(+)
Saponnins	(+)	(+ +)	(−)

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ARABIC SUMMARY

فحص المركبات الكيميائية لبعض النباتات الطبية لسميتها و تأثيرها المثبط ضد دودة ورق القطن,سبودوبتيرا ليتوراليس(بويسد)

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1-قسم التطبيقات البيولوجية مركز البحوث النووية ، هيئة الطاقة الذرية
2- قسم وقاية النباتات مركز البحوث النووية ، هيئة الطاقة الذرية

أجرى هذا البحث بغرض دراسة الفحص الكيمائى لبعض المستخلصات النباتية التى تم الحصول عليها من نباتات التكسوديوم،الأرثينيا،الترمينااليا والميلالويكا وذلك لسميتها وتأثيرها المثبط على حشرة دودة ورق القطن سبودوبتيرا ليتوراليس(بويسد) .ولقد أظهرت نتائج الاختبارات الوصفية للمركبات ان المواد الكربوهيدراتية هى المكون الرئيسى لنباتات التكسوديوم,الميلالويكا والترمينااليا بينما يمثل الفلافونات والتنينات من المركبات الثانوية الاساسية للميلالويكا والترمينااليا بينما يحتوى الميلالويكا على نسبة عالية من التربينات فى حين أن الميلالويكا يحتوى على نسبة متوسطة من القلويدات. ولقد تم تقدير سمية النباتات المختبرة والتى تم استخلاصها بالأيثانول والكلوروفورم باستخدام التركيزات من (10 الى 0.625 %) حيث وجد ان هناك علاقة طردية بين التركيزات المختلفة ونسبة الموت بالنسبة لليرقات وكذلك نسبة التشوهات بالنسبة للعذارى والحشرات الكاملة . كل التركيزات لها تأثير معنوى على نسبة الموت مقارنة بالمعاملة القياسية. وكذلك ظهر نقص واضح فى تعداد الجيل الأول وزيادة فى العمر اليرقى وأعمار العذارى كما تدرج النقص فى نسبة التعذير فى المعاملات المختلفة مقارنة بالجرعة الضابطة . تأثرت النسبة الجنسية تأثرا متوسطا كمانقصت كلا من نسبة خروج الفراشات ومعدل النمو بزيادة التركيز المستخدم من الاربع نباتات مقارنة بالمعاملة القياسية.