RESULTS AND DISCUSSION

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I- Effects of plant extracts on tested insects *Agrotis ipsilon* (Hufnagel) and *Sitophilus oryzae* (Linn .)

Experiments were carried out in the laboratory of plant protection Department, Faculty of Agriculture at Moshtohor.

The use of synthetic pesticides for plant protection against agriculture pests during the last 50 years created many problems. Namely, pest resistance, environmental pollution and disturbance in natural balance. To overcome this problem many researchers all over the world are looking to discover new safe types of pest control agents. Many plant products possess properties that give the same effect of pesticides and are known to be used in pest mangement strategy. The plant extracts obtained in this study are among those compounds under investigation as potential biopesticides.

I.A- Effects on *Agrotis ipsilon*

A.1- Effect of plant extracts as antifeedant

In this trial only 4^{th} instar larvae of *Agrotis ipsilon* were used to establish the presence of antifeeding properties in these plant extracts.

A.1.1- *Thuja orientalis* leaves extracts :-

Results in Table (2) indicated that petroleum ether Thuja extracts possess antifeedant activity and this activity increases by increasing the concentration. The highest antifeedant activity 60.45 % were obtained after the use of 10 % concentration, followed by ethyl acetate, acetone , hexane and ethyl alcohol at the same concentration, recording percentages of antifeeding activity 50.56, 48.50, 34.31 and 32.85 % respectively.

Table(2) Effect of *Thuja orientalis* leaves extracts as antifeedant on 4th larval instar of *Agrotis ipsilon*

solvents	conc. %	No. of larvae used	Consumed area(cm)	% of eaten area	% protection	Antifeedant activity
Petroleum ether	10.00	20	5.770	37.154	62.840	60.450
	5.00	20	8.390	54.024	45.970	42.490
	2.50	20	7.674	49.414	50.590	47.410
	1.25	20	12.090	77.849	22.150	17.140
Acetone	10.00	20	7.514	48.384	51.620	48.500
	5.00	20	8.998	57.939	42.060	38.330
	2.50	20	9.260	59.626	40.370	36.540
	1.25	20	11.154	71.822	28.180	23.550
Hexane	10.00	20	9.585	61.719	38.281	34.310
	5.00	20	10.160	65.422	34.578	30.370
	2.50	20	11.848	76.291	23.708	18.790
	1.25	20	12.550	80.811	19.189	13.980
Ethyl-alcohol	10.00	20	9.797	63.084	36.915	32.850
	5.00	20	10.521	67.746	32.253	27.890
	2.50	20	12.204	78.583	21.416	16.360
	1.25	20	12.550	80.810	19.188	13.980
Ethyl-acetate	10.00	20	7.214	46.452	53.547	50.560
	5.00	20	10.652	68.589	31.410	26.990
	2.50	20	10.676	68.744	31.255	26.830
	1.25	20	12.854	82.769	17.231	11.900
Control		20	14.591	93.954		

L.S.D at 5 %

Values are means n = 3

Solvents (s)	0.879
Conc.(C)	0.879
s x c	N.S

On the other hand, the lowest effect was recorded with 1.25 % of ethyl acetate, giving 11.90 % antifeeding activity.

Data in the same table show that petroleum ether was the best solvent system in extracting bioactive components of *Thuja orientalis* leaves which caused the highest protection to the plant (62.84 %). Statistical analysis showed significant differences between all used solvents and used concentration and non significant between the interaction between them. This results agree with the results of **El – Khayat (1985)** who found that petroleum ether was better than other solvents in the extraction of antifeeding components from plant materials.

A.1.2- *Thuja orientalis* seed extracts:-

Data in Table (3) showed that 10 % acetone extract of *Thuja orientalis* against 4 th instar larvae of *Agrotis ipsilon* gave the higher antifeedant activity (86.86 %), followed by ethyl alcohol, hexane, ethyl acetate and petroleum ether which gave 82.11, 72.92, 68.75 and 48.38 respectively. While the lowest antifeedant activity (10.83 %) was recorded at 1.25 % of petroleum ether extract. The percentages of protection and antifeedant activity increaced by increasing concentration.

With regard to the statistical analysis there were significant differences between used concentrations. The L.S.D value reached 0.871.

A.1.3- *Glycine hispida* seed extracts :-

Data obtained in Table (4) showed that the acetone extract of *Glycine hispida* recorded the highest antifeedant activity 71.11 % against 4 th instar larvae of *Agrotis ipsilon*, when compared with the other four solvents petroleum ether, hexane, ethyl alcohol and ethyl acetate. They showed 67.09, 39.57, 49.69

Table(3) Effect of *Thuja orientalis seed* extracts as antifeedant on 4th larval instar of *Agrotis ipsilon*

solvents	conc. %	No. of larvae used	consumed area (cm)	% of eaten area	% protection	Antifeedant activity
Petroleum ether	10.00	20	7.532	48.499	51.500	48.380
	5.00	20	11.551	74.378	25.621	20.830
	2.50	20	12.550	80.811	19.188	13.990
	1.25	20	13.011	83.779	16.220	10.830
Acetone	10.00	20	1.917	12.344	87.660	86.860
	5.00	20	7.342	47.276	52.720	49.680
	2.50	20	10.580	68.126	31.870	27.490
	1.25	20	11.340	73.019	26.980	22.280
Hexane	10.00	20	3.951	25.441	74.560	72.920
	5.00	20	7.186	46.272	53.730	50.750
	2.50	20	10.220	65.808	34.190	64.810
	1.25	20	13.279	85.505	14.490	8.990
Ethyl-alcohol	10.00	20	2.610	16.806	83.190	82.110
	5.00	20	3.862	24.868	75.130	73.530
	2.50	20	5.085	32.743	67.260	65.150
	1.25	20	6.620	42.627	57.370	54.630
Ethyl-acetate	10.00	20	4.560	29.363	70.640	68.750
	5.00	20	7.289	46.935	53.060	50.040
	2.50	20	8.311	53.516	46.480	43.040
	1.25	20	9.600	61.816	38.180	34.210
Control		20	14.591	93.954		

L.S.D at 5 %
Solvent (s) 0.871
Conc. (C) 0.871
S X C 1.747

Value are means n = 3

Table(4) Effect of Glycine hispida seeds extracts as antifeedant on 4th larval instar of *Agrotis ipsilon*

solvents	conc. %	No. of larvae used	consumed area (cm)	% of eaten area	% protection	Antifeedant activity
Petroleum ether	10.00	20	4.802	30.921	69.079	67.090
	5.00	20	7.247	46.664	53.335	50.330
	2.50	20	11.154	71.822	28.177	23.560
	1.25	20	12.084	77.810	22.189	17.180
Acetone	10.00	20	4.215	27.141	72.858	71.110
	5.00	20	7.467	48.081	51.918	48.820
	2.50	20	8.150	52.479	47.521	44.140
	1.25	20	10.070	64.842	35.157	30.980
Hexane	10.00	20	8.817	56.774	43.226	39.570
	5.00	20	10.345	66.613	33.386	29.100
	2.50	20	10.600	68.255	31.745	27.350
	1.25	20	11.847	76.284	23.715	18.810
Ethyl-alcohol	10.00	20	7.340	47.263	52.736	49.690
	5.00	20	8.515	54.829	45.171	41.640
	2.50	20	12.079	77.778	22.220	17.220
	1.25	20	12.533	80.701	19.298	14.110
Ethyl-acetate	10.00	20	7.620	49.066	50.934	47.780
	5.00	20	11.885	76.529	23.470	18.550
	2.50	20	12.090	77.849	22.151	17.140
	1.25	20	14.018	90.264	9.735	0.039
Control		20	14.591	93.954		

Value are means n = 3

L.S.D. At 5 %

Solvent (S)	0.704
Conc. (C)	0.704
S X C	1.574

and 47.78 % antifeedant activity, respectively. Statistical analysis showed significant differences between different solvent and different concentration comparing with control.

A.1.4- *Thevetia neriifolia* leave extracts :-

Data in Table (5) showed that leaf area consumed by 4th instar larvae of *Agrotis ipsilon* fed on treated leaves with 10 % acetone extract of *T. neriifolia* was 2.727 cm^2 after 24 h. compared with that in the control. Data in the same table indicated that acetone extract had the highest antifeedant activity (81.31 %) than the other solvents. The lowest activity noticed after the treatment by 1.25 % of hexane extract which gave 20.43 % antifeedant activity. Statistical analysis showed significant differeces between the tested solvents.

A.1.5- *Chenopodium ambrosoides* leaf extracts :-

Antifeedant activity of different *C. ambrosoides* extracts against 4th larval instar of *Agrotis ipsilon* is shown in Table (6). These data indicated that the hexane extract recorded the highest antifeedant activity (80.21)%, followed by petroleum ether extract (74.17) %, ethyl alcohol (72.59) %, acetone (62.85) % and ethyl acetate (58.19) %, but ethyl acetate showed the lowest antifeedant activity (15.05%) at 1.25 %. Statistical analysis showed significant differences between solvent and tested concentration compared with control.

A.1.6- *Chenopodium ambrosoides* seed extracts :-

Data in Table (7) indicated that all extracts of this plant gave the moderate antifeedant activity. Petroleum ether and acetone extracts gave the highest antifeedant activity, i.e. 71.9 and 79.44 %, respectively. The lowest antifeedant activity recorded with ethyl alcohol extract 15.77 % at 1.25 %.Statistical

Table (5) Effect of *Thevetia neriifolia* leaves extract as antifeedant on 4 th larval instar of *Agrotis ipsilon*

solvents	conc. %	No. of larvae used	consumed area(cm)	% of eaten area	% protection	Antifeedant activity
Petroleum ether	10.00	20	5.160	33.226	66.774	64.630
	5.00	20	8.287	53.361	46.638	43.210
	2.50	20	9.520	61.300	38.699	34.750
	1.25	20	9.550	61.493	38.506	34.550
Acetone	10.00	20	2.727	17.559	82.440	81.310
	5.00	20	5.010	32.260	67.739	65.660
	2.50	20	7.362	47.405	52.594	49.540
	1.25	20	7.720	49.710	50.289	47.090
Hexane	10.00	20	10.700	68.898	31.101	26.670
	5.00	20	11.065	71.249	28.751	24.170
	2.50	20	11.520	74.179	25.820	21.050
	1.25	20	11.610	74.758	25.241	20.430
Ethyl-alcohol	10.00	20	2.976	19.163	80.837	79.600
	5.00	20	3.519	22.659	77.341	75.880
	2.50	20	4.379	28.197	71.803	69.990
	1.25	20	4.660	30.006	69.993	68.060
Ethyl-acetate	10.00	20	3.599	23.174	76.825	75.330
	5.00	20	6.070	39.085	60.914	58.390
	2.50	20	7.335	47.231	52.768	49.730
	1.25	20	9.460	60.914	39.085	35.170
Control		20	14.591	93.954		

Value are means n = 3

L.S.D. At 5 %	
Solvant (S)	0.629
Conc. (C)	0.629
S X C	1.408

Table(6) Effect of *Chenopodium amrosoides* leaves extracts as antifeedant on 4th larval instar of *Agrotisip ipsilon*

solvents	conc. %	No. of larvae used	consumed area (cm)	% of eaten area	% protection	Antifeedant activity
Petroleum ether	10.00	20	3.769	24.269	75.731	74.170
	5.00	20	5.857	37.714	62.286	59.860
	2.50	20	9.797	63.084	36.915	32.850
	1.25	20	12.204	78.583	21.416	16.360
Acetone	10.00	20	5.420	34.900	65.099	62.850
	5.00	20	6.252	40.257	59.742	57.150
	2.50	20	9.657	62.183	37.817	33.810
	1.25	20	10.600	68.254	31.745	27.350
Hexane	10.00	20	2.887	18.589	81.410	80.210
	5.00	20	4.659	30.000	70.000	68.070
	2.50	20	6.510	41.918	58.081	55.380
	1.25	20	5.780	37.218	62.782	60.390
Ethyl-alcohol	10.00	20	4.000	25.756	74.243	72.590
	5.00	20	5.970	38.442	61.558	59.080
	2.50	20	7.170	46.168	53.831	50.860
	1.25	20	10.900	70.186	29.813	25.290
Ethyl-acetate	10.00	20	6.100	39.278	60.721	58.190
	5.00	20	6.780	43.657	56.340	53.530
	2.50	20	10.676	68.744	31.255	26.830
	1.25	20	12.395	79.813	20.186	15.050
Control		20	14.591	93.954		

L.S.D. At 5 %

Solvents (S)	0.809
Conc. (C)	0.809
S x C	1.809

Value are means n = 3

Table(7) Effect of *chenopodium ambrosoides seeds* extracts as antifeedant on 4th larval instar of *Agrotis ipsilon*

solvents	conc. %	No. of larvae used	consumed area (cm)	% of eaten area	% protection	Antifeedant activity
Petroleum ether	10.00	20	4.100	26.401	73.599	71.900
	5.00	20	4.980	32.067	69.933	65.870
	2.50	20	7.430	47.843	52.157	49.080
	1.25	20	8.390	54.057	45.975	42.460
Acetone	10.00	20	3.000	19.317	80.680	79.440
	5.00	20	3.403	21.912	78.087	76.680
	2.50	20	5.202	33.496	66.503	64.350
	1.25	20	5.733	36.916	63.080	60.710
Hexane	10.00	20	6.539	42.106	57.890	55.180
	5.00	20	8.517	54.842	45.160	41.630
	2.50	20	9.416	60.631	39.370	35.470
	1.25	20	9.490	61.107	38.890	34.960
Ethyl-alcohol	10.00	20	7.696	49.556	50.440	47.260
	5.00	20	9.941	64.012	35.990	31.870
	2.50	20	11.073	71.301	28.690	24.110
	1.25	20	12.290	79.137	20.860	15.770
Ethyl-acetate	10.00	20	5.350	34.449	65.550	63.330
	5.00	20	6.380	41.082	58.920	56.270
	2.50	20	8.189	52.730	47.270	43.880
	1.25	20	9.899	63.741	36.260	32.160
Control		20	14.591	93.954		

Value are means n = 3

L.S.D. At 5 %

Solvents (S)	0.966
Conc. (C)	0.966
S x C	2.16

analysis showed significant differences between solvents and concentration compared with control.

A.1.7- *Cassia fistula* pod extracts :-

Data in Table (8) demonstrated that all extracts of tested plants has mild antifeedant activity ranged between 30.09 % to 60.04 %. Results in the same table showed that percentage of eaten area increased by decreasing concentration. Statistical analysis showed no significant differences between extracts and interaction between solvents and concentration, while showed significant differences between tested concentrations.

A.1.8- *Lupinus termis* seed extracts :-

Data in Table (9) showed that the ethyl alcohol extracts of *Lupinus termis* gave the highest antifeedant activity at of 10 % against 4^{th} larval instar of *Agrotis ipsilon.* The antifeedant activity values reached 50.33 , 61.75 , 60.46 , 82.11 and 53.53 were noticed with 10 % extracts with petroleum ether ,acetone, hexane, ethyl alcohol and ethyl acetate, respectively. Statistical analysis showed high significant differences between the solvents and between concentrations.

A.1.9- *Aptenia cordifolia* leave extracts :-

Data in Table (10) showed that all extracts of this plant have high antifeedant activity ranged between 48.02 % when treated with 1.25 % hexane extract to 93.87 % after the treatment with 10 % ethyl acetate extract which occupied the first category within the extracts of *Aptenia cordifolia.*

Generally, previous results indicate that *Aptenia cordifolia* extracts gave the highest value of antifeedant activity compared with other tested plants. Statistical analysis showed

Table(8) Effect of *Cassia fistula* pods extracts as antifeedant on 4th larval instar of *Agrotis ipsilon*

solvents	conc. %	No. of larvae used	consumed area (cm)	% of eaten area	% protection	Antifeedant activity
Petroleum ether	10.00	20	9.390	60.463	39.540	35.650
	5.00	20	10.830	69.735	30.260	25.780
	2.50	20	11.650	75.016	24.980	20.160
	1.25	20	12.850	82.740	17.260	11.930
Acetone	10.00	20	10.000	64.390	35.610	31.470
	5.00	20	11.290	72.698	27.300	22.620
	2.50	20	12.450	80.167	19.830	14.670
	1.25	20	12.930	83.258	16.740	11.380
Hexane	10.00	20	10.200	65.679	34.320	30.090
	5.00	20	11.630	74.887	25.110	20.290
	2.50	20	12.970	83.515	16.480	11.110
	1.25	20	13.750	88.538	11.460	5.760
Ethyl-alcohol	10.00	20	9.797	63.084	36.910	32.860
	5.00	20	10.521	67.746	32.250	27.890
	2.50	20	12.204	78.583	21.420	16.360
	1.25	20	13.859	89.240	10.760	5.020
Ethyl-acetate	10.00	20	5.830	37.540	62.460	60.040
	5.00	20	10.550	67.933	32.070	27.690
	2.50	20	12.400	79.845	20.150	15.020
	1.25	20	12.650	81.455	18.540	13.300
Control		20	14.591	93.954		

Value are means n = 3

L.S.D. At 5 %

Solvents (S)	N.S
Conc. (C)	0.987
S x C	N.S

Table(9) Effect of *Lupinus termis* seed extracts as antifeedant on 4th larval instar of *Agrotis ipsilon*

solvents	conc. %	No. of larvae used	consumed area(cm)	% of eaten area	% protection	Antifeedant activity
Petroleum ether	10.00	20	7.247	46.660	53.330	50.330
	5.00	20	7.442	47.920	52.080	48.990
	2.50	20	8.485	53.640	45.360	42.910
	1.25	20	9.220	59.370	40.630	36.810
Acetone	10.00	20	5.582	35.940	64.180	61.750
	5.00	20	7.927	51.040	48.950	45.670
	2.50	20	9.579	61.680	38.320	34.350
	1.25	20	10.640	68.510	31.490	27.080
Hexane	10.00	20	5.770	37.150	62.850	60.460
	5.00	20	7.674	49.410	50.580	47.410
	2.50	20	8.390	54.020	45.970	42.500
	1.25	20	9.270	59.690	40.310	36.470
Ethyl-alcohol	10.00	20	2.610	16.810	83.190	82.110
	5.00	20	3.862	24.870	75.120	73.530
	2.50	20	5.085	32.740	67.260	65.150
	1.25	20	8.317	53.550	46.440	43.000
Ethyl-acetate	10.00	20	6.780	43.660	65.340	53.530
	5.00	20	7.620	49.070	50.930	47.780
	2.50	20	9.600	61.810	38.180	34.210
	1.25	20	11.020	70.960	29.622	39.997
Control		20	14.591	93.954		

L.S.D. At 5 %

Solvent (S)	0.798
Conc. (C)	0.798
S x C	1.784

Value are means n = 3

Table(10) Effect of *Aptenia cordifolia* leaves extracts as antifeedant on 4th larval instar of *Agrotis ipsilon*

solvents	conc. %	No. of larvae used	consumed area(cm)	% of eaten area	% protection	Antifeedant activity
Petroleum ether	10.00	20	1.830	11.780	88.220	87.460
	5.00	20	2.150	13.840	86.160	85.270
	2.50	20	3.330	21.440	78.560	77.180
	1.25	20	3.930	25.300	74.690	73.070
Acetone	10.00	20	2.400	15.450	84.550	83.560
	5.00	20	3.600	23.180	76.820	75.330
	2.50	20	3.800	24.470	75.530	73.960
	1.25	20	5.080	32.710	67.290	65.190
Hexane	10.00	20	1.780	11.460	88.540	87.800
	5.00	20	3.230	14.360	85.640	84.720
	2.50	20	4.380	28.940	71.790	69.990
	1.25	20	7.600	48.940	51.060	48.020
Ethyl-alcohol	10.00	20	1.850	11.910	88.090	87.320
	5.00	20	2.400	15.450	84.550	83.560
	2.50	20	4.080	26.270	73.730	72.040
	1.25	20	4.930	31.740	68.250	66.220
Ethyl-acetate	10.00	20	1.280	8.240	91.760	93.870
	5.00	20	1.780	11.460	88.540	87.800
	2.50	20	2.560	16.480	83.520	82.460
	1.25	20	3.900	25.110	74.890	73.270
Control		20	14.591	93.954		

Value are means n = 3

L.S.D at 5 %	
Solvent (S)	0.477
Conc. (C)	0.477
S x C	1.068

high significant difference between solvents and between concentration and the enteraction between them.

A.1.10- *Schinus terbenthifolius* leaves extracts :-

Antifeedant activity data of different extracts of *Schinus terbenthifolius* against 4 th instar larvae of *Agrotis ipsilon* is shown in Table (11). Data indicated that all values were moderate. The high value recorded with acetone was 66.33 % at 10 % concentration. The other extracts gave the following antifeedant activity values petroleum ether (44.22 %), hexane (53.39%), ethyl alcohol (34.21 %) and ethyl acetate (48.46 %) at the same concentration. Statistical analysis showed high significant differences between the tested solvents.

In this respect, it was recorded that *Cassia fistula* , *Datura metal* and other plants caused antifeedant activity against larvae of *S. littoralis* **(El- Shaarawy 1992).** Nine plants species showed feeding deterrent against the black cutworm, *Agrotis ipsilon* and food consumption greatly decreased when larvae fed on leaves treated with pet. ether, acetone and methanol extracts **(Mohamed 1994).** Petroleum ether extract of *Melia azadarach* fruits possess feeding deterrent activity against *Agrotis ipsilon* **(Salem 1994)** while **Babu (1997)** mentioned that a methanol extract of *Azadirachta indica* and a hexane extract of *Thevetia neriifolia* leaves showed antifeedant effects *against Agrotis* janata.

I.A.2- Biological effects of plant extracts on 4th instar larvae of *Agrotis ipsilon*

Extracts were studied to investigate the biological effects, which may occur after exposure of 4th larval instar to these extracts.

Table(11) Effect of *Schinus terbenthfolius* leaves extracts as antifeedant on 4th larval instar of *Agrotis ipsilon*

solvents	conc. %	No. of larvae used	Consumed area(cm)	% of eaten area	% protection	Antifeedant activity
Petroleum ether	10.00	20	8.140	52.410	47.580	44.220
	5.00	20	9.480	61.040	38.960	35.030
	2.50	20	9.600	61.810	38.180	34.210
	1.25	20	10.720	69.030	30.970	26.530
Acetone	10.00	20	4.912	31.630	68.370	66.330
	5.00	20	5.907	38.040	61.980	59.510
	2.50	20	9.225	59.400	41.890	36.780
	1.25	20	10.860	69.930	30.070	25.570
Hexane	10.00	20	6.800	43.790	56.210	53.390
	5.00	20	10.797	69.520	30.470	26.010
	2.50	20	11.377	73.260	26.730	22.030
	1.25	20	12.420	79.970	20.020	14.880
Ethyl-alcohol	10.00	20	9.600	61.810	38.180	34.210
	5.00	20	11.020	70.960	29.040	24.470
	2.50	20	12.854	82.770	17.230	11.900
	1.25	20	14.440	92.980	7.020	1.040
Ethyl-acetate	10.00	20	7.420	48.420	51.580	48.460
	5.00	20	8.130	52.350	47.650	44.280
	2.50	20	8.630	55.570	44.430	40.850
	1.25	20	11.040	71.090	28.910	24.330
Control		20	14.591	93.954		

Value are means n= 3

L.S.D at 5 %	
Solvent (S)	0.641
Conc. (C)	0.641
S x C	1.432

A.2.1- Effect of *Thuja orientalis* leaves extract on insects development:-

Data in Table (12) revealed that development of larvae after the exposure to *Thuja orientalis* leaves extracts with the different five solvents (petroleum ether, acetone, hexane, ethyl alcohol and ethyl acetate). The highest number of dead larvae was recorded at 5 % concentration of acetone extract (17 out of 20 individuals). But the lowest number of dead larvae was recorded with hexane at 1.25 %, which gave only 3 dead larvae out of twenty tested. The whole mean counts of dead larvae recorded with different solvents used ranged from 6.75 dead individual / 20 ethyl alcohol extracts to 13.5 dead larvae in acetone extracts. Statistical analysis showed significant differences between tested solvents and between used concentrations, from the side of dead larvae.

On the other side data in Table (12) showed that the highest number of abnormal pupae resulted after expoure of 4th instar larvae to ethyl alcohol extracts giving between 7 and 9 for all used concentration . The successful pupation after this treatment ranged, descending from 70% in the case of 1.25 % concentration of hexane extract to 10 with 10 % concentration of acetone solvent.

By comparing means of successful pupation in the same table it may be concluded that petroleum ether and acetone recorded the lowest values, i.e. 22.5 and 21.25, respectively. Although 100% successful pupation was recorded in control. On the other hand the successful adult formation values were between 00 to 50 at 10 %, 2.5 % recorded after treated with petroleum ether and acetone extract compared to control.

Table (12) Biological effects of *Thuja orientalis* leaves extracts on 4th larval instar of *Agrotis ipsilon*

Solvents	Conc. %	Mean number of				Successful pupations	Mean number of		Successful Adults emergence
		Larve used	Dead larvae	Normal Pupae	Ab-normal pupae		Normal adults	Ab-normal adults	
Petroleum Ether	10.0	20	14	3	3	15	00	3	00
	5.00	20	13	3	4	15	2	1	10
	2.50	20	9	6	5	30	3	3	15
	1.25	20	7	6	7	30	2	4	10
Acetone	10.0	20	15	2	3	10	2	00	10
	5.00	20	17	3	00	15	2	1	10
	2.50	20	13	5	2	25	3	2	15
	1.25	20	9	7	4	35	4	3	20
Hexane	10.0	20	12	5	3	25	00	5	00
	5.00	20	10	7	2	35	4	3	20
	2.50	20	6	12	2	60	8	4	40
	1.25	20	3	14	3	70	10	4	50
Ethyl-Alcohol	10.0	20	9	4	7	20	2	2	10
	5.00	20	8	4	8	20	2	2	10
	2.50	20	5	6	9	30	4	2	20
	1.25	20	5	7	8	35	4	3	20
Ethyl-acetate	10.0	20	13	3	4	15	3	00	15
	5.00	20	11	4	5	20	3	1	15
	2.50	20	9	6	5	30	4	2	20
	1.25	20	7	9	4	45	6	3	30
Control		20	00	20	00	100	20	00	100

* : Values are means , n = 3

L.S.D at 5 %			
Solvent (s)	0.905	0.745	0.731
Con. (c	0.905	0.745	0.731
S X C	2.023	1.666	1.634

These results agree with the results of **El – Khayat (1985) and Tahany (1998)** who reported that the percentage of adult emergence was lower than control after the treatment with each of plant extracts. It also agree with **Mohamed *et al* (1994)** who found that the ethanol and acetone extracts from *Melia azedarach, Vinca rosa* and *Euphorbia pulcherrima* caused a significant decrease in pupation percent against *Agrotis ipsilon.*

A.2.2-Effect of *Thuja orientalis* seeds extract on insects development:-

The effect of *Thuja orientalis* seed extracts on 4th instar larvae of *Agrotis ipsilon* is tabulated in Table (13). Data show that different solvents and different concentrations affected the number of dead larvae.

The number of dead larvae increased with the increase of concentration. The highest number of dead larvae was recorded at 10 % concentration of petroleum ether extract followed by hexane, ethyl acetate, ethyl alcohol and acetone extracts showing 17, 15, 13 and 11, respectively. On the other hand, the lowest value recorded after the treatment with 1.25 % acetone and ethyl alcohol extracts which gave the same number of the dead individual (3 out 20 larvae).

Statistical analysis showed significant differences between solvents and tested concentrations.

The application with ethyl alcohol extract at 1.25 % gave the highest number of abnormal pupae, while the lowest number (zero/20) was recorded with the treatment with 2.5 % ethyl acetate and 10 % hexane extract.

The comparison between the means of different concentrations of each solvent revealed that ethyl alcohol took

Table (13) Biological effects of *Thuja orientalis* seed extracts on 4^{th} larval instar of *Agrotis ipsilon*

Solvents	Conc. %	Mean number of				Successful Pupations	Mean number of		Successful Adults emergence
		Larvae used	Dead larva	Normal Pupae	Ab-normal pupae		Normal adults	Ab-normal adults	
Petroleum - Ether	10.0	20	18	00	2	00	00	2	00
	5.00	20	15	2	3	10	1	1	5
	2.50	20	13	5	2	25	3	2	15
	1.25	20	12	5	3	25	3	2	15
Acetone	10.0	20	11	5	4	25	5	00	25
	5.00	20	10	7	3	35	6	1	30
	2.50	20	9	7	4	35	6	1	30
	1.25	20	3	8	5	40	7	1	35
Hexane	10.0	20	17	3	00	15	2	1	10
	5.00	20	16	3	1	15	3	00	15
	2.50	20	14	5	1	25	4	1	20
	1.25	20	10	7	3	35	5	2	25
Ethyl-Alcohol	10.0	20	13	2	5	10	1	1	5
	5.00	20	10	4	6	20	3	1	15
	2.50	20	3	12	5	60	7	5	35
	1.25	20	3	10	7	50	7	3	35
Ethyl-acetate	10.0	20	15	1	4	5	00	1	00
	5.00	20	15	3	2	15	2	1	10
	2.50	20	16	4	00	20	2	2	10
	1.25	20	15	4	1	20	3	1	15
Control		20	00	20	00	100	20	00	100

*: Values are means , = 3

L.S.D at 5 %			
Solvent (S)	1.208	0.800	0.759
Conc. (C)	1.208	0.800	0.759
S x C	2.701	1.789	1.698

the first order in producing abnormal pupae 5.75 but hexane produced the lowest mean number of malformed pupae 1.25 %. Comparing the means of successful pupation percentages between different solvent used, lead to conclude that ethyl acetate and petroleum ether were the highest solvents giving abnormal pupae (85 %)followed by hexane, acetone and ethyl alcohol causing 77.5 , 66.25 and 65 %, respectively. Significant differences were recorded between all treatments and control.

Regarding the effect of different extracts of *T.orientalis* ,results in Table (13) showed that petroleum ether and ethyl acetate extracts at 10 % were the most effective in the failure of adult formation (zero adult formation).

A.2.3-Effect of *Glycine hispida* seeds extracts on insects development :-

Data in Table (14) indicates the important role of the studied factor (*Glycine hispida* extract) in determining both reduction in the percent of pupation and adult formation percentages.These data indicated that extracts of petroleum ether, acetone and hexane at 10 % concentration caused the higher percent of dead larvae, i.e. 18, 15, 13 respectively.

A concentration of 1.25 % acetone extract showed the lowest number of dead larvae, (5). Data revealed that the extracts of petroleum ether were the most effective in reducing adult formation. A concentration of 2.5 % prevented, completely, the adult formation (Fig 4).

A.2.4-Effect of *Thevetia nerifolia* leaves extracts on insects development:-

Data in Table (15) and Fig (4) show the biolgical effect of different solvent extracts of *Thevetia nerifolia* against 4th larval

Table (14) Biological effects of *Glycine hispida seeds* extracts on 4th larval instar of *Agrotis ipsilon*

Solvents	Conc . %	Mean number of				Successful pupations	Mean number of		Successful Adults emergence
		Larvae used	Dead larvae	Normal Pupae	Ab-normal pupae		Normal adults	Ab-normal adults	
Petroleum - Ether	10.0	20	18	2	00	10	1	1	5
	5.00	20	16	3	1	15	2	1	10
	2.50	20	16	3	1	15	00	3	00
	1.25	20	10	6	4	30	4	2	20
Acetone	10.0	20	15	2	3	10	2	00	10
	5.00	20	11	3	6	15	3	1	15
	2.50	20	8	5	7	25	4	1	20
	1.25	20	5	5	10	25	3	2	15
Hexane	10.0	20	13	4	3	20	3	1	15
	5.00	20	11	3	6	15	3	00	15
	2.50	20	9	4	7	20	2	2	10
	1.25	20	8	5	7	25	3	2	15
Ethyl-Alcohol	10.0	20	9	5	6	25	3	2	15
	5.00	20	8	5	7	25	3	2	15
	2.50	20	8	7	5	35	5	2	25
	1.25	20	6	11	3	55	8	3	40
Ethyl-acetate	10.0	20	10	6	4	30	3	3	15
	5.00	20	9	7	4	35	3	4	15
	2.50	20	7	8	5	40	5	3	25
	1.25	20	7	10	3	50	7	3	35
Control		20	00	20	00	100	20	00	100

* : Values are means , n = 3

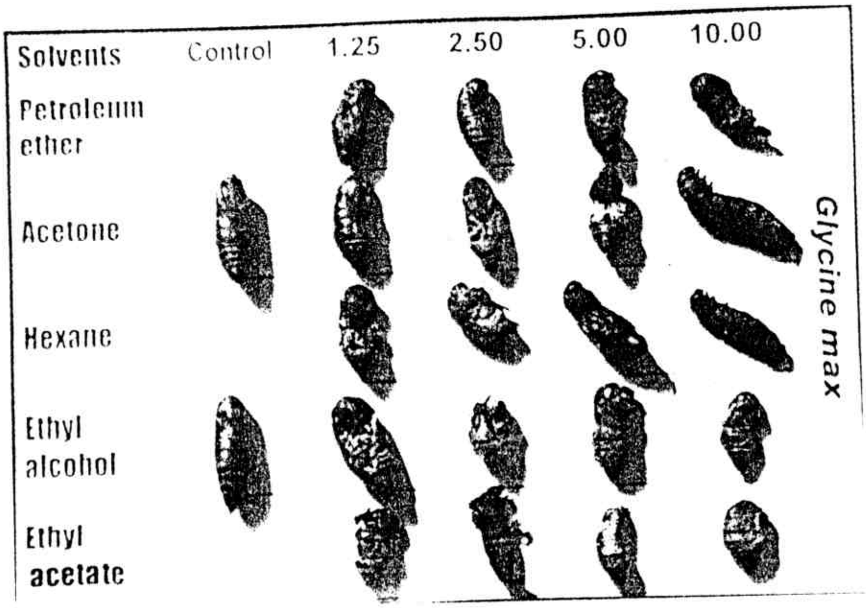
L.S.D at 5 %			
Solvent (S)	0.814	0.764	0.804
Conc (C)	0.814	0.764	0.804
S x C	1.819	1.708	1.819

Table (15) Biological effects of *Thevetia neriifolia* leaves extracts on 4th larval instar of *Agrotis ipsilon*

Solvents	Conc . %	Mean number of				Successful pupations	Mean number of		Successful Adults emergence
		Larvae used	Dead larvae	Normal Pupa	Ab-normal pupae		Normal adults	Ab-normal adults	
Petroleum - Ether	10.0	20	19	00	1	00	00	1	00
	5.00	20	17	3	00	15	3	00	15
	2.50	20	16	3	1	15	2	1	10
	1.25	20	14	4	2	20	3	1	15
Acetone	10.0	20	13	5	2	25	4	1	20
	5.00	20	11	7	2	35	5	2	25
	2.50	20	10	8	2	40	6	2	30
	1.25	20	9	8	3	40	6	2	30
Hexane	10.0	20	15	4	1	20	4	00	20
	5.00	20	13	5	2	25	4	1	20
	2.50	20	11	7	2	35	4	3	20
	1.25	20	10	8	2	40	6	2	30
Ethyl-Alcohol	10.0	20	18	2	00	10	1	1	5
	5.00	20	15	3	2	15	2	1	10
	2.50	20	13	6	1	30	4	2	20
	1.25	20	10	7	3	35	5	2	35
Ethyl-acetate	10.0	20	13	3	4	15	3	00	15
	5.00	20	13	5	2	25	3	2	15
	2.50	20	10	5	5	25	4	1	20
	1.25	20	8	7	5	35	5	2	25
Control		20	00	20	00	100	20	00	100

L.S.D at 5 %   * : Values are mean , n = 3

Solvent (S)	1.123	1.002	0.877
Conc . (C)	1.123	1.002	0.877
S x C	2.509	N.S	1.960



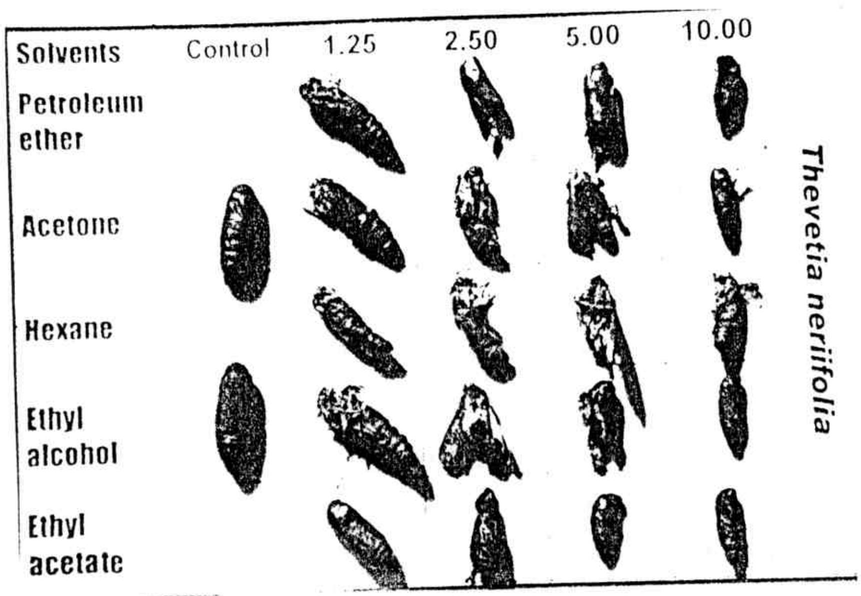


Fig (4) Malformed pupae resulted when the 4 th instar larvae of *Agrotis ipsilon* were fed on castor oil leaves treated with different solvent extracts of *Thevetia neriifolia* and *Glycine hispida*.

instar of *Agrotis ipsilon*. Data indicated that petroleum ether and ethyl alcohol extracts of Thevetia at 10% gave the highest number of dead larvae, i.e. 19, 18 and 20, respectively. While ethyl acetate extract recorded the lowest number of dead larvae, reaching 8 individuals among the tested twenty. Statistical analysis showed significant differences between solvents and concentration. Results revealed that the extracts of this plant had low adverse effects on further development The lowest percentage of successful adult formation was obtained from larvae exposed to 10 % concentration of petroleum ether extract. In all other extracts the percentages of successful adult formation was lower than that of control.

A.2.5- Effect of *Chenopodium ambrosoides* leaves extracts on insects development:-

Data in Table (16) show the biological effect of *chenopodium ambrosoides* extracts on 4^{th} larval instar of *Agrotis ipsilon*. Mortality among the exposed larvae ranged between 6 to 20 individuals after the treatment with 1.25 % of petroleum ether, ethyl alcohol and ethyl acetate extracts. Although, the number of dead larvae reached 20/20 in the case of acetone extract at 10 % concentration. The same concentration of ethyl acetate extract caused 17/20 mortality. The number of larvae failed to reach the stage of normal adults can be considered as an indication to the adverse effect of the different extracts on development of treated 4^{th} instar larvae of *Agrotis ipsilon*. The investigated extracts produced only between 0 to 40 % adult formation . The 10 % concentration of each acetone and ethyl acetate extracts, completely prevented adult formation. Acetone extract used as 5 % concentration resulted in 10 % adult

Table (16) Biological effects of *Chenopodium ambrosoides* leaves extracts on 4^{th} larval instar of *Agrotis ipsilon*

Solvents	Conc. %	Mean number of				Successful pupations	Mean number of		Successful Adults emergence
		Larvae used	Dead larvae	Normal Pupae	Ab-normal pupae		Normal adults	Ab-normal adults	
Petroleum - Ether	10.0	20	12	4	4	20	3	1	15
	5.00	20	9	8	3	40	5	3	25
	2.50	20	7	8	5	40	6	2	30
	1.25	20	6	10	4	50	8	2	40
Acetone	10.0	20	20	00	00	00	00	00	00
	5.00	20	15	2	3	10	2	00	10
	2.50	20	13	6	1	30	4	2	20
	1.25	20	10	7	3	35	4	3	15
Hexane	10.0	20	13	4	3	20	3	1	15
	5.00	20	11	5	4	25	5	00	25
	2.50	20	9	6	5	30	5	1	25
	1.25	20	7	7	6	35	6	1	30
Ethyl-Alcohol	10.0	20	10	3	7	15	3	00	15
	5.00	20	8	5	7	25	4	1	20
	2.50	20	7	7	6	35	7	00	35
	1.25	20	6	8	6	40	8	00	40
Ethyl-acetate	10.0	20	17	00	3	00	00	00	00
	5.00	20	14	4	4	20	4	00	20
	2.50	20	10	5	5	25	4	1	20
	1.25	20	6	8	6	40	6	2	30
Control		20	00	20	00	100	20	00	100

* : Values are meas , n = 3

L.S.D at 5 %			
Solvent (S)	0.969	0.877	0.852
Conc. (C)	0.969	0.877	0.852
S x C	2.167	1.960	1.905

formation. While the lowest extracts in preventing adults emergence were 1.25 % of each of petroleum ether and ethyl alcohol extracts, resulting 40 % successful adult formation.

Finally the percentages of successful adults formation is reversibly proportional to the concentration of the effective plant extracts.

A.2.6- Effect of *Chenopodium ambrosoides* seeds extracts on insects development :-

Data in Table (17) showed the biological effects of *ch. ambrosoides* seeds extracts on 4^{th} instar larvae of *A. ipsilon*. Results indicated that the extracts of seeds by all solvents were less effective in killing larvae than the extracts of leaves. All seed extracts failed to achieve 100 % mortality. Ethyl acetate at 10 % gave only 18/20 dead larvae followed by the same concentration of ethyl alcohol extract which resulted in (17/20) dead larvae.As for, the formation of adult, seed extracts of *Chenopodium ambrosoides* seeds extracts were most effective than the extracts of leaves where 3 of these extracts successed to prevent adult formation. These extracts were 10 % and 5 % of ethyl acetate extracts and 10 % of hexane extract. The lowest effective one in preventing adult formation was 1.25 % acetone extract producing 40 % adult formation. Statistical analysis showed significant differences between all solvents and the control and also between different concentrations of plant extracts.

Table (17) Biological effects ofChenopodium ambrosoides seeds extracts on 4th larval instar of *Agrotis ipsilon*

Solvents	Conc . %	Mean number of				Successful pupations	Mean number of		Successful Adults emergence
		Larvae used	Dead larvae	Normal Pupae	Ab-normal pupae		Normal adults	Ab-normal adults	
Petroleum - Ether	10.0	20	11	3	6	15	3	00	15
	5.00	20	9	5	6	25	3	2	15
	2.50	20	7	6	7	30	4	2	20
	1.25	20	4	7	9	35	5	2	25
Acetone	10.0	20	9	6	5	30	5	1	25
	5.00	20	6	8	6	40	6	2	30
	2.50	20	4	9	7	45	6	3	30
	1.25	20	2	10	8	50	8	2	40
Hexane	10.0	20	14	2	4	10	00	2	00
	5.00	20	14	4	2	20	2	2	10
	2.50	20	13	5	2	25	4	1	20
	1.25	20	9	7	4	35	6	1	30
Ethyl-Alcohol	10.0	20	17	1	2	5	1	00	5
	5.00	20	15	2	3	10	2	00	10
	2.50	20	11	5	4	25	3	2	15
	1.25	20	10	5	5	25	2	3	10
Ethyl-acetate	10.0	20	18	00	2	00	00	2	00
	5.00	20	15	1	4	5	00	1	00
	2.50	20	13	3	4	15	3	00	15
	1.25	20	11	4	5	20	3	1	15
Control		20	00	20	00	100	20	00	100

* : Values are means , n = 3

L.S.D at 5 %			
Solvent (S)	0.796	0.864	0.839
Conc . (C)	0.796	0.864	0.839
S x C	1.779	1.933	N.S

A.2.7-Effect of *Cassia fistula* pods extracts on insects development:-

Data presented in Table (18) and Fig (5) show the effect of *Cassia fistula* extracts on of 4^{th} instar larvae of *Agrotis ipsilon* and the follwing effect on insect development.

Results in this table showed that all extracts at all concentrations influence the number of dead larvae, normal pupae, and normal adults. It is obvious that increasing concentration lead to increase the number of dead larvae. While it decreased the number formed of normal pupae and adults. The data in the same table revealed that the petroleum ether extract was the best solvent used, it gave the highest number of dead larvae with uses 17 dead out of 20 individual and the lowest percentage in both successful pupation, adult formation, 15 % and zero respectively. Statistical analysis showed that there were significant differences between all solvants & concentration and the interaction between them.

A.2.8- Effect of *Lupinus termis* seed extracts on insects development:-

Results in Table (19) and Fig (5) revealed that all used extracts dead larvae epescielly the higher concentration 10 %. Results showed that both the petroleum ether and hexane extracts gave seventeen dead larvae out of twenty followed by acetone, ethyl acetate and ethyl alcohol extracts which killed 15, 14, and 12, respectively. Statistical analysis showed that there were significant differences between solvents and concentrations comparing to control.

In regard to adult emergence, all treatments gave lower percentages of adult formation than control. The lowest adult

Table (18) Biological effects of *Cassia fistula* leaves extracts on 4^{th} larval instar of *Agrotis ipsilon*

Solvents	Conc. %	Mean number of				Successful pupations	Mean number of		Successful Adults emergence
		Larvae used	Dead larvae	Normal Pupae	Ab-normal pupae		Normal adults	Ab-normal adults	
Petroleum - Ether	10.0	20	17	3	00	15	00	3	00
	5.00	20	14	4	2	20	1	3	5
	2.50	20	13	4	3	20	2	2	10
	1.25	20	8	7	5	35	4	3	20
Acetone	10.0	20	11	6	3	30	4	2	20
	5.00	20	11	5	4	25	5	00	25
	2.50	20	7	7	6	35	5	2	25
	1.25	20	4	9	7	45	7	2	35
Hexane	10.0	20	16	3	1	15	00	3	00
	5.00	20	14	4	2	20	2	2	10
	2.50	20	12	4	4	20	1	3	5
	1.25	20	9	6	5	30	3	3	15
Ethyl-Alcohol	10.0	20	11	5	4	25	4	1	20
	5.00	20	10	7	3	35	3	4	15
	2.50	20	6	9	5	45	5	4	25
	1.25	20	5	9	6	45	5	4	25
Ethyl-acetate	10.0	20	11	6	3	30	6	00	30
	5.00	20	9	7	4	35	5	2	25
	2.50	20	8	8	4	40	7	1	35
	1.25	20	7	10	3	50	7	3	35
Control		20	00	20	00	100	20	00	100

* : Values are means , n = 3

L.S.D at 5 %			
Solvent (S)	0.791	0.759	0.701
Conc. (C)	0.791	0.759	0.701
S x C	1.769	1.698	1.567

Table (19) Biological effects of *Lupinus termis seeds* extracts on 4th larval instar of *Agrotis ipsilon*

Solvents	Conc. %	Mean number of: Larvae used	Dead larvae	Normal Pupae	Ab-normal pupae	Successful pupations	Mean number of: Normal adults	Ab-normal adults	Successful Adults emergence
Petroleum - Ether	10.0	20	17	00	3	00	00	3	00
	5.00	20	15	4	1	3	20	4	00
	2.50	20	13	4	3	20	3	1	15
	1.25	20	10	5	5	25	4	1	20
Acetone	10.0	20	15	4	1	20	2	2	10
	5.00	20	14	4	2	20	2	2	10
	2.50	20	10	7	3	35	3	4	15
	1.25	20	6	8	6	40	5	3	25
Hexane	10.0	20	17	00	3	00	00	3	00
	5.00	20	15	00	5	00	00	5	00
	2.50	20	12	3	5	15	3	00	15
	1.25	20	9	4	7	20	3	1	15
Ethyl-Alcohol	10.0	20	12	2	6	10	00	2	00
	5.00	20	10	4	6	20	3	1	15
	2.50	20	9	4	7	20	3	1	15
	1.25	20	8	6	6	30	4	2	20
Ethyl-acetate	10.0	20	14	3	3	15	3	00	15
	5.00	20	10	4	6	20	3	1	15
	2.50	20	8	6	6	30	4	2	20
	1.25	20	5	8	7	40	4	4	20
Control		20	00	20	00	100	20	00	100

L.S.D at 5 %

* : Values are means , n = 3

L.S.D at 5 %			
Solvent (S)	0.653	0.685	0.716
Conc. (C)	0.653	0.685	0.716
S x C	1.461	1.533	1.601

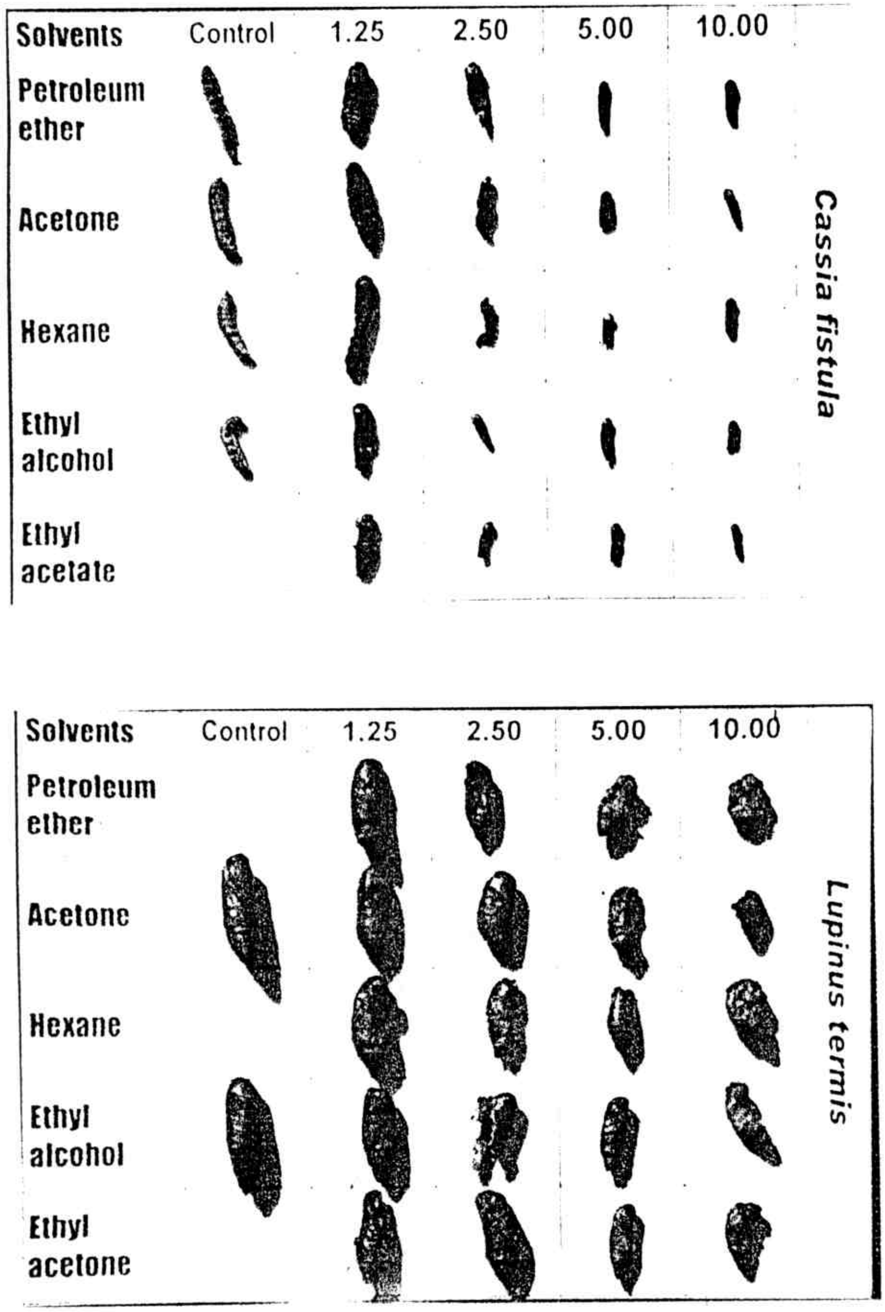


Fig (6) Malformed larvae and pupae resulted when the 4 th instar larvae of *Agrots ipsilon* were fed on castor oil leaves treated with different solvent extracts of *Cassia Fistula* and *Lupinus termis*.

formation percentage was zero percent recorded with 10 % and 5 % of petroleum ether, hexane and ethyl alcohol extracts. While adult formation percentage increased to 10 % using 10 and 5 % concentration of acetone extracts. The highest percentage of 25 % adult formation reached after the treatment with 1.25 % concentration of acetone extracts.

A.2.9-Effect of *Aptenia cordifolia* leave extracts on insects development:-

Data in Table (20) represent the effect of different extracts of *Aptenia cordifolia* against 4th instar larvae of *Agrotis ipsilon.*

Results showed that acetone extracts gave the highest number of dead larvae were15 / 20 insects at 10 % concentration. The lowest number of dead larvae was recorded after the treatment with 1.25 % concentration of petroleum ether, hexane and ethyl acetate (only 6 / 20 dead of larvae).

Statistical analysis showed significant differences at 5 % between different treatments compard with control.

The pupation percentage were also highly influenced by all treatments. The percentage of pupation reduced down to 5 % compared to 100 % successful pupation for the control. The us the lowest pupation percentage was 5 % with the treatment with ethyl alcohol extracts at 10 % concentration.

Data in the same table showed that percentages of adult formation with all treatments were lower comparing to control. The adult formation percentages varied from zero percent at 10 % concentration with ethyl alcohol to 35 % in the case of acetone and hexane extracts at 1.25 %.

Table (20) Biological effects of *Aptenia cordifolia* leaves extracts on 4[th] larval instar of *Agrotis ipsilon*

Solvents	Conc . %	Mean number of Larvae used	Mean number of Dead larvae	Mean number of Normal Pupae	Mean number of Ab-normal pupae	Successful pupations	Mean number of Normal adults	Mean number of Ab-normal adults	Successful Adults emergence
Petroleum - Ether	10.0	20	14	2	4	10	2	00	10
	5.00	20	10	4	6	20	3	1	15
	2.50	20	9	5	6	25	5	00	25
	1.25	20	6	7	7	35	6	1	30
Acetone	10.0	20	15	3	2	15	3	00	15
	5.00	20	11	5	4	25	3	2	15
	2.50	20	10	5	5	25	4	1	20
	1.25	20	7	7	6	35	7	00	35
Hexane	10.0	20	11	5	4	25	3	2	15
	5.00	20	10	6	4	30	4	2	20
	2.50	20	9	7	4	35	4	3	20
	1.25	20	6	8	6	40	7	1	35
Ethyl-Alcohol	10.0	20	14	1	5	5	00	1	00
	5.00	20	11	4	5	20	2	2	10
	2.50	20	9	5	6	25	2	3	10
	1.25	20	8	7	5	35	4	3	20
Ethyl-acetate	10.0	20	13	3	4	15	1	2	5
	5.00	20	11	4	5	20	2	2	10
	2.50	20	9	4	7	20	3	1	15
	1.25	20	6	7	7	35	5	2	25
Control		20	00	20	00	100	20	00	100

* : Values are means , n = 3

L.S.D at 5 %			
Solvent (S)	0.653	0.716	0.637
Conc. (C)	0.653	0.716	0.637
S x C	1.461	N.S	N.S

Statistical analysis showed non significant difference in the case of enteraction between solvents and concentration on normal pupae and normal adults.

A.2.10-Effect of *Schinus terbenthfolius* leave extracts on insects development :-

Data in Table (21) demonstrate the effect of *Schinus terbenthfolius* extracts on 4th larval instar of *Agrotis ipsilon* and further development after of exposure to there extracts. Mortality among the exposed larvae were low and moderate. It did not exceed 14 larvae from 20 in the case of ethyl acetate extract at 10 % concentration followed by 13 from 20 at the same concentration of pet.ether and ethyl alcohol extracts. The lowest number of larval mortality (5 from 20) were recorded after the treatment with 1.25 % hexane extract and 2.5 % ethyl alcohol extract.

The application of *Schinus terbenthfolius* extracts produced between 20 to 55 % adult formation opposite 100 % in the case of control. The used extracts could be arranged as effective in preventing the production of adults formation as example of 10 % of ethyl alcohol and ethyl acetate extracts which prevent 80 % of the pupae to be adults. The second in order kill 75 % of the pupae at the same concentration of 10 % of each of pet. ether, acetone and hexane extracts.The lowest effective one in preventing adult formation was pet. Ether extract at concentration of 1.25 %.

Statistical analysis of the obtained data showed significant differences between solvents and concentration in concern of larval mortality.

Table (21) Biological effects of *Schinus terbenthifolius* leaves extracts on 4th larval instar of *Agrotis ipsilon*

Solvents	Conc . %	Mean number of: Larvae used	Dead larvae	Normal Pupae	Ab-normal pupae	Successful pupationsn	Mean number of: Normal adults	Ab-normal adults	Successful Adults emergence
Petroleum - Ether	10.0	20	13	7	00	35	5	2	25
	5.00	20	10	9	1	45	6	3	30
	2.50	20	8	11	1	40	6	2	30
	1.25	20	6	14	00	30	11	3	55
Acetone	10.0	20	13	6	1	30	5	1	25
	5.00	20	10	8	2	40	6	2	30
	2.50	20	7	9	4	45	8	1	40
	1.25	20	7	11	2	55	9	2	45
Hexane	10.0	20	12	7	1	35	5	2	25
	5.00	20	10	8	2	40	6	2	30
	2.50	20	8	12	00	60	8	4	40
	1.25	20	5	14	1	70	10	4	50
Ethyl-Alcohol	10.0	20	13	5	2	25	4	1	20
	5.00	20	12	5	3	25	5	00	25
	2.50	20	5	6	1	30	5	1	25
	1.25	20	6	7	1	35	7	00	35
Ethyl-acetate	10.0	20	14	4	2	20	4	00	20
	5.00	20	12	6	2	30	5	1	25
	2.50	20	8	10	2	50	8	2	40
	1.25	20	7	11	2	55	9	2	45
Control		20	00	20	00	100	20	00	100

* : Values are means , n = 3

L.S.D at 5 %			
Solvent (S)	0.653	0.716	0.685
Conc. (C)	0.653	0.716	0.685
S x C	1.461	1.601	1.533

I.A.3- Insecticidal effects of various plant extracts on 4^{th} larval instar of *Agrotis ipsilon*

The effect of various plant extracts as stomach poisons to fourth larval instar of *A. ipsilon* is given in Table (22).Generally, all these extracts showed moderate mortality after 24 h. and increased gradually within the second and third days increased after 72 h. of treatment.

Data also showed that all plant extracts showed lethal effect on 4^{th} instar larvae of *A. ipsilon.* The highest mortalities (100%) has caused by the treatment with the highest 3 concentrations of pet. ether extract of *Glycine hispida,* 10 % each of pet. ether *Chenopodium ambrosoides* seed extract, hexane *Glycine hispida* extract, ethyl – alcohol extract of *chenopodium ambrosoides* seeds and also 10 % ethyl alcohol extract of *Thevetia neriifolia.* Data demonstrated in the same Table revealed that decreasing the concentration of plant extracts lead to lowering the mortality percentages of 4^{th} instar larvae of *Agrotis ipsilon.* The lowest percentage of mortality (17.2%) was recorded after the treatment with 1.25 % ethyl alcohol of Thuja leaves extract .

The above mentioned results may be taken to indicate that pet. ether for the majority of tested plant organs was the best solvent for extracting the most effective components. By comparing the mortalities after the treatment of all these extracts under study it may be concluded that *Glycine hispida* plant extracts were the highest effective one among all the used plants. Concentration of 10%, of all solvents gave not less than 90 % mortality. The above results may be an indication to the presence of toxicants which can be extracted and used in field application

Table (22) Means of mortality of different plant extracts after treatment 4th larval of *Agrotis ipsilon*.

Solvents	Conc.	No. of larval used	% mortality after 72h.									
			Thuja orientalis leaves	*Thuja orientalis* seed	*Glycin hispida* seed	*Thevetia neriifolia* leaves	*Chenopodium* ambrosoides (leaves)	*Chenopodium ambrosoides* (seeds)	*Cassia fistula* pods	*Lupinus termis* seeds	*Aptenia cordifolia* leaves	*Schinus terebinthifdius* (leaves)
Petroleum ether	10.0	25	92.5	90.0	100	89	73.6	100	89.3	84.0	89.9	87.0
	5.00	25	72.4	78.0	100	65	61.3	92	74.7	76.0	71.3	76.0
	2.50	25	69.5	45.0	100	44	51.4	78	66.7	66.0	66.4	52.0
	1.25	25	56.8	30.0	95	39	30.9	58	60.0	32.0	44.0	20.0
Acetone	10.0	25	88.7	94.0	90	69	76.0	66	72.0	80.0	80.2	69.3
	5.00	25	60.0	81.0	89	59	68.0	65	53.3	56.0	77.0	61.3
	2.50	25	48.9	78.0	80	50	56.0	39	45.3	44.0	56.0	50.7
	1.25	25	32.0	61.0	79	49	20.0	22	38.7	36.0	36.6	44.0
Hexane	10.0	25	83.3	90.5	100	90	74.7	95	89.3	76.0	87.0	89.3
	5.00	25	75.0	77.3	95	78	66.7	81	74.7	68.0	66.1	66.7
	2.50	25	69.4	61.5	82	70	60.0	61	66.7	60.0	40.0	58.0
	1.25	25	54.2	30.0	55	43	45.3	40	60.0	36.0	35.0	33.0
Ethyl-alcohol	10.0	25	83.3	95.0	99	100	74.7	100	81.3	72.0	97.5	99.0
	5.00	25	75.0	83.0	85.1	91	65.3	90	72.0	56.0	89.0	85.0
	2.50	25	41.6	77.0	69	89	61.3	87.5	56.7	40.0	69.2	78.0
	1.25	25	17.2	66.0	39	53	53.3	62.1	28.9	32.0	51.2	61.3
Ethyl-acetate	10.0	25	77.3	89.0	93.2	81	62.7	88	65.3	80.0	90.5	74.7
	5.00	25	73.1	79.0	72	45	53.3	63	61.3	68.0	62.1	65.3
	2.50	25	57.5	65.0	40	37	45.3	47	53.3	68.0	40.9	58.7
	1.25	25	49.7	55.0	23	29	38.7	26	42.7	60.0	27.2	52.0
control			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

alone or integrated with other pest management agents. It is obvious that further detailed studies are needed.

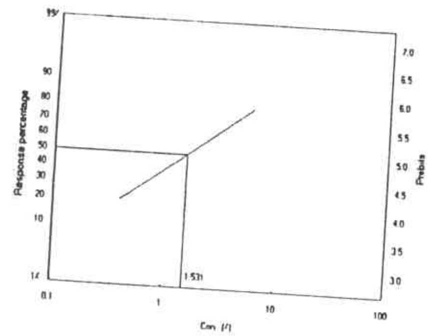
I.A.4-LC_{50} s of investigated plants extracts on insects :-

Table (23) and Fig(6-15) show the results of probit analysis obtained by the exposure of the larvae of 4th instar of *Agrotis ipsilon* to different concentrations of the ten plant extracts. When the LC_{50} values of the different extracts were compared the most effective extracts were having the smallest values for LC_{50}.There were a group of effective extracts having LC_{50} lower than one %.*Glycine hispida* extract with petroleum ether was the most effective one recording the lowest value of LC_{50} (0.057%) followed by the same plant but with other solvent (acetone) having also the same value of LC_{50} (0.057%). *Thuja* seed ethyl alcohol extract (0.66%), *Thuja* seeds acetone extract (0.708%), ethyl alcohol extract of *Chenopodium* seeds (0.795%) ,*Cassia* extract with hexane or with petroleum ether (0.824).The obtained figures showed the LC_{50} values of :

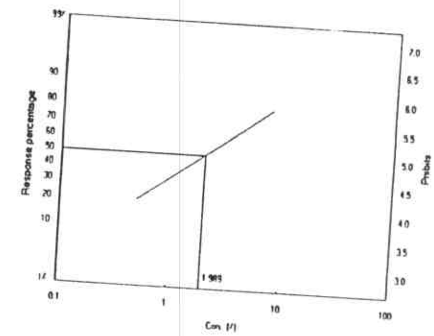
Hexane extract of *Thuja* leaves (0.96%), *Schinus* extract with ethyl alcohol (0.96%), *Thuja* seed extract with hexane (0.97%) and petroleum ether extract of *Chenpodium* seeds (0.98%). The second group from the side of LC_{50} values that having higher than 1 % and lower 2 % were ethyl alcohol extract of *Thevetia* plant (1.08%), pet. ether extract of *Thuja* leaves (1.09%),ethyl alcohol extract of *Chenopodium* leaves (1.11%), ethyl acetate extract of *Thuja* seeds (1.23%). *Thuja* leaves extracted with ethyl acetate (91.31%), *Aptenia* ethyl alcohol extract (1.36%), ethyl alcohol extract of *Lupinus termis* seeds, *Thevetia*_hexane extract (1.45%) ,*Schinus* ethyl acetate extract (1.46%), *Aptenia* extracted with pet. ether (1.53%), *Glycine*

Table (23) L C_{50} of investigated plant extracts on 4th instar larvae of *Agrotis ipsilon* after 3 days feeding on treated castor bean leaves.

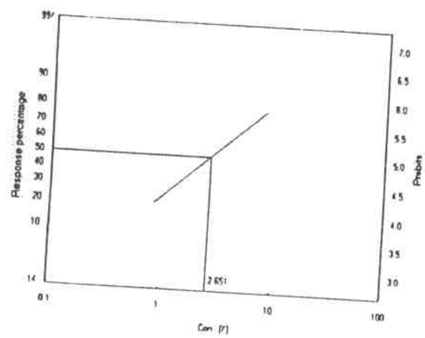
Plants \ Solvent	Petroleum ether		Acetone		Hexane		Ethyl-alcohol		Ethyl-acetate	
	Slope±SE	LC_{50}	Slope±SE	LC_{50}	Slope±SE	LC_{50}	Slope±SE	LC_{50}	Slope±SE	LC_{50}
Aptenia cordifolia	1.428±0.211	1.531	1.406±0.204	1.989	1.685±0.207	2.651	2.113±0.255	1.360	0.667±0.108	1.943
Thavetia neriifolia	1.598±0.206	2.384	0.600±0.189	1.983	1.554±0.218	1.446	2.287±0.359	1.081	1.575±0.204	4.395
Thuja orientalis (seeds)	2.107±0.222	2.424	1.245±0.228	0.708	1.137±0.211	0.973	1.228±0.23	0.664	1.259±0.210	1.227
Thuja orientalis (leaves)	1.207±0.211	1.090	1.719±0.208	2.718	0.920±0.204	0.863	2.223±0.221	3.077	0.899±0.197	1.312
Chenopodium ambrosoides (leaves)	1.207±0.196	2.834	1.648±0.205	2.984	1.532±0.203	2.831	0.630±0.193	1.114	0.722±0.190	4.598
Chenopodium ambrosoides (seeds)	1.975±0.359	0.980	1.243±0.198	5.305	1.529±0.212	1.674	1.777±0.211	0.795	2.029±0.215	3.123
Cassia fistula	1.01±0.209	0.824	0.943±0.192	3.235	1.010±0.209	0.824	1.665±0.207	2.542	0.682±0.189	2.769
Glycine hispida	0.573±0.23	0.057	0.573±0.230	0.057	2.422±0.348	1.093	2.554±0.267	1.720	2.602±0.236	3.057
Lupinus termis	2.254±0.222	3.069	1.430±0.204	2.074	1.695±0.207	2.641	2.115±0.256	1.360	2.147±0.218	3.238
Schinus terbinthifolius	2.228±0.225	2.613	0.754±0.191	2.296	1.695±0.211	2.189	1.754±0.254	0.959	0.696±192	1.457



Petroleum ether



Acetone



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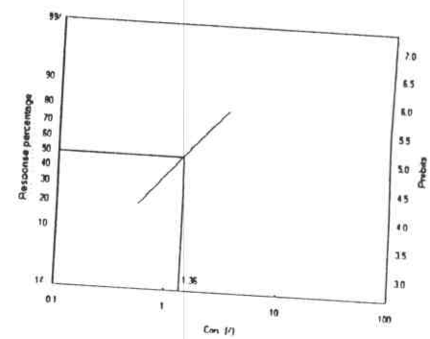
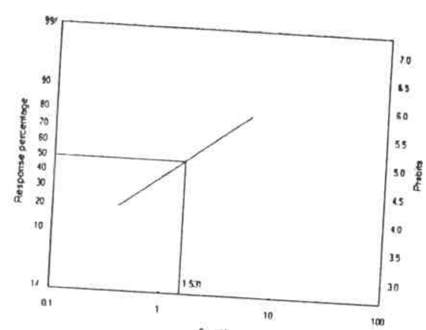
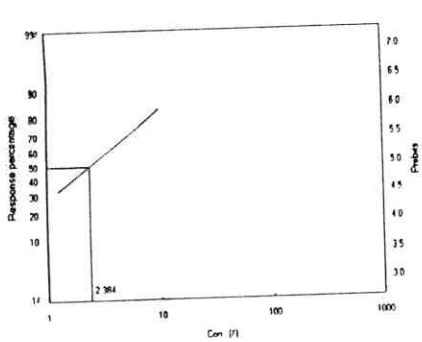


Ethly alcohol



Ethly actate

Fig (6) Lethal response after treatment 4 th instar larvae of *Agrotis ipsilon* to *Aptenia cordifolia* leaves extracts after 72 hours



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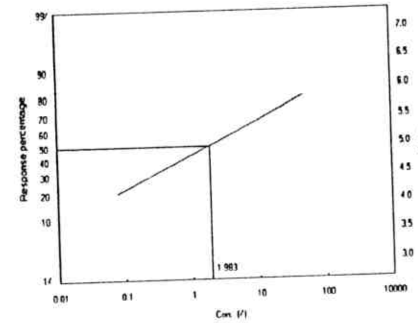

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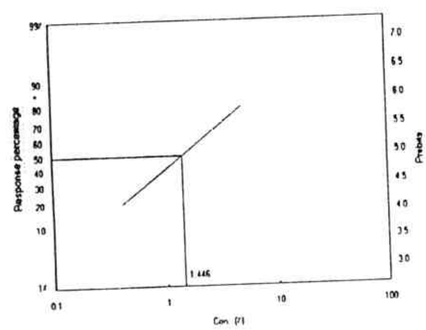

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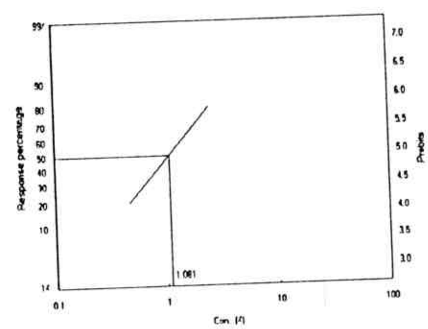
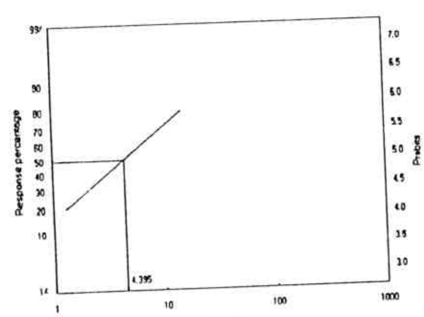
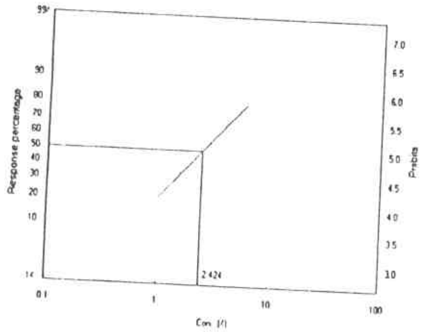


Ethyl alcohol



Ethyl acetate

Fig (7) Lethal response after treatment 4 th instar larvae of *Agrotis ipsilon* to *Thevetia neriifolia* leaves extracts after 72 hours



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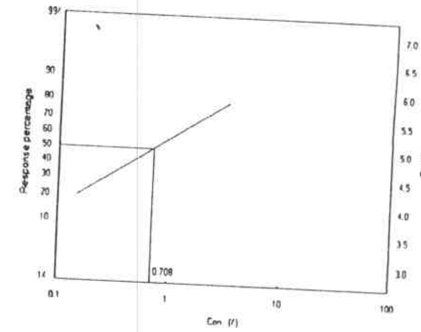

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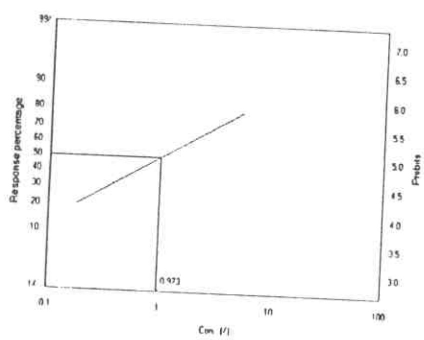

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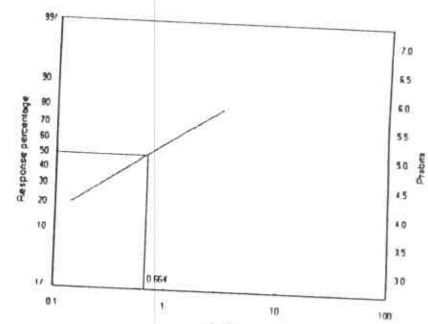
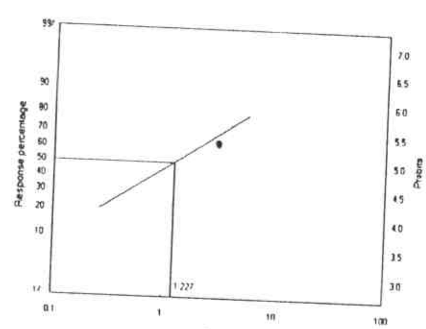
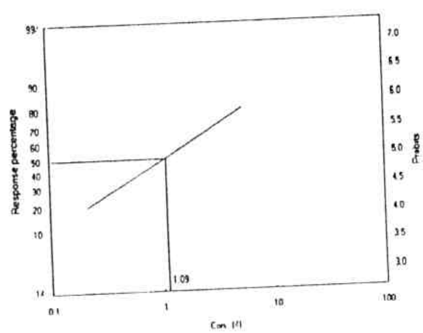


Ethyl alcohol

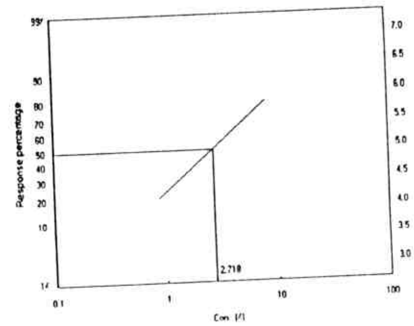


Ethyl actate

Fig (8) Lethal response after treatment 4 th instar larvae of *Agrotis ipsilon* to *Thuja orientalis seed* extracts after 72 hours



Petroleum ether



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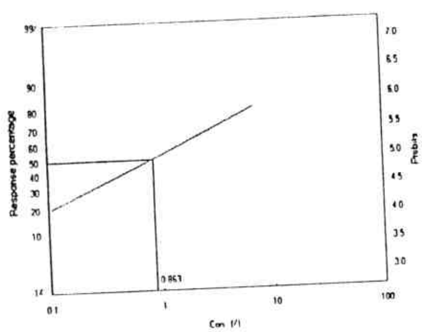

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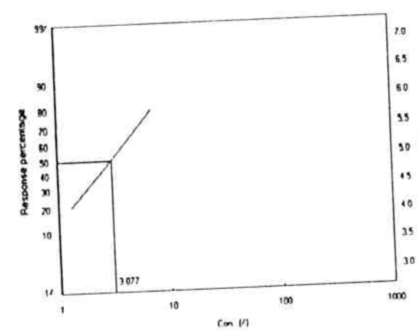
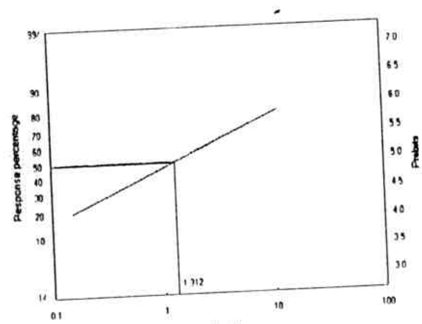
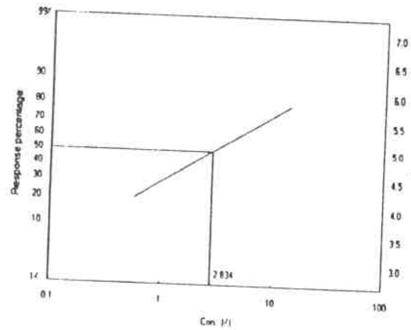


Ethyl alcohol

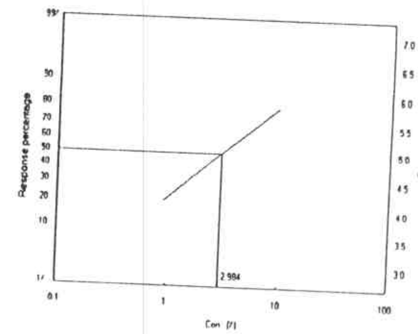


Ethyl acetate

Fig (9) Lethal response after treatment 4 <u>th</u> instar larvae of *Agrotis ipsilon* to *Thuja orientalis* leaves extracts after 72 hours



Petroleum ether



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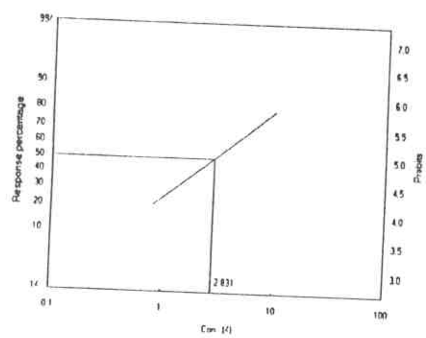

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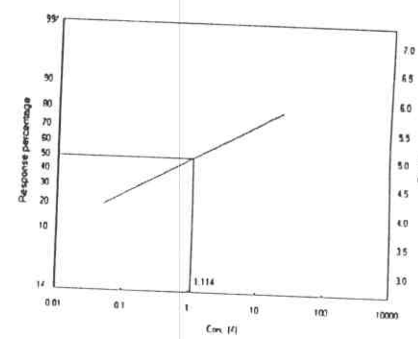
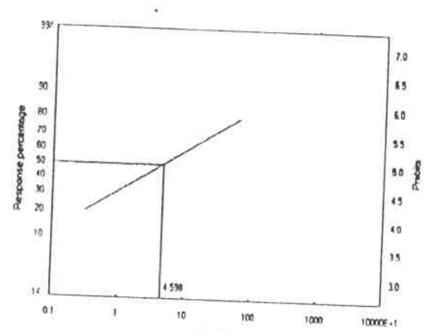
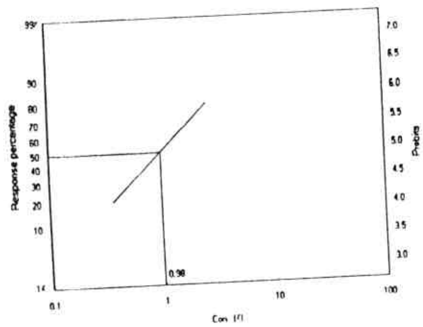


Ethyl alcohol

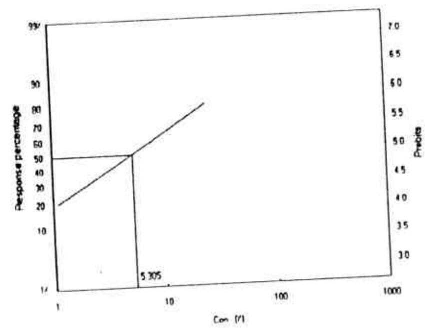


Ethyl acetate

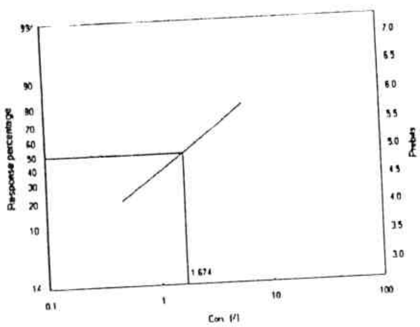
Fig (10) Lethal response after treatment 4 th instar larvae of *Agrotis ipsilon* to *Chenopodium ambrosoides* leaves extracts after 72 hours



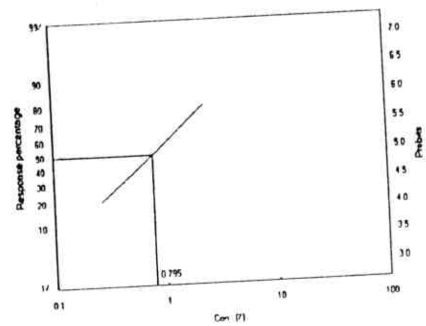
Petroleum ether



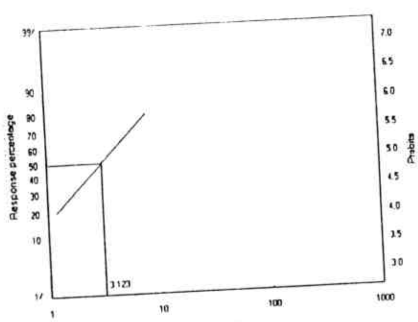
Acetone



Hexane

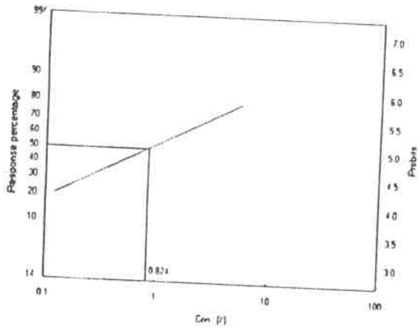


Ethyl alcohol

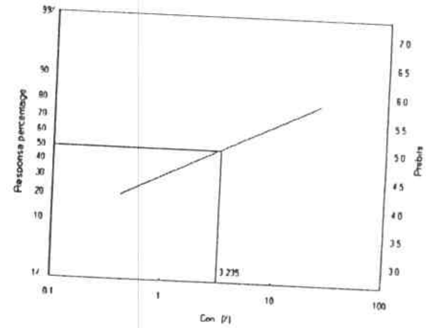


Ethyl acetate

Fig (11) Lethal response after treatment 4 th instar larvae of *Agrotis ipsilon* to *Chenopodium ambrosoides seed* extracts after 72 hours



Petroleum ether



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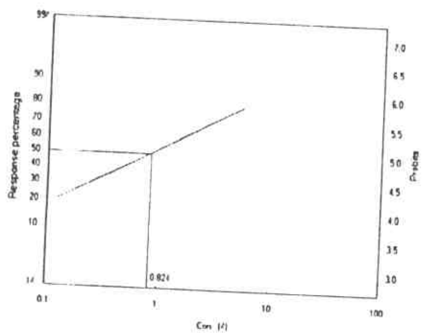

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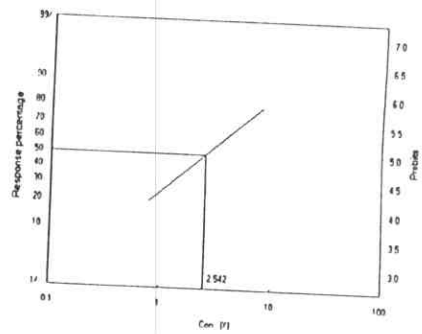

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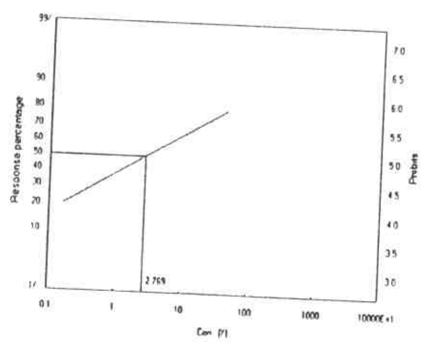
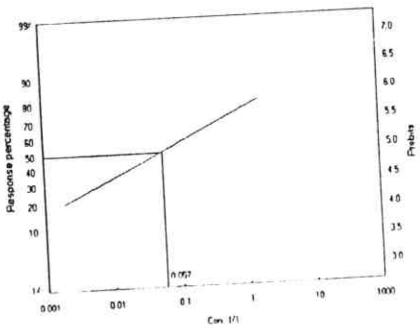


Ethyl acetate

Fig (12) Lethal response after treatment 4 th instar larvae of *Agrotis ipsilon* to *Cassia fistula* leaves extracts after 72 hours



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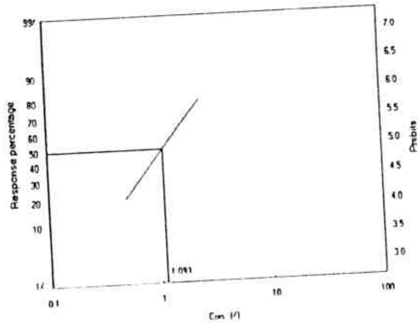
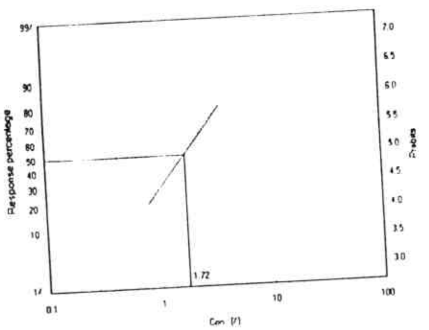
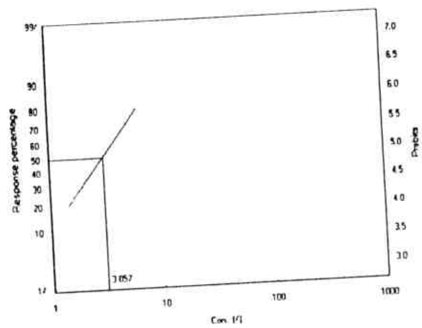


Hexane

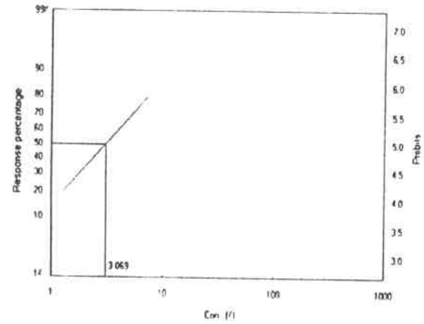


Ethyl alcohol

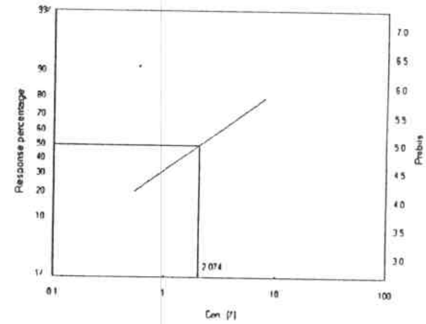


Ethyl acetate

Fig (13) Lethal response after treatment 4 th instar larvae of *Agrotis ipsilon* to *Glycine hispida seeds* extracts after 72 hours



Petroleum ether



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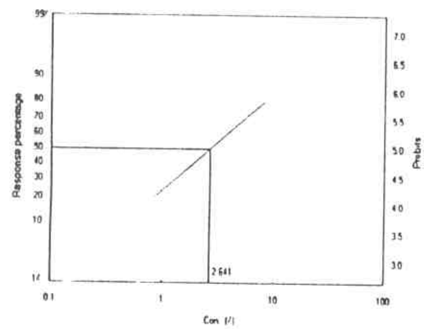
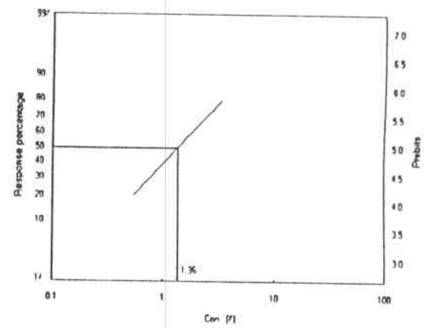
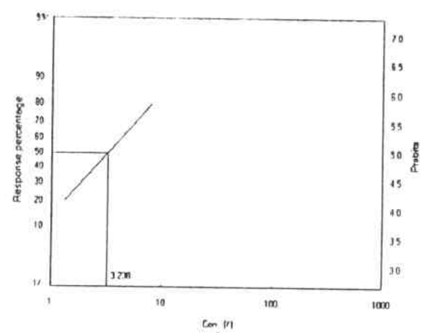


Hexane



Ethyl alcohol



Ethyl acetate

Fig (14) Lethal response after treatment 4 th instar larvae of *Agrotis ipsilon* to *Lupinus termis seed* extracts after 72 hours

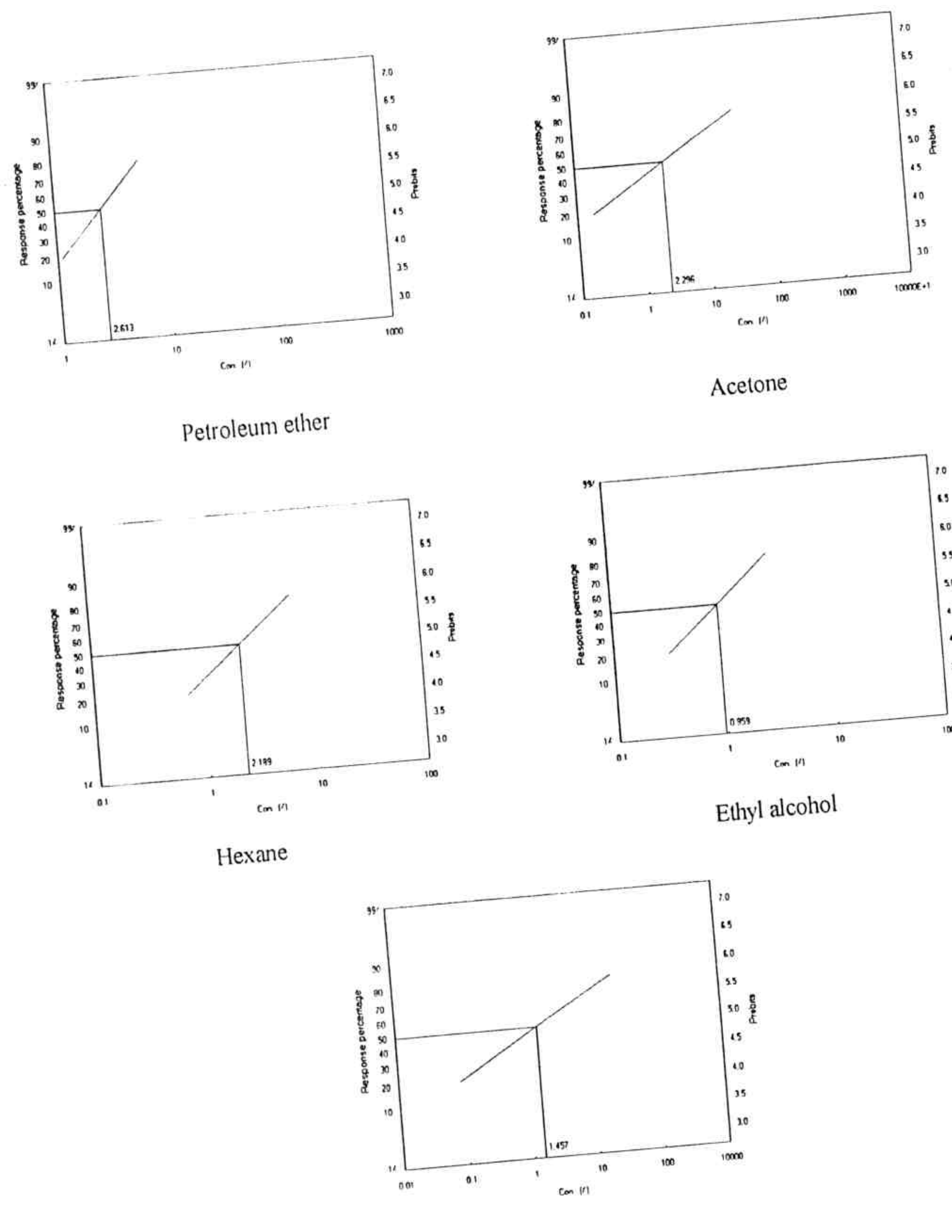


Fig (15) Lethal response after treatment 4 th instar larvae of *Agrotis ipsilon* to *Schinus terbenthifolius* leaves extracts after 72 hours extract with ethyl alcohol (1.72%), *Chenopodium* seeds hexane extract (1.67%) ,acetone extract of *Thevetia* (1.98%) and *Aptenia* acetone extract (1.99%). There were moderatly effective group which showed LC_{50} lower than 3 %. The least effective extract against *A. ipsilon* based on with LC_{50} values was *Chenopodium* acetone extract (5.31 %). The values of slopes varied between 0.57 to 2.60. There was a considerable difference between the highest slope and the lowest one. This may indicate that the response of the tested insects to the extracts with high slope was more uniform than that of other extracts of low slope.

Owing to the wide range of differences in the slopes of the extracts tested on the larvae of greasy cutworm it was expected that the arrangement of their potency would differ doses than LC_{50} values.

The above results lead to the conclusion that most of tested plant extracts needs of further studies. The acetone and pet.ether extracts of *Clycine hispida* were the most effective against the larvae of *A. ipsilon,* followed by ethyl alcohol and acetone extracts of *Thuja* seeds.

At last ethyl alcohol extract of *Chenopodium ambrosoides* seeds, hexane extract of *Cassia,* pet. ether extract of *Cassia,* hexane extract of *Thuja* leaves ethyl alcohol extract of *Schinus* and hexane extract of *Thuja* leaves governed with the LC_{50} values.

It is well known that most of these types of plant extracts influence different sites in insects body. Investigating the effect of the extracts on the six genus of plants under study on the midgut of the insects will certainly throw lights on the mode of action of the bioactive compounds extracted by the used solvents.

I.A.5-Histological studies on the 4^{th} instar larvae of *Agrotis ipsilon*

Figure (16) is a cross section in the midgut of 4^{th} instar larva fed on untreated food as a control

As shown in the figure, the basement membrane (BMb) with this epithelial cells appears to be a tunica propria or product of the cell bases, differing in no respect from the basement membrane of the body wall or from that of the alimentary canal, **(Snodgrass, 1935).**

The appearance of the ventricular epithelium varies greatly according to the state of the digestive processes. Most of its cells are columnar, with irregular inner ends more or less projecting into the stomach lumen. The cytoplasm appears granular or spongy, the nuclei are large (Fig 16) and generally occupy the middle or distal parts of the cell bodies. In addition to these larger spongy cells that form most of the epithelial wall, there are other smaller cells (rg) of a denser texture occurring either singly or in groups between the bases of the larger cells. The larger cells having their inner ends exposed or projecting into the stomach lumen, are the digestive cells, that take an active part in the processes of secretion or absorption. The smaller bassal cells are the regenerative cells. The function of which is to propagate cells to replace the digestive cells when the latter are exhausted by secretary activities or shed at the time of ecdysiast. The digestive cells constitute the functional epithelium of the stomach.

The food content of the stomach is separated from the verticular epithelium by a thin membrane, which though often in more or less intimate contact with the inner ends of the epithelial

Fig. (16): Cross section in the midgut of 4th instar *Agrotis ipsilon* larva fed on untreated diet.

Fig. (17): Cross section in the midgut of 4th instar *Agrotis ipsilon* larva fed on untreated diet.

1 **Lmcl**
2 **Cmcl**
3 **BMb**
4 **PMb**
5 **F**
6 **rg**
7 **Apth**

cells, typically surrounds the food mass as a cylindrical sheath for the most part free from the stomach walls. This food envelope is known as the pertrophic membrane (PMb).

The circular fibers (Cmcl) constitute the principal layer. The longitudinal fibers laying external to the circulars, being is widely spaced and look like groups of longitudinal fibers from special longthwise muscle (lmcl) bonds that seem as cords stretched between the two ends of the stomach.

The majority of insects feed most intensely during the immature stages of their lives. Many insects take but little food and some none at all , during the imaginal period, and yet it is usually in the early part of the adult stage that the reproductive elements are brought to maturity.

The physiological economy of the insect, therefore, must inculcate a system of food conservation to guarantee a consummation of the reproductive function, or to compensate for the inequality of ingestion between the immature and adult stages. In the Halometabola, moreover, the constructive metabolism that takes place in the pupa is partly dependent on food reserves stored in the body during the larval period. The principal tissue that serves for the deposit of nutritive and energy forming substances is that which constitutes the so - called fat body, a derivative of the mesoderm, formed in the embryo.

In the case of normally fed insects, as shown in our target insect(Fig.16), this adipose tissue consists of compact masses of cells distributed in the perivisceral apaces of the abdomen, which Cleary observed in the cross section of the abdomen of untreated 4^{th} instar black cutworm larva. Cross section in larva fed by treated food with extract of *Thuja orientalis* at the concentration

10 % obtained that, the layers of both longitudinal and circular muscles are separated largely from the epithelial layer. Many of the epithelial cells are destroyed, as shown in Fig.(17). Fat bodies are also relatively affected, it seems to be skinney in comparison with the same tissues in control section.

The same effect in longitudinal muscles, circular muscles and epithelial cells was observed in treatments *Glycine hispida* and *Aptenia cordifolia* as shown in Fig (19 and 20).

The separation of the muscle layer from the epithelium cells after treatment with extract of *Thuja orientalis, Glycine hispida* and *Aptenia cordifolia* led to the treated larvae loose eating ability as well as less movement of the wall. These results agree with that found by **Schmidt *et al.* (1997),** they stated that, the layers of both longitudinal and circular muscles are separated largely from the epithelial layer and most of epithelial cells were damaged as a result of larval feeding on treated food with melia extract at 100 ppm for 3 days.

This results agree also with that found by **Nagwa Salem *et al.* (2003),** they found that feeding of 6th instar larvae of *Spodoptera littoralis* on treated food with water extract of *Peganium harmala* at concentration 5 % resulted in separation of the muscle layer of midgut in addition to breakdown of the epithelium. Destroying heavily the epithelial cells means stopping digestion and absorption of digested food, that resulted is reduction in larval weight and development in comparison with control **(Breuer and Schmidt (1990) and Breuer (1993).**

Fat bodies were more affected in treated larvae with *Glycine hispida.* Cross section in the midgut of treated larva with *Aptenia corifolia* showed also that, the size of epithelial cells

Fig. (18): Cross section in the mid gut of 4th instar treated Larva of *Agrotis ipsilon* with 10% *Thuja orientalis* Ethyl-alcohol extract.

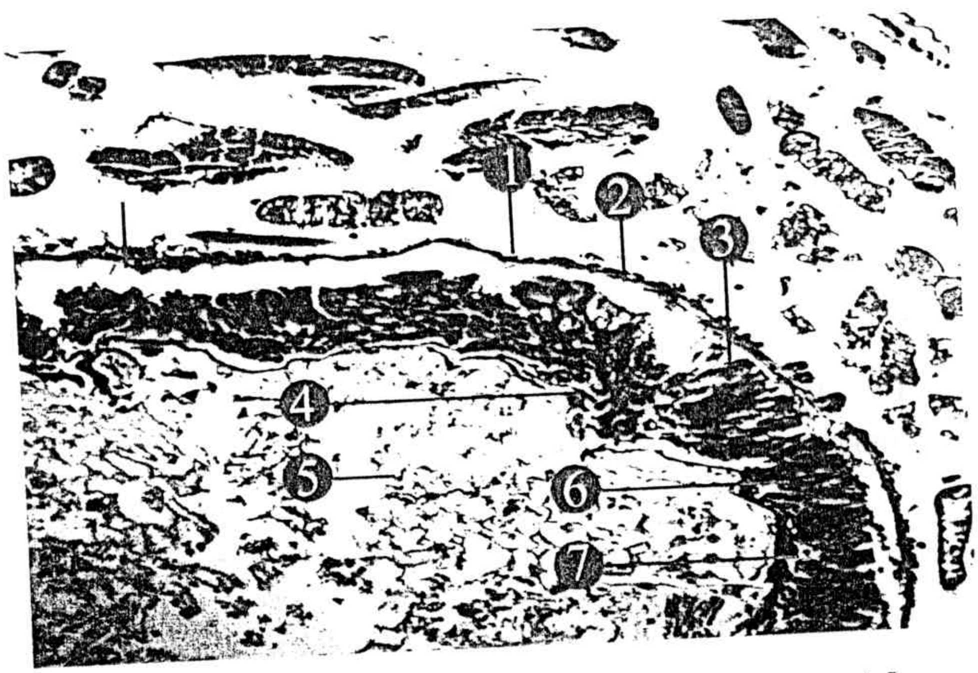


Fig. (19): Cross section in the mid gut of 4th instar treated Larva of *Agrotis ipsilon* with 10% *Glycine hispida* Petroleum ether extract.

became bigger in comparison with control and a space was found between the epithelium and the bulk of foods some nuclei of the destroyed cells seems scattered away on the edge of food bulk, (19). That agree with that found with **Ahmed (1995)** who reported that, some muscle of the destroyed cells seems scattered away on the edge of food bulk in 4^{th} instar treated larvae of *Agrotis ipsilon* with 100ppm melia extract.

Extract of *Theveta neriifolia* was less effective than others described before layers of midgut of *Agrotis ipsilon* 4^{th} instar larvae when used by feeding, while the effect on fat bodies was clearely observed as shown in Fig. (20). The fat body is the source of the majority of serum proteins. The fat body is made up of only a few cell types and has the potential of reacting in a uniform manner to the forces of metamorphic change, **(Wyatt and Pan, 1978).**

The circular muscles are relatively separated from the epithelial layer in the same locations of the cross section in addition to absence of some regenerative cells.

Treated larvae by extracts of *lupinus termis* or *cassia fistula* resulted completely in disappearance of the fat bodies as observed in the cross section Fig. (22 and 23).

All spongy cells regenerative and cells were destroyed in both treatments.

Fig. (20): Cross section in the mid gut of 4^{th} instar treated Larva of *Agrotis ipsilon* with 10% *Aptenia cordifolia* Ethyl-alcohol extract.

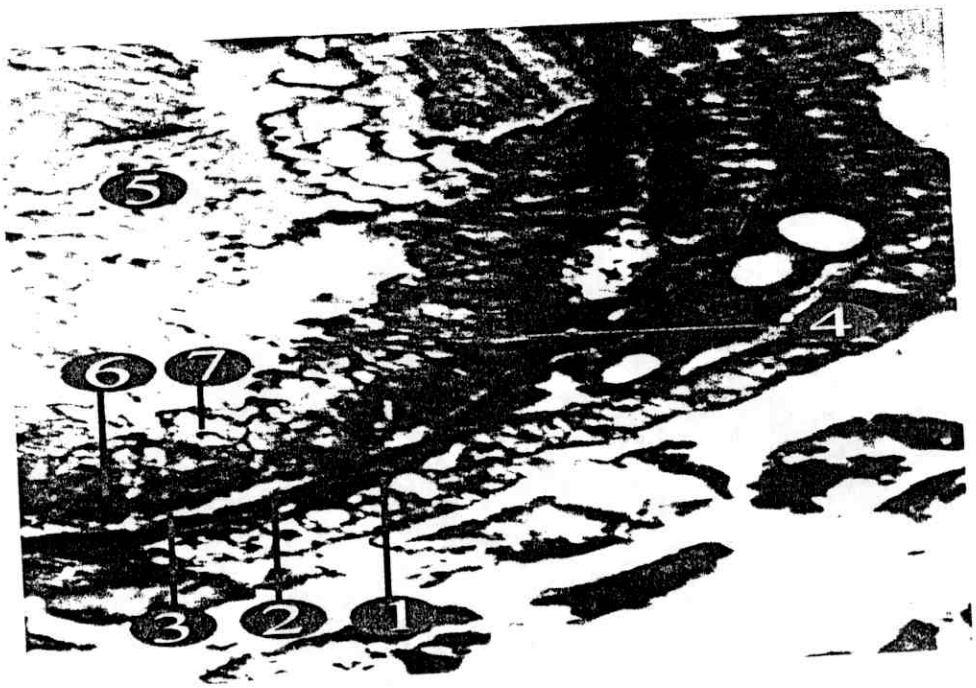


Fig. (21): Cross section in the mid gut of 4^{th} instar treated Larva of *Agrotis ipsilon* with 10% *Theveta neriifolia* Ethyl-alcohol extract.

Fig. (22): Cross section in the mid gut of 4^{th} instar treated Larva of *Agrotis ipsilon* with 10% *Lupinus termis* Petroleum ether extract.

Fig. (23): Cross section in the mid gut of 4^{th} instar treated Larva of *Agrotis ipsilon* with 10% *Cassia fistula* Petroleum ether extract.

I.B- Effect of tested extracts against adults of *Sitophilus oryzae*

The 10 plant extracts were tested against the adults of *S. oryzae* as stomach and also, to investigate the repellency effect of these extracts.

I.B.1- Toxic effect of plant extracts

All plant extracts under investigation were examined for their stomach toxicity to the adult of *S. oryzae*. Results, generally, revealed that the mortality percentages increased by the increase of concentration and time of exposure.

B.1.I- Effect of *Aptenia cordifolia* leaves extracts :-

Results in Table (24) showed clearly that very high mortality values (100, 100, 95.1, 93.3 and 90.9 %) were recored after 14 days of the treatment with 10 % extracts of *Aptenia cordifolia* leaves extracted by ethyl acetate, ethyl alcohol, acetone, petroleum ether and hexane, respectively.

Data obtained using the mean values to compare between the effieciency of different solvents, revealed that ethyl acetate was the best solvent followed by hexane, petroleum ether, ethyl alcohol and acetone giving over all mean values 54.47, 53.24, 50.16, 48.83 and 40.49 % respectively.

B.1.2- Effect of *Thevetia neriifolia* leaves extracts :-

The toxic effect of the different extracts of *Thevetia neriifolia* leaves against *Sitophilus oryzae* are presented in Table (25). The results indicated that mortality percentages were generally increased with increasing time of exposure and concentration. Extract of ethyl –alcohol was highly toxic to (*Sitophilus oryzae*). Complete reduction of the adult weevils were observed after (1) days from the treatment with 10 %

Table (24) Effect of *Aptenia cordifolia* leaves extract on mortality of the rice weevile adults (*Sitophilus oryzae* Linn.)

Concentrations (%)	No. of insects	Average % mortalits of adults after treatment (days) ± SE																													
		Petroleum ether						Acetone						Hexane						Ethyl-alcohol						Ethyl-acetate					
		1	3	5	7	14	CM±SE	1	3	5	7	14	CM±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE
10.00	50	26.67	74.67	92.00	93.33	93.30	93.1±0.6	10.65	52.63	79.67	85.91	95.32	95.1±0.9	11.32	56.65	81.32	89.32	91.32	90.9±0.3	52.19	90.21	100.0	100.0	100.0	100.±0.1	40.30	68.70	88.51	93.92	100.0	100±0.2
5.00	50	14.00	45.34	68.67	78.67	84.70	84.3±0.3	10.22	33.67	49.89	63.84	75.19	74.2±0.6	14.67	52.67	78.67	84.00	85.33	84.7±0.3	31.68	53.02	67.30	70.20	70.20	675±0.3	33.10	40.30	67.34	91.34	91.34	90.3±0.4
2.50	50	5.33	39.99	55.32	58.65	63.90	63.1±0.4	5.32	29.01	37.42	42.11	56.33	54.5±0.3	4.67	41.34	78.01	81.34	83.34	82.6±0.3	20.11	28.67	30.50	30.50	30.50	24.1±0.3	15.10	20.00	45.94	70.58	85.98	84.3±0.6
1.25	50	3.14	11.34	27.32	30.19	36.60	35.3±0.2	1.99	8.07	16.63	27.99	27.99	24.9±0.3	2.20	6.11	29.34	41.02	52.19	50.2±0.2	12.09	20.11	23.12	23.12	23.12	16.0±0.4	9.97	13.11	21.58	46.14	46.19	39.7±0.3
Control	50	0.00	2.00	2.00	2.00	2.00	2.0±0.1	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	2.00	2.00	2.00	2.00	2.00		4.00	4.00	4.00	4.00	4.00	4.00	0.00	0.00	4.00	4.00	4.00	4.00	8.45	8.45	8.45	8.45	8.45		10.66	10.66	10.66	10.66	10.66	
Mean		50.16						40.49						53.24						48.83						54.47					

Values are means (±SE) N = 3
C.M. = Corrected mortality for 14 days

Table (25) Effect of *Thevetia neriifolia* leaves extract on mortality of the rice weevile adults (*Sitophilus oryzae* Linn.)

centrations (%)	No. of insects	Average % mortalits of adults after treatment (days) ± SE					
		Petroleum ether					
		1	3	5	7	14	CM±SE
10.00	50	4.67	18.67	39.34	51.30	26.00	24.4±0.1
5.00	50	4.67	14.67	26.00	33.30	36.60	35.3±0.2
2.50	50	2.67	10.67	18.70	26.00	32.70	31.3±0.3
1.25	50	0.66	4.88	10.30	15.33	17.50	15.8±0.4
Control	50	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	2.00	2.00	2.00	2.00	2.00	
Mean		21.53					

centrations (%)	No. of insects	Acetone					
		1	3	5	7	14	CM±SE
10.00	50	10.30	23.30	46.70	59.70	69.10	67.8±0.8
5.00	50	4.68	19.90	38.70	43.10	50.10	48.0±0.6
2.50	50	3.55	16.60	30.60	39.20	41.80	39.4±0.3
1.25	50	1.67	6.90	14.10	19.50	25.00	21.8±0.3
Control	50	0.00	2.00	2.00	2.00	2.00	0.00
Control (s)	50	4.00	4.00	4.00	4.00	4.00	
Mean		28.27					

centrations (%)	No. of insects	Hexane					
		1	3	5	7	14	C.M±SE
10.00	50	23.30	51.30	58.60	64.60	69.30	68.0±0.1
5.00	50	3.33	23.30	47.30	55.90	60.60	59.0±1.5
2.50	50	1.30	7.30	15.30	21.90	30.60	27.7±0.9
1.25	50	0.66	2.32	9.33	11.90	14.60	11.0±0.9
Control	50	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	0.00	0.00	4.00	4.00	4.00	
Mean		28.67					

centrations (%)	No. of insects	Ethyl-alcohol					
		1	3	5	7	14	C.M±SE
10.00	50	100.0	100.0	100.0	100.0	100.0	100±0.0
5.00	50	99.3	100.0	100.0	100.0	100.0	100±0.0
2.50	50	95.30	95.30	95.30	96.00	96.00	95.6±0.
1.25	50	60.10	60.10	65.00	65.00	65.00	61.7±0.
Control	50	2.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	8.45	8.45	8.45	8.45	8.45	
Mean		89.63					

centrations (%)	No. of insects	Ethyl-acetate					
		1	3	5	7	14	C.M±SE
10.00	50	2.66	21.30	98.00	100.0	100.0	100±0.02
5.00	50	0.66	20.00	95.30	99.30	99.50	99.4±0.01
2.50	50	0.66	19.30	85.30	96.00	96.00	95.5±0.01
1.25	50	0.00	1.33	5.93	14.90	20.50	11.01±0.3
Control	50	2.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	10.66	10.66	10.66	10.66	10.66	
Mean		48.84					

Values are means (±SE) N = 3
C.M. = Corrected mortality for 14 days

concentration and after (3) days from the treatment with 5 %. Ethyl acetate extract gave 100 % mortality by the end of the second week. Petroleum ether extract have the lowest effect against adult weevils giving 17.5 ± 0.4 – 26.0 ± 0.1 at all tested concentration after 14 days of treatment.

The comparison between mortality means of different concentrations of each solvent revealed that ethyl – alcohol took the first order in producing mortality (89.62%) but petroleum ether produced the lowest number of mortality (21.53%).

In this study *Thevetia neriifolia* ethyl alcohol extract is the most toxic caused 100 % mortality after (1) days among the plant tested. These results agreed with **Talukder *et al* (1998)** who found that *T. neriifolia* was the most toxic material.

B.1.3- Effect of *Thuja orientalis* (leaves and seeds)extracts :-

Data in Table (26and27) summarized the effect of different extracts of *Thuja orientalis* (leaves and seeds) on the adults of *S. oryzae*. Results clearly indicated that ethanol (ethyl alcohol) was the most effective solvent in extracting the toxic components from plant parts and this shown in mortality percentages of 99.3, 100, and 100 % for the three concentration 10, 5 and 2.5 % after only 24 h. from the treatment with seed extract and also 100, 98, 99.3 % after leaves extract treatment with the same concentrations, respectively.

Ethyl acetate took the second place one recording 100, 95 and 90 % mortality. Although these percentage appeared by the end of the second week of treatment.

By comparing the overall means of mortalities it could be arranged the solvent by order of efficiency as follows :- ethyl alcohol, ethyl acetate, petroleum ether, hexane and acetone

Table (26) Effect of *Thuja orientalis* seed extract on mortality of the rice weevile adults *(Sitophilus oryzae* Linn.)

Concentrations (%)	No. of insects	Average % mortalits of adults after treatment (days) ± SE																													
		Petroleum ether						Acetone						Hexane						Ethyl-alcohol						Ethyl-acetate					
		1	3	5	7	14	CM±SE	1	3	5	7	14	CM±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE
10.00	50	10.00	37.40	43.40	50.70	53.00	52.1±1.0	2.67	8.63	10.10	12.20	20.70	17.4±0.5	4.67	9.34	14.00	17.30	22.60	19.4±0.9	100.0	100.0	100.0	100.0	100.0	100±0.0	2.00	18.60	90.60	99.30	99.3	99.2±1.3
5.00	50	6.60	8.66	23.30	30.70	35.30	52.3±2.6	1.33	7.32	7.35	10.20	15.70	12.2±0.5	4.00	7.34	11.34	13.34	20.01	16.7±1.3	100.0	100.0	100.0	100.0	100.0	100±0.0	0.66	16.00	91.30	97.30	97.30	97.0±0.8
2.50	50	1.4	8.06	20.70	26.60	30.10	28.6±1.3	0.66	5.99	6.32	8.72	10.20	6.47±0.5	2.67	9.34	10.60	12.60	15.30	11.8±2.1	99.30	99.30	99.30	99.30	99.30	99.2±0.1	0.40	14.00	82.60	96.60	96.60	96.2±0.3
1.25	50	0.00	3.45	7.18	7.18	13.20	11.4±0.8	0.00	0.00	1.13	4.26	4.26	0.71±0.5	1.33	4.67	6.87	10.60	10.60	6.96±0.7	50.30	50.30	70.00	70.00	70.00	67.2±0.3	0.00	5.35	22.70	30.90	30.90	22.7±0.3
Control	50	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	2.00	2.00	2.00	2.00	2.00		4.00	4.00	4.00	4.00	4.00		0.00	0.00	4.00	4.00	4.00		8.45	8.45	8.45	8.45	8.45		10.66	10.66	10.66	10.66	10.66	
Mean		20.88						6.89						10.49						90.36						49.65					

Values are means (±SE) N = 3
C.M. = Corrected mortality for 14 days

Table (27) Effect of *Thuja orientalis* leaves extract on moytality of the rice weevile adults (*Sitophilus oryzae* L.

centrations (%)	No. of insects	Average % mortalits of adults after treatment (days) ± SE																													
		Petroleum ether						Acetone						Hexane						Ethyl-alcohol						Ethyl-acetate					
		1	3	5	7	14	CM±SE	1	3	5	7	14	CM±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE
10.00	50	4.60	19.20	33.18	73.18	73.10	72.5±0.1	2.67	7.34	8.67	15.99	26.12	27.3±1.2	4.67	13.99	15.99	22.65	30.22	27.3±0.1	100.0	100.0	100.0	100.0	100.0	100±0.0	6.66	62.00	92.66	100.0	100.0	100±0.3
5.00	50	2.00	7.40	14.72	52.72	52.20	51.2±0.2	1.33	6.00	7.33	12.67	19.33	25.2±0.0	5.33	11.33	13.99	22.66	28.19	25.2±0.3	98.00	99.32	100.0	100.0	100.0	100±0.0	2.66	30.00	72.00	94.00	95.00	94.4±0.4
2.50	50	0.60	3.32	17.30	38.62	38.60	37.3±0.1	0.66	3.99	5.99	12.65	15.22	15.5±1.1	3.33	7.99	9.32	16.65	18.85	15.5±1.0	99.32	99.32	99.32	99.32	99.32	99.3±1.0	2.00	20.00	65.32	90.00	90.00	89.3±0.3
1.25	50	0.33	0.33	1.66	5.18	5.18	3.2±0.0	0.00	1.66	3.96	3.96	6.14	6.26±0.3	2.55	5.50	5.50	10.01	10.01	6.26±0.2	39.14	50.67	50.67	59.00	59.00	55.2±0.3	0.00	4.53	10.19	23.49	40.19	33.1±0.2
Control	50	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	2.00	2.00	2.00	2.00	2.00		4.00	4.00	4.00	4.00	4.00		0.00	0.00	4.00	4.00	4.00		8.45	8.45	8.45	8.45	8.45		10.66	10.66	10.66	10.66	10.66	
Mean		17.15						8.08						12.94						87.62						50.04					

Values are means (±SE) N = 3
C.M. = Corrected mortality for 14 days

recording overall means of mortalities 90.36, 87.26, 49.65& 50.04, 20.86 & 17.13, 10.49 & 12.94 and 6.89 & 8.08 for seed and leaves extracts of *Thuja orientalis*.

B.1.4- Effect of *Chenopodium ambrosoids leaves extract* :-

The effect of various concentrations of different extracts of *Chenopodium ambrosoides* leaves are presented in Table (28). Data in this table showed that the mortality percentages were very low after the treatment with all extracts and concentrations. No one of these extracts recorded more than 40 % of mortality. Although acetone, ethyl alcohol extracts gave the highest record of mortality (37.6 and 35 %) followed by hexane extract (31.9%) after 14 days of the treatment at 10 % concentration of each of the for a mentioned extracts. From these data, it is obivious that the extracts of leaves of *Chenopodium ambrosoides* had shown low toxic effect against the adults of *S. oryzae*.

B.1.5- Effect of *Chenopodium ambrosodium seeds* extract :-

Table (29) presented the effect of different *Chenopodium ambrosoides* seed extracts on the adults of *S. oryzae*. Data showed increase in mortality percentages compared with the leaves extracts of the same plant. Ethyl alcohol was the most powerful solvent extracting toxic components. Among the effectfive solvent used the mortality reached 98.4% after 14 days from the application of this extract, at 10 % concentration followed by ethyl acetate extract which killed 65 % after the same period. The comparison between the means mortalities percentages of concentrations of each solvent revealed that ethyl alcohol was the first (42.27%) followed by ethyl acetate, petroleum ether, hexane and acetone recording 20.15, 14.27, 10.04 and 8.14 %, respectively. In this respect, **Su (1991)**

Table (28) Effect of *Chenopodium ambrosoides* leaves extract on mortality of the rice weevile adults *(Sitophilus oryzae)*

centrations (%)	No. of insects	Average % mortalits of adults after treatment (days) ± SE																													
		Petroleum ether						Acetone						Hexane						Ethyl-alcohol						Ethyl-acetate					
		1	3	5	7	14	CM±SE	1	3	5	7	14	CM±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE
10.00	50	0.60	6.66	35.30	45.80	70.10	69.4±0.1	0.70	10.00	12.60	24.80	40.10	37.6±0.3	1.50	4.49	9.20	16.60	34.60	31.9±0.4	7.22	15.30	35.9	40.5	40.5	35.0±0.5	15.12	34.12	50.01	61.00	79.6	77.16
5.00	50	0.60	4.60	26.11	39.20	55.20	45.2±0.8	0.30	7.99	13.60	20.70	36.10	33.4±0.3	0.66	3.17	5.13	7.32	12.70	9.14± 03	5.66	9.18	20.10	20.13	20.13	12.7±0.6	8.22	18.60	36.01	44.33	44.33	37.68
2.50	50	0.60	3.86	7.86	21.00	32.20	30.8±0.8	0.33	3.50	10.18	15.13	28.07	25.1±0.3	0.66	2.15	4.22	8.19	7.98	4.14±0.2	3.33	6.40	13.10	13.10	13.10	5.08±0.0	5.12	7.02	16.50	26.41	26.41	17.62
1.25	50	0.00	1.98	3.19	9.50	14.00	12.2±0.6	0.00	0.00	4.99	6.15	12.20	8.54±0.1	0.33	1.50	3.19	3.19	3.19	0.84±0.7	0.00	1.66	7.98	7.98	7.98	0.51±0.3	2.08	3.19	9.50	18.51	19.12	9.46
Control	50	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	2.00	2.00	2.00	2.00	2.00		4.00	4.00	4.00	4.00	4.00		0.00	0.00	4.00	4.00	4.00		8.45	8.45	8.45	8.45	8.45		10.66	10.66	10.66	10.66	10.66	
Means		9.99						12.38						6.51						14.47						2.78					

Values are means (±SE) N = 3
C.M. = Corrected mortality for 14 dys

Table (29) Effect of *Chenopodium ambrosodies* seeds extract on mortality of the rice weevile adults *(Sitophilus oryzae)*

centrations (%)	No. of insects	Average % mortalits of adults after treatment (days) ± SE																													
		Petroleum ether						Acetone						Hexane						Ethyl-alcohol						Ethyl-acetate					
		1	3	5	7	14	CM±SE	1	3	5	7	14	CM±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE
10.00	50	5.40	16.60	33.90	40.90	59.30	58.4±1.3	3.33	7.32	11.90	12.60	18.60	15.2±1.5	2.50	7.55	16.99	27.08	39.41	36.8±0.1	17.32	72.66	72.7	98.6	98.6	98.4±0.1	4.55	13.01	40.96	60.11	65.0	60.8±0.6
5.00	50	4.00	12.00	15.12	16.64	18.20	16.5±0.6	3.30	7.32	11.32	13.99	17.99	14.5±2.6	1.25	4.18	9.11	15.13	28.19	25.1±0.1	7.00	53.32	53.32	80.00	80.00	78.1±0.3	1.66	11.65	20.13	40.01	40.01	32.8±0.5
2.50	50	2.00	5.32	7.32	12.15	14.60	12.8±0.3	0.66	7.33	7.99	8.66	11.90	8.32±1.7	0.66	3.33	7.52	11.01	19.00	15.6±0.3	4.66	20.66	20.66	54.00	54.00	49.7±0.1	0.66	5.09	13.98	20.91	29.70	21.3±0.3
1.25	50	0.00	0.00	3.52	9.11	9.11	7.2±0.3	0.66	0.66	4.50	6.19	6.19	2.28±0.9	0.00	0.00	1.66	3.15	3.15	0.88±0.3	0.66	8.50	8.50	19.55	19.55	12.1±0.0	0.00	0.33	10.50	12.31	12.31	1.84±0.3
Control	50	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	2.00	2.00	2.00	2.00	2.00		4.00	4.00	4.00	4.00	4.00		0.00	0.00	4.00	4.00	4.00		8.45	8.45	8.45	8.45	8.45		10.66	10.66	10.66	10.66	10.66	
Mean		14.27						8.14						10.04						42.27						20.15					

Values are means (±SE) N = 3
C.M. = Corrected mortality for 14 days

mentioned that Chenpodium oil as essential oil of *Chenopodium ambrosoides* caused 52 % adult mortality of *S. oryzae*

B.1.6-Effect of *Cassia fistula* pods extracts :-

The effect of *Cassia fistula* extracts on the adult mortality of *S. oryzae* is given in Table (30). Data in this table revealed very low initial killing in the treatments of all extracts. Although ethyl alcohol extracts recorded initial mortality ranged from 40 % in the case of the lowest concentration (1.25%) to 99.32% initial killing at 10 % concentration.

The other extracts did not record high initial kill. By the end of two weeks from the beginning of treatment the mortality percentages were increased in all treatments. It was moderate 45.9% at 10 % concentration of petroleum ether extract and 53.3 % mortality after the treatment with 10 % of hexane extracts. Complete kill (100% mortality) was achieved using higher concentration (10,5 and 2.5 %) of ethyl acetate and ethyl alcohol extracts.

The means of mortality of different concentrations for each solvent, may be arranged, disc end, ethyl alcohol, ethyl acetate , hexane, petroleum ether ,and acetone, recording 87.81, 64.32 ,11.02 10.1 and 8.27 means of mortality respectively.

B.1.7- Effect of *Glycine hispida* seeds extracts :-

Table (31) summarized the effect of seeds extracts of *Glycine hispida* on the adults of *S. oryzae*. Data showed that these extracts were the most effective between all plant extracts used in this study. The initial mortality was 100 % after 24 h. of treatment with ethyl alcohol extracts at 10 % concentrations. Decreasing the concentration to 5 % reduce the mortality to 99.32 %.

Table(30) Effect of *Cassia fistula* extract on mortality of the rice weevile adults *(Sitophilus oryzae* Linn.)

centrations (%)	No. of insects	Average % mortalits of adults after treatment (days) ± SE																													
		Petroleum ether						Acetone						Hexane						Ethyl-alcohol						Ethyl-acetate					
		1	3	5	7	14	CM±SE	1	3	5	7	14	CM±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE
10.00	50	4.00	14.00	32.00	34.60	45.90	44.7±0.2	5.10	10.00	10.12	20.52	25.19	22.1±0.3	2.22	5.90	10.22	25.33	55.21	53.3±0.1	99.32	99.32	100.0	100.0	100.0	100±0.0	22.00	98.00	100.0	100.0	100.0	100±0.0
5.00	50	3.40	8.80	10.12	12.78	25.40	23.8±0.2	4.30	7.95	8.22	13.21	15.33	11.8±0.4	1.33	3.32	9.21	17.18	31.09	28.2±1.2	98.66	98.66	99.32	99.32	100.0	100±0.0	14.66	92.00	100.0	100.0	100.0	100±0.0
2.50	50	1.40	2.10	2.66	7.98	9.98	8.14±0.3	1.99	4.22	6.13	10.19	10.18	6.44±0.1	0.66	2.51	5.71	10.11	23.98	20.8±0.9	89.32	90.00	90.00	90.66	90.66	89.7±0.2	6.00	42.00	100.0	100.0	100.0	100±0.1
1.25	50	0.66	1.00	1.00	1.00	1.00	1.0±0.3	0.00	0.33	2.98	2.98	8.59	2.69±0.1	0.66	1.33	1.33	5.99	7.18	3.31±0.5	40.00	53.14	69.70	70.00	78.16	76.1±0.8	6.00	15.22	30.14	30.14	30.14	21.8±0.3
Control	50	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	2.00	2.00	2.00	2.00	2.00		4.00	4.00	4.00	4.00	4.00		0.00	0.00	4.00	4.00	4.00		8.45	8.45	8.45	8.45	8.45		10.66	10.66	10.66	10.66	10.66	
Mean		10.1						8.27						11.02						87.81						64.03					

Values are means (±SE) N = 3
C.M. = Corrected mortality for 14 days

Table (31) Effect of *Glycine hispida* seeds extract on mortality of the rice weevile adults (*Sitophilus oryzae* Linn.)

Concentrations (%)	No. of insects	Average % mortalits of adults after treatment (days) ± SE																													
		Petroleum ether						Acetone						Hexane						Ethyl-alcohol						Ethyl-acetate					
		1	3	5	7	14	CM±SE	1	3	5	7	14	CM±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE
10.00	50	####	59.40	92.72	96.04	100.00	100±0.1	8.00	35.40	80.60	88.60	95.20	95.0±0.1	33.30	97.92	99.92	99.92	100.0	100±0.0	100.0	100.0	100.0	100.0	100.0	100±0.0	93.32	100.0	100.0	100.0	100.0	100±0.2
5.00	50	7.40	30.01	68.80	78.12	89.10	88.8±1.0	7.33	14.00	20.00	45.03	74.20	73.1±0.3	13.66	42.64	71.24	93.24	100.0	100±0.0	99.32	100.0	100.0	100.0	100.0	100±0.0	94.66	100.0	100.0	100.0	100.0	100±0.0
2.50	50	2.60	21.90	32.60	46.60	79.10	78.6±0.3	4.70	10.58	13.18	43.18	45.11	42.8±0.3	8.33	34.58	47.98	72.58	87.98	87.5±0.1	97.32	98.00	99.32	100.0	100.0	100±0.0	50.33	64.00	100.0	100.0	100.0	100±0.0
1.25	50	0.66	9.18	18.22	26.05	34.70	33.3±0.1	1.66	6.18	8.22	17.20	23.15	19.9±0.3	3.58	9.52	20.50	45.90	45.90	43.8±0.1	50.02	70.98	70.98	90.15	90.15	89.2±0.2	22.09	29.11	35.66	61.07	61.07	56.4±0.3
Control	50	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	2.00	2.00	2.00	2.00	2.00	2.00	4.00	4.00	4.00	4.00	4.00		0.00	0.00	4.00	4.00	4.00		8.45	8.45	8.45	8.45	8.45		10.66	10.66	10.66	10.66	10.66	
Mean		45.62						32.08						56.43						93.3						80.57					

Values are means (±SE) N = 3
C.M. = Corrected mortality for 14 days

All the used extracts of this plant seeds reduced completely the popualtion by the end of experiment after 14 days of treatment with the exception of acetone extracts which gave 95 % mortality after the same period. Results showed also that mortality increased with rising the concentration and exposure period. In regard to the overall means of mortality of the four concentrations of each solvent the extracts of ethyl alcohol come in first order giving 93.3 % followed by ethyl acetate extracts (80.57%), hexane extracts (56.43%), petroleum ether extracts (38.09%) and finally acetone extracts recording the lowest overall mean of mortality (32.08%).These results agree with the findings of **Shukla *et al* (1992),** they found that soybean extract is the best one between all tested plants against *S. oryzae.*

B.1.8- Effect of *Schinus terebinthifolius* leaves extracts :-

Data in Table (32) explain the mortality in adults of *S. oryzae* after the exposure to *S. terebinthifolius* extracts. Mortality among the exposed adults varied from extract to another and from concentration to another.

The highest number of dead adults as initial (100%) was recorded at 10 % of ethyl alcohol. The other concentrations of this extract gave high initial kill, reaching 98.66 and 96.66 % after the treatment with 5 % and 2.5 % concentrations, respectively. Au extracts failed to achieve 100 % mortality till the end of the experiment. Although ethyl acetate extract at 10 % gave 85.8% after 14 days from the begnning of the treatment.

The overall mean counts of dead adults of *S. oryzae* that were recorded with different plant extracts ranged from 15.35 % representing the lowest effective treatment (petroleum ether extracts) to 91.6 % with ethyl alcohol extracts.

Table (32) Effect of *Schinus terebinthifolius* Leaves extract on mortality of the rice weevile adults (*Sitophilus oryzae L.*)

Concentrations	No. of insects	Average % mortalits of adults after treatment (days) ± SE																													
		Petroleum ether						Acetone						Hexane						Ethyl-alcohol						Ethyl-acetate					
		1	3	5	7	14	CM±SE	1	3	5	7	14	CM±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE	1	3	5	7	14	C.M±SE
10.00	50	9.33	14.66	40.70	50.10	70.50	69.9±1.2	17.32	31.92	39.92	45.32	73.92	72.8±0.3	6.20	8.66	18.66	67.26	70.14	68.9±1.0	100.0	100.0	100.0	100.0	100.0	100±0.0	4.66	40.00	60.00	87.32	87.3	85.8±0.3
5.00	50	10.70	14.06	15.40	22.80	58.20	57.3±0.3	20.68	24.66	27.26	32.66	67.86	66.5±0.3	2.00	4.00	8.00	35.30	56.40	54.6±1.0	98.66	98.66	100.0	100.0	100.0	100±0.0	2.66	33.32	50.90	70.10	70.10	66.5±0.1
2.50	50	6.00	7.98	9.32	20.72	52.10	51.1±0.1	9.40	17.40	22.00	29.40	62.80	61.3±0.2	6.70	7.36	25.13	30.40	45.97	43.7±0.3	96.66	98.66	100.0	100.0	100.0	100±0.0	4.66	26.00	30.00	50.01	50.50	44.6±0.3
1.25	50	3.33	3.33	7.00	10.23	20.10	18.5±0.2	5.19	9.52	18.99	23.14	35.67	32.9±0.1	1.67	4.72	12.18	20.66	20.66	17.4±0.3	60.13	67.09	70.73	70.73	70.73	68.0±0.3	0.00	9.67	14.08	27.13	29.00	20.5±0.1
Control	50	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	2.00	2.00	2.00	2.00	2.00		4.00	4.00	4.00	4.00	4.00		0.00	0.00	4.00	4.00	4.00		8.45	8.45	3.45	8.45	8.45		10.66	10.66	10.66	10.66	10.66	
Mean		22.33						30.75						22.60						91.6						37.37					

Values are means (±SE) N = 3
C.M. = Corrected mortality for 14 days

B.1.9- Effect of *Lupinus termis* seed extract on the rice weevil *S. oryzae* adults :-

The effect of *L. termis* seeds extracts with five solvents (petroleum ether, acetone, hexane, ethyl alcohol and ethyl acetate) against the adults of *S. oryzae* is presented in Table (33). showed clearly that very high mortality values were recorded with all used extracts by the end of the experiment. The initial lethal effect of these extracts were found weak for the petroleum ether, acetone and hexane extracts.

The maximum mortality aforementioned extracts was 41.30 % after one day of treatment. Ethyl alcohol and ethyl acetate extracts had the highest initial effect, giving 100 % mortality for the first one at 10 and 5 % concentrations. While the second one (ethyl acetate) killed 96 % of the treated population with 10 % concentration.

By comparing means of mortality of different concentrations for each solvent extracts, it appears that ethyl alcohol extracts took the first category in killing *S. oryzae* adults achieving a mortality of 86.3 %, followed by ethyl acetate (73.39 %)followed by hexane at a concentration of (52.20 %). While petroleum ether and hexane extracts were the lowest effective groups causing only 38.20 and 31.56 5% mortality respectively.

The toxicity effects of the plant extracts might be due to the fact that these plants contains terpenoids, glycosides, alkaloids, steroloides or similar substances which possess antifeedant, repellent activities or lead to moulting disturbance which is often lethal (**Champagne *et al* 1989).**

Table (33) Effect of *Lupinus termis* seeds extract on mortality of the rice weevile adults (*Sitophilus oryzae L.*)

Average % mortalits of adults after treatment (days) ± SE

Concentration	No. of insects	Petroleum ether 1	3	5	7	14	CM±SE
10.00	50	26.10	38.20	55.32	65.98	91.30	91.1±0.3
5.00	50	16.00	20.40	45.32	67.32	90.60	90.4±0.2
2.50	50	5.20	9.86	26.52	51.18	62.41	61.6±0.5
1.25	50	2.20	6.40	17.98	29.64	30.00	31.6±0.1
Control	50	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	2.00	2.00	2.00	2.00	2.00	2.00
Mean		38.20					

Concentration	No. of insects	Acetone 1	3	5	7	14	CM±SE
10.00	50	17.32	33.32	38.72	56.72	93.32	93.1±0.2
5.00	50	14.60	25.20	29.20	51.80	78.40	77.5±0.3
2.50	50	11.32	12.72	18.12	28.72	56.72	54.9±0.1
1.25	50	5.20	8.72	14.50	14.50	22.13	18.9±0.2
Control	50	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	4.00	4.00	4.00	4.00	4.00	
Mean		31.56					

Concentration	No. of insects	Hexane 1	3	5	7	14	C M±SE
10.00	50	41.30	68.70	88.52	93.92	99.12	99.1±0.0
5.00	50	33.30	47.30	45.94	67.34	91.34	90.9±1.0
2.50	50	12.67	20.00	45.98	70.58	85.98	85.4±1.0
1.25	50	7.45	12.00	25.94	43.34	43.34	40.9±0.2
Control	50	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	0.00	0.00	4.00	4.00	4.00	
Mean		52.20					

Concentration	No. of insects	Ethyl-alcohol 1	3	5	7	14	C M±SE
10.00	50	100.0	100.0	100.0	100.0	100.0	100±0.0
5.00	50	100.0	100.0	100.0	100.0	100.0	100±0.0
2.50	50	88.04	88.04	90.40	90.40	90.04	89.0±0.3
1.25	50	40.77	40.77	65.00	66.19	66.19	63.1±0.2
Control	50	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	8.45	8.45	8.45	8.45	8.45	
Mean		86.3					

Concentration	No. of insects	Ethyl-acetate 1	3	5	7	14	C M±SE
10.00	50	96.00	100.0	100.0	100.0	100.0	100±0.0
5.00	50	50.33	74.66	100.0	100.0	100.0	100±0.0
2.50	50	20.04	50.33	85.00	90.10	90.10	88.9±0.3
1.25	50	66.19	66.19	8.00	20.00	50.87	45.0±0.3
Control	50	0.00	2.00	2.00	2.00	2.00	2.00
Control (s)	50	10.66	10.66	10.66	10.66	10.66	
Mean		73.39					

Values are means (±SE) N = 3
C.M. = Corrected mortality for 14 days

I.B.2-LC_{50} values of investigated plant extracts to the adults of *S. oryzae*

Table No. (34) and Fig (24-33) demonstrate the results obtained by the exposure of *S. oryzae* adults to treated food with different concentrations of the tested plant extracts.

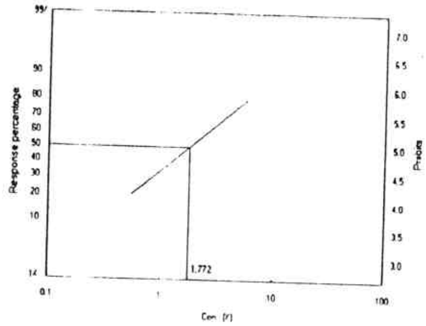
The maximum toxicity, was noticed with ethyl acetate extracts of *Glycine hispida* and *Cassia fistula* As well with ethyl alcohol extracts of *Glycine* and *Schinus.* The LC $_{50}$ of this Plant extracts was not determined because of the poor insecticidial activities in the reduction to the corresponding concentration. The mortality recorded reached 100 % with the three concentration used. Among the LC_{50} calculated, hexane extract of *Aptenia cordifolia* had the lowest LC_{50} value of 0.46 % followed by ethyl alcohol extract of *Cassia fistula* with an LC_{50} of 0.72 %. The LC_{50} of ethyl alcohol extract of *Thevetia* was (1)%. Ethyl alcohol extract of *Thuja* leaves reached (1.2%), while ethyl acetate extracts of *Schinus*, hexane extract of *Lupinus* give an LC_{50} of 1.36%an of *Glycine* (1.37%). The LC 50 of ethyl acetate extracts of *Aptenia, Thuja* leaves, *Thuja* seeds, *Thevetia* and pet. ether extract of *Aptenia, Glycine* and of *Lupinus* Varied between 1.37 % to 1.86 %.

A few extracts have moderately toxic effect recording LC_{50} higher than 2 %, but lower than 3 %, i.e. ethyl alcohol extract of *Chenopodium* (2.68%) and acetone extract of *Glycine* (2.77%). The other extracts have high LC_{50} values. This means that these extracts were low effective effiency in concern of LC_{50} values.

It could be concluded from the above mentioned results that higher mortalities occurred among the adults of *S. oryzae*

Table (34) L C_{50} of investigated plant extracts after treated the rice weevile adult *Sitophilus oryzae*.

Solvent / Plants	Petroleum ether		Acetone		Hexane		Ethyl-alcohol		Ethyl-acetate	
	Slope±SE	LC_{50}	Slope±SE	LC_{50}	Slope±SE	LC_{50}	Slope±SE	LC_{50}	Slope±SE	LC_{50}
Aptenia cordifolia	1.641±0.235	1.772	2.413±0.233	2.374	1.463±0.230	0.957	2.490±0.34	3.708	2.783±0.358	1.407
Thavetia neriifolia	1.270±0.202	6.735	1.363±0.199	4.605	1.934±0.215	4.864	3.486±0.422	1.00	9.574±0.825	1.677
Thuja orientalis (seeds)	1.209±0.205	8.813	1.366±0.310	42.276	0.670±0.241	166.15	6.569±1.435	1.069	5.653±0.616	1.587
Thuja orientalis (leaves)	1.866±0.230	2.308	1.144±0.259	39.328	0.967±0.228	33.33	7.646±1.444	1.202	3.802±0.442	1.507
Chenopodium ambrosoides (leaves)	1.874±0.212	4.765	1.037±0.211	15.922	2.248±0.434	16.922	2.155±0.404	15.51	1.668±0.228	8.345
Chenopodium ambrosoides (seeds)	1.760±0.235	9.760	0.924±0.273	99.529	1.121±0.328	19.831	3.389±0.284	2.681	2.186±0.243	7.785
Cassia fistula	2.174±0.274	10.642	1.266±0.285	41.157	1.840±0.235	9.068	2.677±0.531	0.715	-	-
Glycine hispida	4.820±0.492	1.754	2.669±0.242	2.771	4.675±0.580	1.374	-	-	-	-
Lupinus termis	1.650±0.236	1.858	2.312±0.240	2.569	2.642±0.310	1.364	1.428±0.20	1.531	4.723±0.602	1.34
Schinus terbinthifolius	1.483±0.201	3.404	1.098±0.196	2.207	1.485±0.201	4.205	-	-	2.068±0.216	3.039



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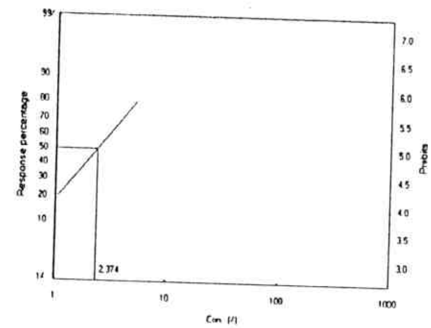
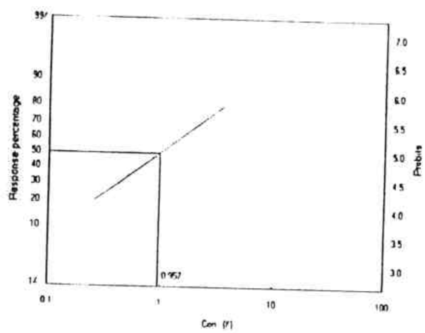
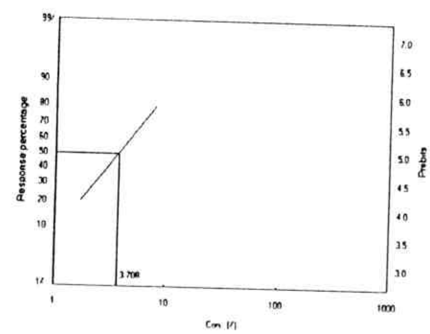


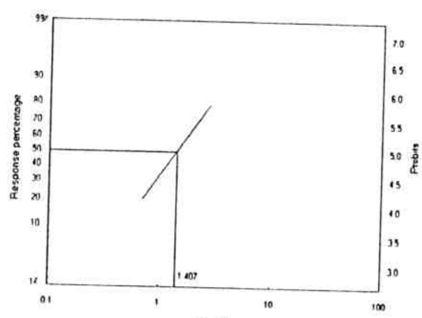
Acetone



Hexane

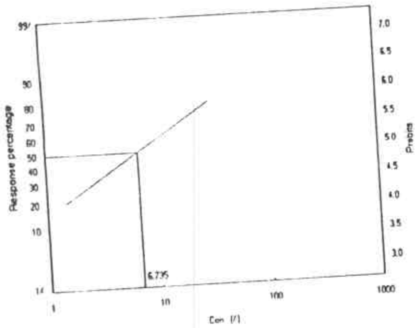


Ethyl alcohol



Ethyl acetate

Fig (24) Log concentration probit lines showing response of adults of *Sitophilus oryzae* to *Aptenia cordifolia* leaves after 14 days



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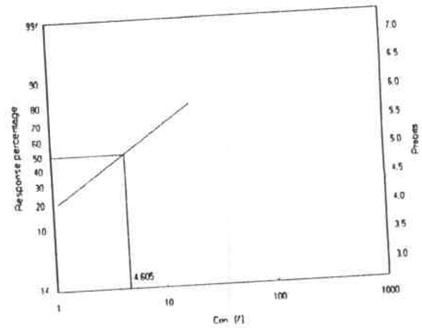

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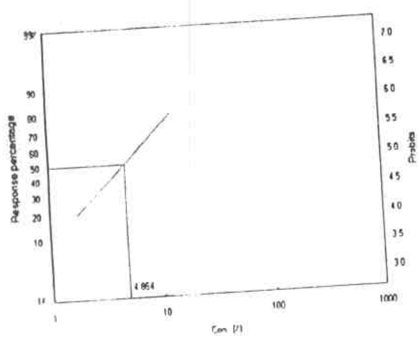

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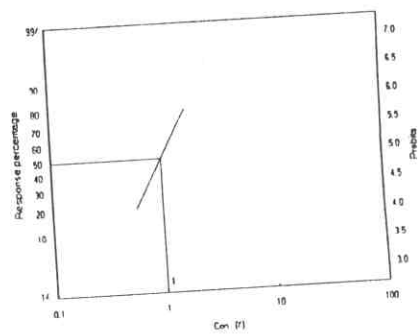

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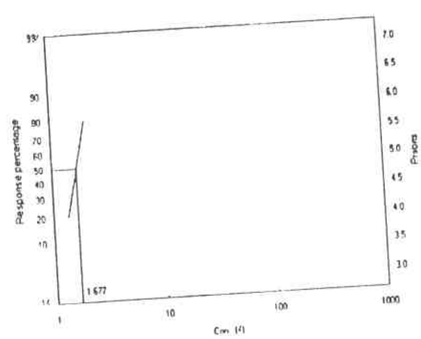
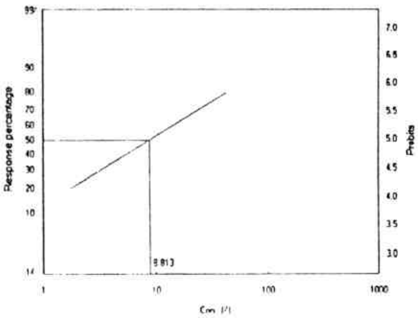
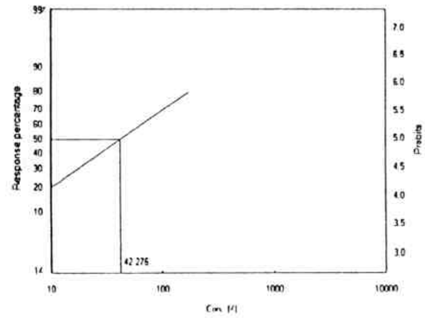


Ethyl acetate

Fig (25) Log concentration probit lines showing response of adults of *Sitophilus oryzae* to *Thevetia neriifolia* leaves after 14 days



Petroleum ether



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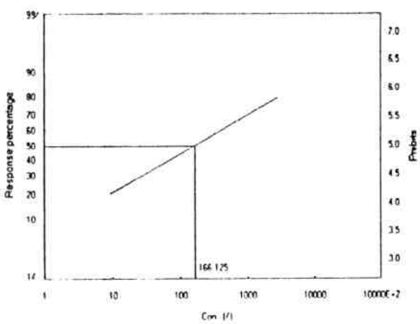
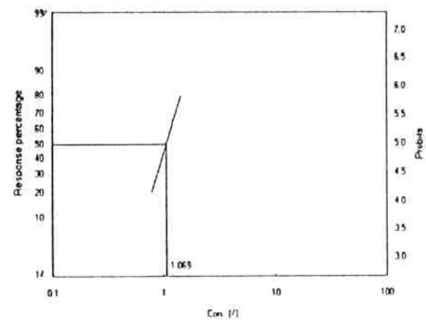
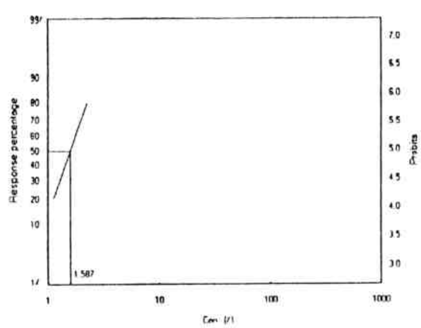


Hexane

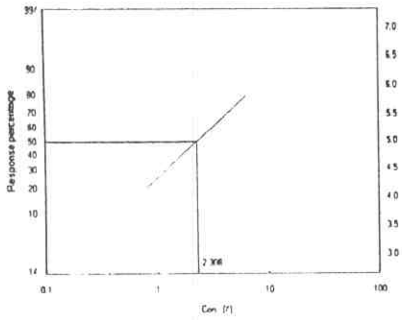


Ethyl alcohol

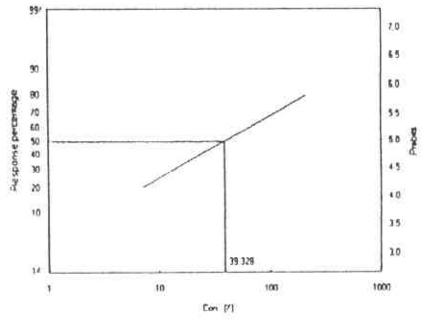


Ethyl acetate

Fig (26) Log concentration probit lines showing response of adults of *Sitophilus oryzae* to *Thuja orientalis seed* after 14 days



Petroleum ether



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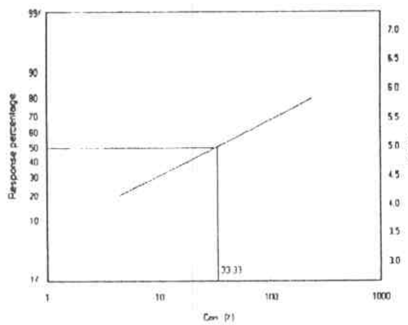
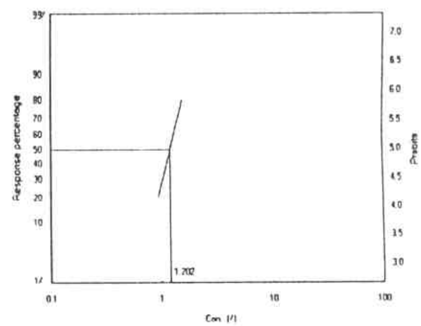
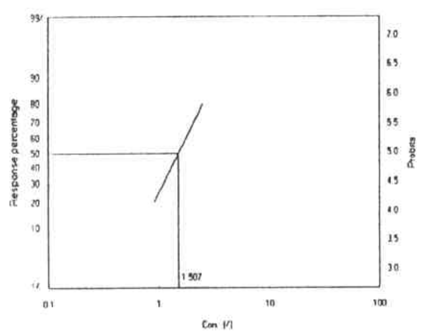


Hexane

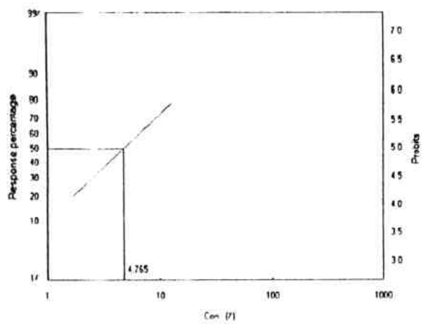


Ethyl alcohol

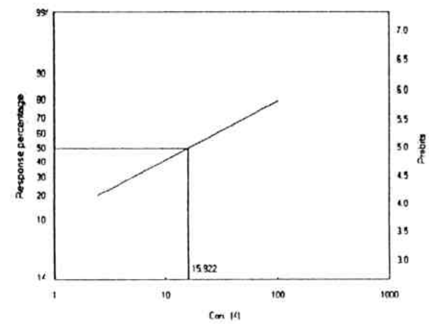


Ethyl acetate

Fig (27) Log concentration probit lines showing response of adults of *Sitophilus oryzae* to *Thuja orientalis* leaves after 14 days



Petroleum ether



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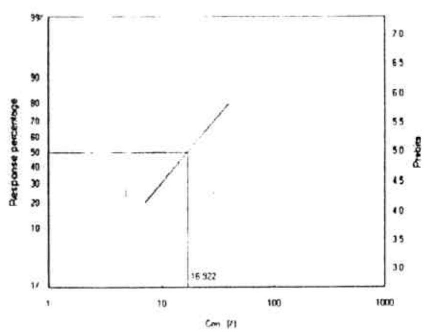

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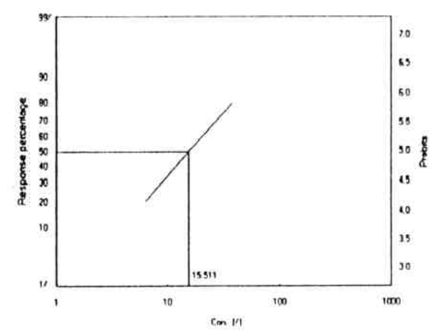
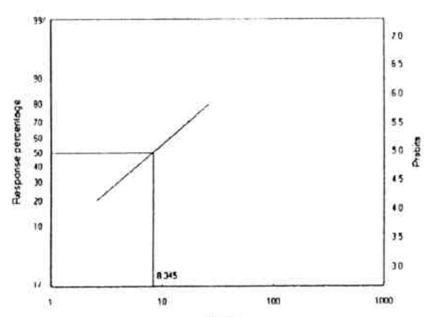
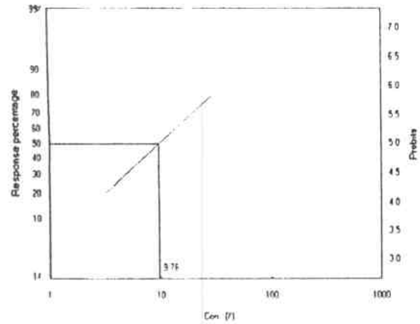


Ethyl alcohol

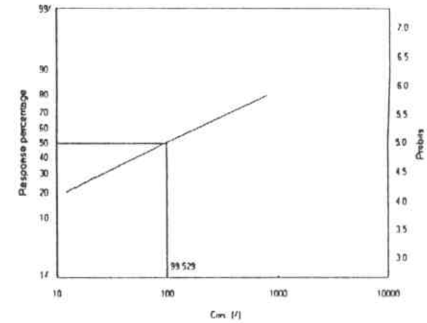


Ethyl acetate

Fig (28) Log concentration probit lines showing response of adults of *Sitophilus oryzae* to *Chenopodium ambrosoides* leaves after 14 days



Petroleum ether



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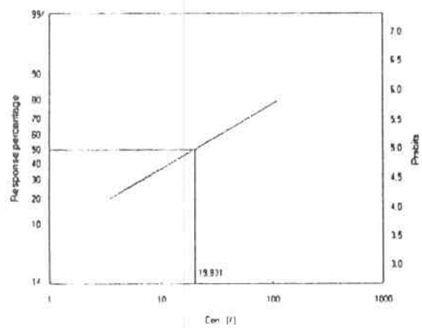
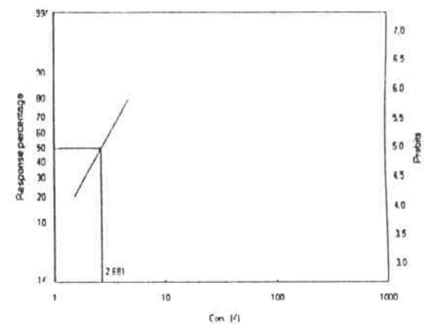
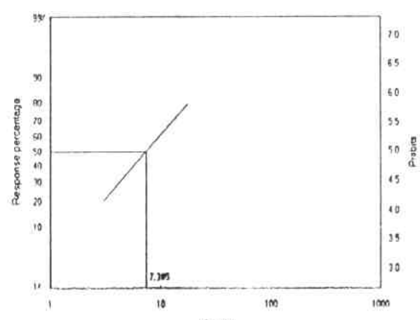


Hexane

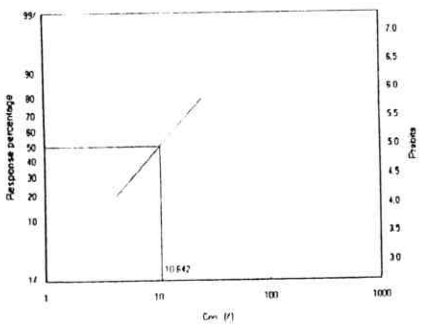


Ethyl alcohol

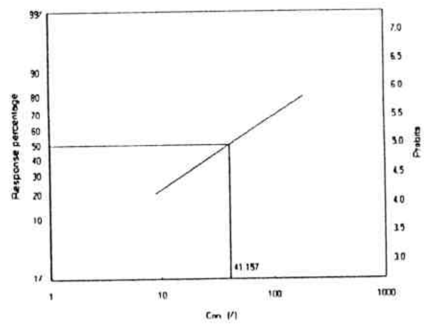


Ethyl acetate

Fig (29) Log concentration probit lines showing response of adults of *Sitophilus oryzae* to *Chenopodium amrosoides seed* after 14 days



Petroleum ether



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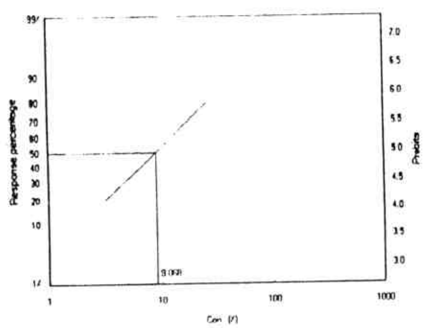
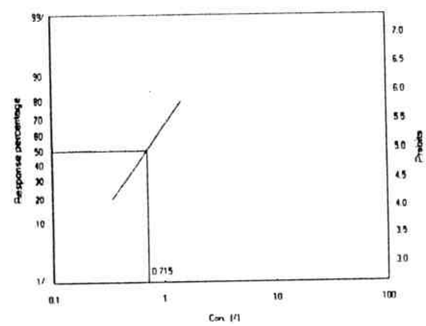
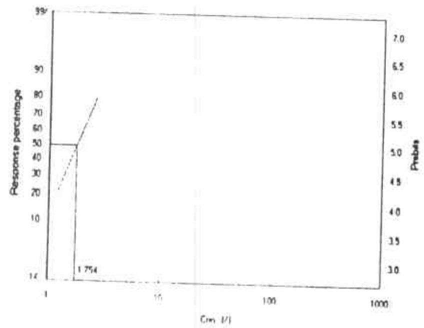


Hexane

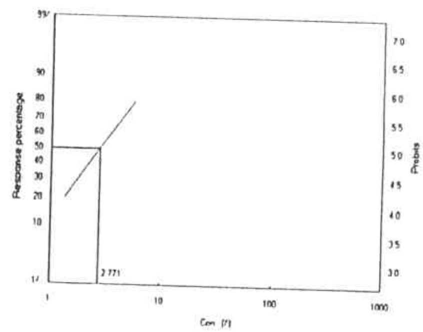


Ethyl alcohol

Fig (30) Log concentration probit lines showing response of adults of *Sitophilus oryzae* to *Cassia fistula pods* after 14 days



Petroleum ether



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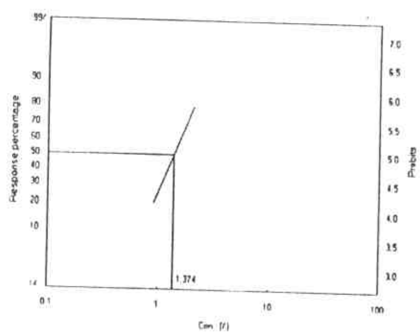
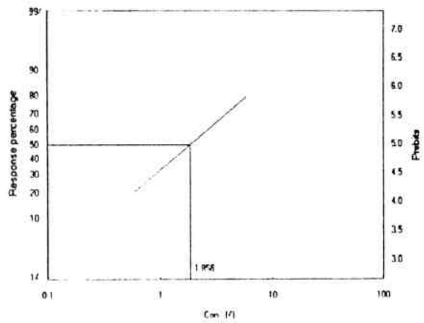
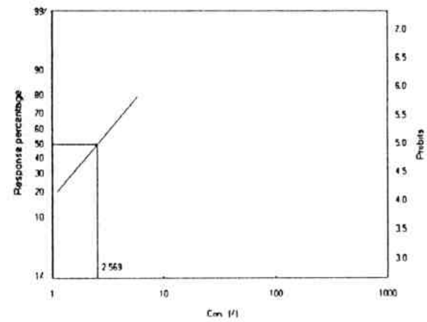


Hexane

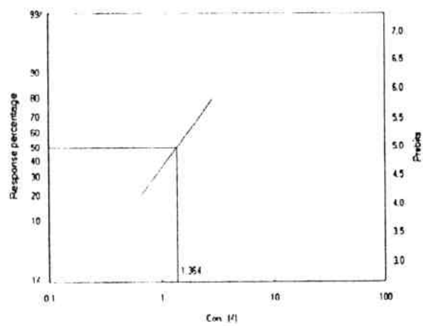
Fig (31) Log concentration probit lines showing response of adults of *Sitophilus oryzae* to *Glycine hispida seed* after 14 days



Petroleum ether



Acetone



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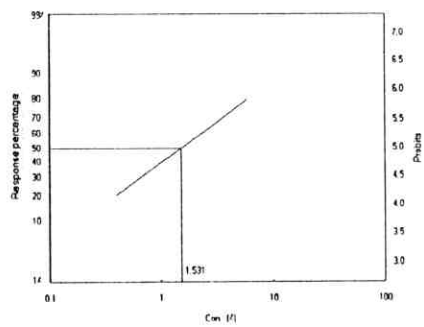
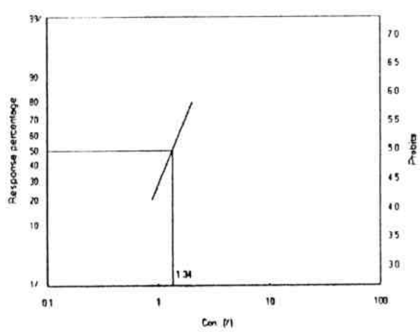
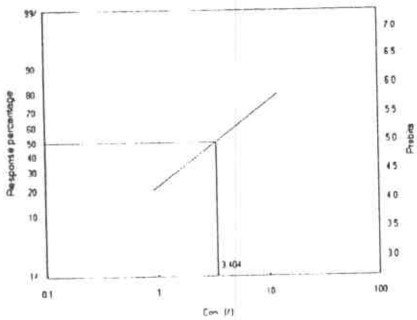


Ethylalcohol

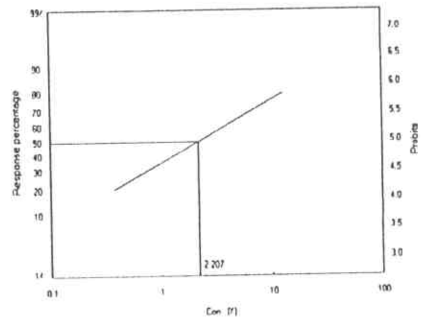


Ethyl acetate

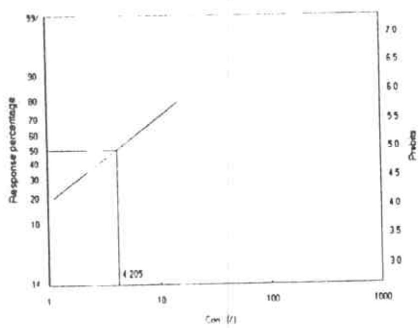
Fig (3 2) Log concentration probit lines showing response of adults of *Sitophilus oryzae* to *Lupinus termis seed* after 14 days



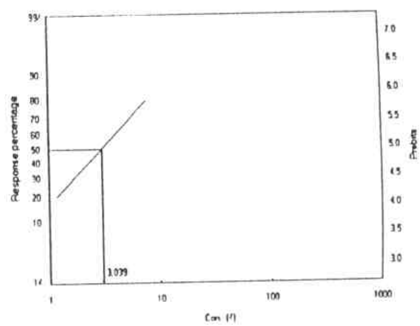
Petroleum ether



Acetone



Hexane



Ethyl acetate

Fig (33) Log concentration probit lines showing response of adults of *Sitophilus oryzae* to *Schinus terbenthifolius* leaves after 14 days

fed on treated diets with plant extracts than control. The highest percentages of mortalities and LC_{50} values recorded were with the following extracts :-all ethyl acetate plant extracts except for Chenopodium *seeds* and *Schinus* ,ethyl alcohol extracts with the excption of *Aptenia* , *Chenopodium* leaves and seeds, hexane extracts of *Aptenia, Glycine* and *Lupinus,* pet. ether extracts of *Aptenia, Glycine* and *Schinus.* The slope values of the established LC p lines the tested extracts was ranged between 0.67 to 9.57. The obvious difference between the highest slope and the lowest one may indicate that the response of the *S. oryzae* adults to the extract with high slope was uniform.

I.B.3-Repellency of the various plant extracts to the adults of *S. oryzae*

The results of repellent effect of different plant extracts on the adults of *S. oryzae* are given in Tables (35 to 44). Data showed that the percentages of repellency of these extracts were related with the type of extract and the used concentration. Data also revealed that the extracts of *Schinus terebenthifolius* and *Thuja orientalis* either leaves or seed were the most effective deterrent agents.

The petroleum ether extract of *Schinus terebenthifolius* gave the highest percentages of repellency, it reached 100% after 3 days of exposure at 10 % concentration and continued effective by the end of experiment (15 days). The repellent effect was not less than 98% by decreasing the concentration of the extract to 5 %. All the other *Schinus terebenthifolius* extracts proved high repellency to *S. oryzae* adults especially with 10 % extracts.

No one of these extracts gave lower than 95 % repellency with the prolongation of period expoure until 15 days, except

Table (35) Efffect of *Aptenia cordifoliale* leaves extract on repellency of the rice weevil adults (*Sitophilus oryzae L.)*

Concentrations	No. of insects	% Repellency (days after treatment)														
		Petroleum ether			Acetone			Hexane			Ethyl-alcohol			Ethyl-acetate		
		3	7	15	3	7	15	3	7	15	3	7	15	3	7	15
10.00	25	70.14	70.14	35.19	73.92	73.92	45.32	73.50	73.50	73.50	67.26	67.26	32.66	79.55	79.55	50.11
5.00	25	56.40	56.40	23.12	67.86	67.86	32.66	58.20	58.20	58.20	35.30	35.30	20.66	61.19	61.19	39.50
2.50	25	45.97	45.97	7.36	62.80	62.80	29.40	40.70	40.70	40.70	30.40	30.40	15.40	47.98	47.98	21.87
1.25	25	18.66	18.66	4.70	31.90	31.90	17.40	22.80	22.80	22.80	18.66	18.66	6.22	20.01	20.10	13.11
Control	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control (s)	25	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	0.00	0.00	0.00	2.00	2.00	2.00
Mean		37.73			49.81			48.80			31.52			45.18		

Values are means n= 3

Table (36) Efffect of *Thevetia neriifolia* leaves extract on repellency of the rice weevil adults (*Sitophilus oryzae L.)*

Concentrations	No. of insects	% Repellency (days after treatment)														
		Petroleum ether			Acetone			Hexane			Ethyl-alcohol			Ethyl-acetate		
		3	7	15	3	7	15	3	7	15	3	7	15	3	7	15
10.00	25	70.01	70.01	62.01	75.19	75.19	69.15	72.66	64.66	64.66	59.76	59.76	46.66	51.34	51.34	40.66
5.00	25	42.66	42.66	36.66	61.08	61.08	50.13	66.66	55.99	55.99	43.12	43.12	38.67	33.33	33.33	23.33
2.50	25	36.00	36.00	32.67	53.19	53.19	40.80	38.63	21.96	21.96	39.71	39.71	30.63	26.00	26.00	19.80
1.25	25	18.67	18.67	10.00	41.82	41.82	30.63	30.63	15.29	15.29	23.33	23.33	19.99	18.67	18.67	8.35
Control	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control (s)	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00
Mean		39.67			54.44			43.70			38.98			29.24		

Values are means n =3

Table (37) Efffect of *Thuja orientalis* seeds extract on repellency of the rice weevil adults (*Sitophilus oryzae L.*)

Concentrations	No. of insects	% Repellency (days after treatment)														
		Petroleum ether			Acetone			Hexane			Ethyl-alcohol			Ethyl-acetate		
		3	7	15	3	7	15	3	7	15	3	7	15	3	7	15
10.00	25	89.13	89.13	93.14	90.04	90.04	90.04	79.86	79.86	67.19	90.01	90.01	97.18	73.18	73.18	33.18
5.00	25	80.42	80.42	89.72	70.76	70.76	70.76	61.98	61.98	53.61	86.14	86.14	93.22	52.72	52.72	14.30
2.50	25	72.15	72.15	59.33	59.11	59.11	59.11	48.11	48.11	39.00	71.99	71.99	80.41	38.62	38.62	14.72
1.25	25	50.09	50.09	54.21	40.51	40.51	40.51	38.14	38.14	27.00	49.23	49.23	57.11	24.52	24.52	8.72
Control	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control (s)	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00
Mean		73.33			65.11			53.58			76.89			37.42		

Values are means n =3

Table (38) Efffect of *Thuja orientalis* leaves extract on repellency of the rice weevil adults (*Sitophilus oryzae L.)*

Concentrations	No. of insects	% Repellency (days after treatment)														
		Petroleum ether			Acetone			Hexane			Ethyl-alcohol			Ethyl-acetate		
		3	7	15	3	7	15	3	7	15	3	7	15	3	7	15
10.00	25	93.18	93.18	97.00	81.19	81.19	93.41	73.18	73.18	66.08	91.78	91.78	95.13	80.40	80.40	80.40
5.00	25	82.04	82.04	90.06	70.33	70.33	79.51	52.72	52.72	40.13	85.33	85.33	90.63	69.99	69.99	69.99
2.50	25	63.14	63.14	80.99	59.91	54.91	63.82	38.62	38.62	27.51	66.12	66.12	74.18	50.22	50.22	50.22
1.25	25	52.12	52.12	65.13	40.03	40.03	52.09	33.18	33.18	14.72	50.31	50.31	69.41	38.19	38.19	38.19
Control	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control (s)	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00
Mean		76.18			65.56			45.32			76.37			59.70		

Values are means n =3

Table (39) Efffect of *Chenopodium ambrosoides* leaves extract on repellency of the rice weevil adults (*Sitophilus oryzae L.*)

Concentration	No. of insects	% Repellency (days after treatment)														
		Petroleum ether			Acetone			Hexane			Ethyl-alcohol			Ethyl-acetate		
		3	7	15	3	7	15	3	7	15	3	7	15	3	7	15
10.00	25	40.05	40.05	23.96	49.00	49.00	40.15	67.32	67.32	34.66	43.15	43.15	0.00	35.40	35.40	16.66
5.00	25	38.99	38.99	22.11	40.92	40.00	36.13	43.41	43.41	30.18	30.07	30.07	0.00	14.00	14.00	7.32
2.50	25	32.15	32.15	19.92	33.18	92.00	27.07	23.32	23.32	12.78	19.86	19.86	0.00	10.58	10.58	4.45
1.25	25	21.00	21.00	12.64	28.07	33.18	20.77	20.77	20.77	9.20	10.01	10.01	0.00	4.70	4.70	0.00
Control	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control (s)	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00
Mean		28.58			40.79			33.04			17.18			13.15		

Values are means n =3

'able (40) Efffect of *Chenopodium ambrosoides* seed extract on repellency of the rice weevil adults (*Sitophilus oryzae L.*)

Concentrations	No. of insects	% Repellency (days after treatment)														
		Petroleum ether			Acetone			Hexane			Ethyl-alcohol			Ethyl-acetate		
		3	7	15	3	7	15	3	7	15	3	7	15	3	7	15
10.00	25	65.22	65.22	59.29	23.65	0.00	0.00	50.50	50.50	39.41	63.91	63.91	50.40	39.47	39.47	39.47
5.00	25	30.12	30.12	18.22	21.11	0.00	0.00	35.07	35.07	28.19	50.31	50.31	26.14	28.13	28.13	28.13
2.50	25	22.45	22.45	14.50	12.20	0.00	0.00	22.68	22.68	15.13	30.12	30.12	15.11	16.99	16.99	16.99
1.25	25	14.64	14.64	10.11	4.00	0.00	0.00	19.00	19.00	7.99	22.45	22.45	10.22	7.32	7.32	7.32
Control	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control (s)	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00
Mean		30.58			5.08			28.77			36.29			22.98		

Values are means n =3

Table (41) Efffect of *Cassia fistula* extract on repellency of the rice weevil adults (*Sitophilus oryzae L.)*

Concentrations	No. of insects	% Repellency (days after treatment)														
		Petroleum ether			Acetone			Hexane			Ethyl-alcohol			Ethyl-acetate		
		3	7	15	3	7	15	3	7	15	3	7	15	3	7	15
10.00	25	53.10	53.10	45.98	35.00	35.00	25.19	70.11	70.11	55.21	66.68	66.98	73.19	55.00	55.00	55.00
5.00	25	43.23	43.23	25.44	23.14	23.14	15.33	45.91	45.91	31.09	51.02	51.02	64.54	39.15	39.15	39.15
2.50	25	19.20	19.20	9.98	15.01	15.01	10.18	33.92	33.92	23.98	43.19	43.19	51.18	22.31	22.31	22.31
1.25	25	8.80	8.80	4.30	7.95	7.95	3.42	17.18	17.18	9.21	32.65	32.65	40.00	7.18	7.18	7.18
Control	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control (s)	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00
Mean		27.86			18.03			37.81			51.36			30.91		

Values are means n= 3

Table (42) Efffect of *Glycine hispida* seeds extract on repellency of the rice weevil adults (*Sitophilus oryzae L.)*

Concentrations	No. of insects	% Repellency (days after treatment)														
		Petroleum ether			Acetone			Hexane			Ethyl-alcohol			Ethyl-acetate		
		3	7	15	3	7	15	3	7	15	3	7	15	3	7	15
10.00	25	0.00	0.00	0.00	12.00	12.00	0.00	15.30	15.30	8.70	2.67	0.00	0.00	23.15	19.22	19.22
5.00	25	0.00	0.00	0.00	8.00	8.00	2.18	13.33	13.33	6.99	0.66	0.00	0.00	17.33	13.71	13.71
2.50	25	4.90	4.90	0.00	5.33	5.33	1.66	8.00	8.00	3.16	0.00	0.00	0.00	13.22	8.00	8.00
1.25	25	1.33	1.33	0.00	2.67	2.67	0.33	5.11	5.11	2.99	0.00	0.00	0.00	8.97	1.33	1.33
Control	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control (s)	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00
Mean		1.04			5.01			8.78			0.28			12.27		

Values are means n =3

Table (43) Efffect of *Schinus terbenthifolius* leaves extract on repellency of the rice weevil adults (*Sitophilus oryzae L.)*

Concentrations	No. of insects	% Repellency (days after treatment)														
		Petroleum ether			Acetone			Hexane			Ethyl-alcohol			Ethyl-acetate		
		3	7	15	3	7	15	3	7	15	3	7	15	3	7	15
10.00	25	100.00	100.00	100.00	95.20	95.20	97.30	99.92	99.92	88.60	92.72	92.72	59.40	99.92	99.92	99.92
5.00	25	98.12	98.12	100.00	74.20	74.20	80.54	93.24	93.24	45.03	68.80	68.80	30.01	71.24	71.24	71.24
2.50	25	79.15	79.15	93.20	45.11	45.11	63.22	72.58	72.58	30.01	32.60	32.60	20.80	47.48	47.98	47.98
1.25	25	46.60	46.60	69.60	20.00	20.00	35.40	47.98	47.98	21.90	21.90	21.90	8.80	33.30	33.30	33.30
Control	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control (s)	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00
Mean		84.21			62.12			67.75			45.92			63.07		

Values are means n = 3

Table (44) Efffect of *Lupinus termis* seeds extract on repellency of the rice weevil adults (*Sitophilus oryzae L.)*

Concentrations	No. of insects	% Repellency (days after treatment)														
		Petroleum ether			Acetone			Hexane			Ethyl-alcohol			Ethyl-acetate		
		3	7	15	3	7	15	3	7	15	3	7	15	3	7	15
10.00	25	60.65	60.65	50.72	29.15	29.15	0.00	30.01	14.01	14.01	22.66	22.66	22.66	9.34	9.34	9.34
5.00	25	40.15	40.15	30.72	17.33	17.33	0.00	27.52	13.34	13.34	20.01	20.01	20.01	7.34	7.34	7.34
2.50	25	33.16	33.16	26.64	14.09	14.09	0.00	20.13	11.34	11.34	10.17	10.17	10.17	4.67	4.67	4.67
1.25	25	20.72	20.72	10.11	8.72	8.72	0.00	12.67	5.34	5.34	8.72	8.72	8.72	2.67	2.67	2.67
Control	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control (s)	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00
Mean		35.63			11.55			14.87			15.39			6.01		

Values are means n = 3

hexane and ethyl alcohol extracts which gave 88.60 and 59.40 % repellency by the end of investigation.

The second effective groups of extracts in repellency were leaves and seeds extracts of *Thuja orientalis.* Although leaves were more effective than seeds. The pet. ether extract of leaves repelled 93.18 % of exposed adults after 3 days, than in reached 97 % after 15 days of treatment. Also, ethyl acetate extract of the leaves drived a way 91.78% , 91.78% and 95.13 % repellency after 3,7 and 15 days of exposure respectively. All the other groups of *Thuja orientalis* extracts were effective but by lower degrees than the previous extracts. On the other hand, *Chenopodium ambrosoides* leaves and seed extracts, exerted lower repellent effect against the rice weevil. The seeds extracts of this plant contains repellent components more effective than leaves. This appeared in the repellency percentages which were higher than that of leaves. Concerning, the repellent effect of *Thevetia neriifolia* leaves extract on the rice weevil adults, there were low difference with the previous plant extracts in behalf of *Thevetia* leaves extracts especially acetone extract, repelling 75.19 % at 10 % concentration.

Regarding, the effect of *Cassia fistula* extracts the repellency values revealed that ethyl alcohol extract have the highest value 73.19 %. Acetone extract gave the lowest percentage of repellence 25.19 % after 15 days of treatment at 10 % concentration of aforementioned extracts.

With respect to *Glycine hispida* seed extracts, data clearly indicated that all tested extracts showed very low values of repellency against the adults of *S. oryzae*. However, petroleum ether and ethyl alcohol extracts did not give any repellent effect after treatment at 10 % and 5 % concentrations of pet. Ether. Similarly at all concentrations, except 10 % and 5 % after 3 days in the case of ethyl alcohol, a very low values of repellency were obtained.

The values of repellency for, *Lupinus termis* seed extracts were relatively low. Although pet. ether extract at 10 % gave values of repellency varied between 50.72 % after 15 days to 60.65 % after 7 days from treatment. The other extracts showed low repellent effect not exceed 30.1 %.

Comparing the potential repellency activities of the different groups of extracts using the overall means of repellency [Table 35 – 44] shows that with *Schinus* pet. ether extracts was the best solvent followed by hexane, acetone, ethyl acetate and ethanol respectively. *Thuja* leaves and seeds ethyl alcohol extracts occupy to the first position followed by pet. ether, acetone, hexane and ethyl acetate.

From the previous repellency results in Tables (35 - 44), it is clear that the repellent values are dependent on the kind of extract and its concentration. Previous data lead to the speculation that repellency values were increased with the increase in extract concentration and decreased with the prolongation of period after treatment. This could be due to the loss of some volatiles, components or various unstable components. The results obtained go on line with that of **El. Lakwah** ***et al***.**(1999, 1997, 1998).**

II.Chemical investigation :

II.A-Preliminary phytochemical screening :-

The plants which were tested for the insecticidal activities of their extracts on 4 th instar larvae of black cut worm *Agrotis* *ipsilon* and the adults of rice weevels *Sitophilus oryzae* were screened phytochemically.

Air dried powders of the different plant samples were phytochemically screened for their constituents of carbohydrate and / or glycosides, flavonoids, saponins, tannins, sterols and / or triterpenes and alkaloids or nitrogenous bases. The results are recorded in Table (45).

The phytochemical investigation of *Thevetia nerviifolia, Cassia fistula* and *Aptenia cordifolia* illustrated that they were rich in carbohydrate and *Glycine hispida* was rich in flavonoides, saponins and sterols. *Thuja orientalis* and *Schinus terebinthifolius* were rich in sterols or triterpenes. On the other hand, *Lupinus termis* seeds was rich in alkaloids or nitrogen's bases.

II.B-Percentage of solid percolate (gum) of different tested plant extracts :-

Two handred grams of air dried powder of each plant was extracted by orgainc solvents of different polarity i.e (petroleum ether , acetone, hexane, ethyl acetate and ethyl alcohol). The residue of each extract was concentrated under reduced pressure till dryness and kept over calcium sulphate in desiccators. the percentage of each crude residue was reported in Table (46). *Thuja orientalis* and *Schinus terebinthifolius* which contain volatile oils was extracted by hydro distillation.

As described before *Schinus terbenthifolius* and *Thuja orientalis* extracted with pet. ether were the most effective repellent extracts against the insect tested *S. oryzae* . As well, it was found that *Glycine hispida* and *Aptenia cordifolia* have the

Table (45). Preliminary phytochemical secreening of dried powder of the tested plants

Tested phytochemicals	*Thuja orietalis*		*Glycine hispida*	*Chenopoaium ambosoides*		*Thevetia neriifolia*	*Cassia fistula*	*Lupinus termis*	*Aptenia cordifolia*	*Schinus terebinthifolius*
	Leaves	Fruits	Seeds	Leaves	Seeds	Leaves	Pods	Seeds	Leaves	Leaves
Carbohydrate and / or glycosides	(+)	(-)	(++)	(+)	(±)	(+++)	(+++)	(-)	(+++)	(±)
Tannins				(+)	(+)		(+++)	(-)	(-)	
Flavonoides	(-)	(-)	(++)	(++)	(+)	(+)	(-)	(-)	(±)	(+)
Saponins	(-)	(-)	(++)	(-)	(-)	(-)	(+)	(-)	(++)	(-)
Sterols and / or rriterpenes	(+++)	(++)	(++)	(-)	(-)		(-)	(-)	(±)	(+++)
Alkaloids and / or nitrogenous bases	(-)	(-)	(-)	(-)	(±)	(-)	(-)	(+++)	(-)	(-)

(+++) high amount
(++) moderate amount
(+) low amount
(±) traces
(-) absent

Table (46). Percentage of each extract of different plants based on 200 gm dry powder

Plants	Parts	Petroleum ether	Acetone	Hexane	Ethyl acetate	Ethyl alcohol
Thuja orientalis,L	leaves	19.601	13.241	4.262	15.079	14.585
Thuja orientalis,L	seeds	25.931	12.185	12.351	14.33	18.287
Glycine hispids,L	seeds	4.899	12.255	19.226	7.671	22.604
Chenopodium ambrosoide	leaves	2.01	7.915	5.314	0.973	8.19
Chenopodium ambrosoide	seeds	5.535	11.404	6.31	2.911	12.804
Thevetia neriifolia,L	leaves	4.89	7.182	4.901	15.478	10.991
Cassia fistula,L	pods	0.918	10.641	1.154	5.09	18.604
Lupinus termis,L	seeds	12.345	10.283	10.595	12.309	10.804
Aptenia cordifolia ,L	leaves	2.485	0.173	4.205	10.917	7.51
Schinus terebinthifolivs,L	leaves	5.3	16.861	2.926	9.847	16.107

highest potential toxicity and antifeedant effect against the two tested insects *Agrotis ipsilon* larvae and *S. oryzae* adults.

The literatures revealed the possibility of the presence of volatile oils as a reason for the repellency effect. Pet. ether extracts of *Schinus terbenthifolius* and *Thuja orientalis* as the most effective extracts were hydro distillated and their volatile oils were isolated. The isolated volatile oils were examined against *S. oryzae* adults.

The preliminary mammalian toxicity of these volatile oils was investigated by exposing the albino rats to fed on treated diet with aforementioned volatile oils.

It was not excluded that these extracts may have a harmful effect in wheat cereals. To illustrate this possibility the germination of wheat seeds were determined as well as the chlorophyll ratio of germinated seeds was also estimated.

III- Repellency effect of essential oil extracted from *Schinus terbenthifolius* and *Thuja orientalis* on the adults of *S. oryzae*

Table (47) contains the results of the repellent effect of essential oils of the tested two plants. Data obtained show that the first concentration 1000 ppm was highly repellent to the adults recording 91.5, 95.3 & 95.3 and 93.2, 100 and 100 % of repellency for the first and the second plants after 3,7 and 15 days, respectively. The maximum repellence rate (100 %) happened after the treatment with *Schinus terbenthifolius* essential oil after 7 and 15 days. The repellency was reduced by the decease of used concentration. The second concentration of 500 ppm essential oils of *Thuja* achieved repellency between 70.8 to 80.7% of repellency. *Schinus terbenthifolius* extracts gave 75 to 86.7 % repellency at the same concentration. The

Table (47): Effect of *Thuja orientalis* and *Schinus terebinthifolius* essential oil on repellency and reduction in F_1 progeny of the rice weevil adults (*Sitophilus oryzae* L.)

Conc. ppm	No.of Insect used	*Thuja orientalis L.*					*Schinus terebinthifolius L.*				
		% repellency at exposure days			No. of emerged adults after 45 days	Reduction In F1 progeny %	% repellency at exposure days			No. of emerged adults after 45 days	Reduction In F1 progeny %
		3	7	15			3	7	15		
1000	20	91.5	95.3	95.3	12.0±0.3	68.5	93.2	100	100	10±1.9	89.0
500	20	70.8	80.7	80.7	7.5±1.3	91.5	75.0	86.7	86.7	7±2.5	92.3
250	20	49.5	55.1	55.1	10.1±0.0	88.6	45.9	60.1	60.1	13±0.2	85.7
125	20	33.3	33.3	33.3	15.9±2.5	82.1	27.5	30.1	30.1	7±1.7	92.3
62.5	20	12.2	15.3	15.3	13.7±1.3	84.6	17.4	17.4	17.4	23±1.6	74.7
Control	20	0.0	0.0	0.0	89.0±0.4		0.0	0.0	0.0	91±0.3	

repellence was further decreased by reducing the used concentration in both two plants.

With respect to the effect of these essential oils on F1 progeny after 45 days, the reduction in F_1 progeny was very high with all concentration of the two plants. It was at the range of 68.5 – 91.5 in case of *Thuja* essential oils and from 74.7 to 92.3 % reduction in case of the treatment with *Schinus* essential oils.

From the previous results, it was observed that essential oils extracted from *Schinus* leaves was more repellent than that extracted from
Thuja leaves and the repellency percent depended on the concentration of these essential oils.

III.1- Effect of essential oils of *Thuja* and *Schinus* leaves on wheat grains germination :-

Germination percentages of treated grains with essential oils extracted from *Thuja* and *Schinus* leaves are presented in Table (48).The reduction in grains germination was obvious in the treated wheat seed. The germination of wheat seeds in the case of control was 96.67 %. There was no obvious difference between germination of wheat seeds planted
quickly after 7days of treatment and the other planted after 8 weeks of treatment.

The reduction in seeds germination increased by increasing the concentration of essential oils. The essential oils of *Thuja* were more reductive to germination of wheat grains than that extracted from *Schinus* and this was more pronounced with the increase of storage period after treatment. Similar results were reported by **Mahgoub and Ahmed (1996),** they found that wheat grains treated with *Ricinus comunis* seed

Table (48) Germination test for wheat grains treated with *Thuja orientalis* and *Schinus terebinthifolis* extracts stored for 8 weeks.

Period weeks	Con. ppm	*Schinus terebinthifolis*			*Thuja orientalis*		
		Germination %	Germination Rate	Germination capacity	Germination %	Germination rate	Germination capacity
Initial	62.5	87.78	65.48	97.78	75.55	63.83	75.55
	125	80.00	65.51	88.89	70.00	63.83	71.11
	250	66.67	63.61	88.89	57.78	60.49	60.00
	500	63.33	63.38	86.67	56.67	58.83	53.33
	1000	47.77	61.80	77.78	37.78	58.42	45.55
	control	96.67	65.47	96.67	96.67	65.47	96.67
8 weeks	62.5	85.55	65.47	95.55	67.78	66.66	65.55
	125	68.88	63.74	91.11	66.67	65.08	64.44
	250	58.89	62.70	86.67	56.67	65.99	55.55
	500	53.33	61.82	85.55	51.11	57.57	52.22
	1000	47.78	62.12	74.44	28.89	50.31	31.11
	control	96.67	65.47	96.67	96.67	65.47	96.67

extracts lost their viability. **Parakash *et al.* 1982** found that *undicke, callophllum, inophylum* showed an obvious adverse effect on germination of rice grains.

III.2– Effect on chlorophyll content :-

Data in Table (49) showed a clear difference between the seedlings resulted after using the oils extracted from both plants (*Thuja orientalis* and *Schinus terebinthifolius*. The treatment with *Schinus* oils was more effective in increasing the chlorophyll content than the other treatment with *Thuja* leaves oils which was 35.8 after 8 weeks than 26.4 in the second plant.

The chlorophyll content decreased by increasing the concentration of essential oils in treatments but increased with the prolongation of expossure period before germination of grains.

The reduction in chlorophyll is reversibly proportional to the reduction in photosynthetic capacity in the plant which effects on the organic substance **(Batanouny *et al* . 1991).**

III.3- Effect of *Thuja* and *Schinus* essential oils on albino rats

To give a preliminary knowledge about the effect of these components on mammals the essential oils were tested on albino rats to illustrate their mammalian toxicity.

3.1- The effect on blood components :-

The blood is a vessel or fluid tissue. The blood consists of two phases of components. The living corpuscles represent the solid components swimming in dead liquid matter called plasma. The blood cells or corpuscles are in two kinds. The first is erythrocytes or the red blood corpuscles and the second is leucocytes or while blood corpuscles. The blood is a red colour liquid. The red colour is due to the hemoglobin. Hemoglobin

Table(49) : Effect of *Thuja orientalis* and *Schinus terebinthifolius* extracts on the chlorophyll content of the seedling wheat.

Periods weeks	Concentration ppm	Chlorophyll content	
		Thuja orientalis	*Schinus terebinthifolius*
Initial	1000	19.7	25.4
	500	20.3	28.3
	250	21.3	28.4
	125	25.7	29.5
	62.5	30.4	29.9
	Control	23.8	24.2
8 weeks	1000	20.0	27.1
	500	23.3	29.3
	250	24.5	30.5
	125	24.6	31.4
	62.5	29.3	36.5
	Control	26.4	35.8

presents chagrine on erythrocytes. According to the previous composition of the blood, the effect of essential oils extracted from the leaves of the tested two plants on the number of erythrocytes and haemoglobin were examined. The concentration used were 250, 125 and 62.5 ppm.

Data in Table (50) revealed that erythrocytes values were 8.86 ± 1.32, 7.33 ±0.66, 6.76 ± 0.7 and 9.35 ± 0.3, 7.54± 0.34,6.91 ±0.83 at 250, 125 and 62.5 p.p.m with *Thuja* and *schinus*, respectively compared to 8.60 ± 0.34 for the control. A tested concentration of 250 ppm was the one leading to increase the number of erythrocytes, while the other two concentration decreased it. Although, their was no significant difference in numbers of erythrocytes between the two highest concentrations or between it and that of the control.

Despite off, the non significant differences between the two plant *Thuja* and *Schinus*, the effect of *Thuja* was slightly higher than the *Schinus* values.

The values of the hemoglobin concentration, was significantly higher in control than that of all treatments at all concentrations used. All treatments caused significant reduction in haemoglobin concentration. The values recorded varied between 9.4 ± 0.45 to 10.99 ± 0.53 compared with 13.0 ± 0.28 for the control.

3.2 – Histological effect of *Thuja* and *Schinus* essential oils on some male albino rat organs :-

One of the most important problem caused by the drastic use of traditional insecticides was their mammlian toxicity either acute or chronic. Before the introduction of any formulation or

Table(50) : Haematological parameter, means ±S.E. after treated diet of with *Thuja orientalis* and *Schinus terebinthifolius* in albino rats.

plants	Parameter / Conc.(ppm)	RBCS (million/ul)	Hb. (gm /dt)
Thuja orientalis	250	8.86±1.32	9.40±0.45
	125	7.33±0.66	13.00±0.63
	62.5	6.76±0.70	10.60±0.45
Schinus terebinthifolius	250	9.35±0.37	10.99±0.53
	125	7.54±0.34	10.40±0.53
	62.5	6.91±0.83	10.40±0.40
Control	0.00	8.60±0.34	13.00±0.28

L.S.D at 5 %	1.55	0.994

R.B.C_S.: Erythrocytic count in million/microliter (ul).
Hb: Hemoglobin concentration in gm/dl
n = 5

commercial product to the field as plant protection agent it is essential to consider their mammalian toxicity.

Further these studies were performed to give preliminary information about the effect of these plant products on albino rat organs as an indication to their possible hazards to human being and animals (Fig 34-53).

3.2.a-Effect on brain :-

As illustrated in Fig (34-38) the essential oils caused more vaculation of the cells and haemorrhage between cells in the case of *Thuja* 250 ppm. These symptoms were less appearance in *Thuja* at 62.5 ppm concentration or in *Schinus* product. There was infiltration with inflammatory cells after *Schinus* treatment.

The previous observation show that it is possible to describe the symptoms of the used plant products on brain bused on the Vaculation of the cells , haemnorrhag between the cells infilteration and inflammatory cells.

3.2.b- Effect on liver :-

Fig (39-43) show the effect of essential oils of *Thuja* and *Schinus* on the liver of male albino rats. Without any treatment (control) the liver cells arranged in cords radiating from the central vein , blood sinusoids can be seen. A photomicrographs of a section of treated rat liver with *Thuja* essential oils showed disturbed liver cord with inflammatory cells and vacculation of the liver cells. *Schinus* product caused dilated central vein, increase of inflammatory cells vacculations and haemorrhagic central vein.

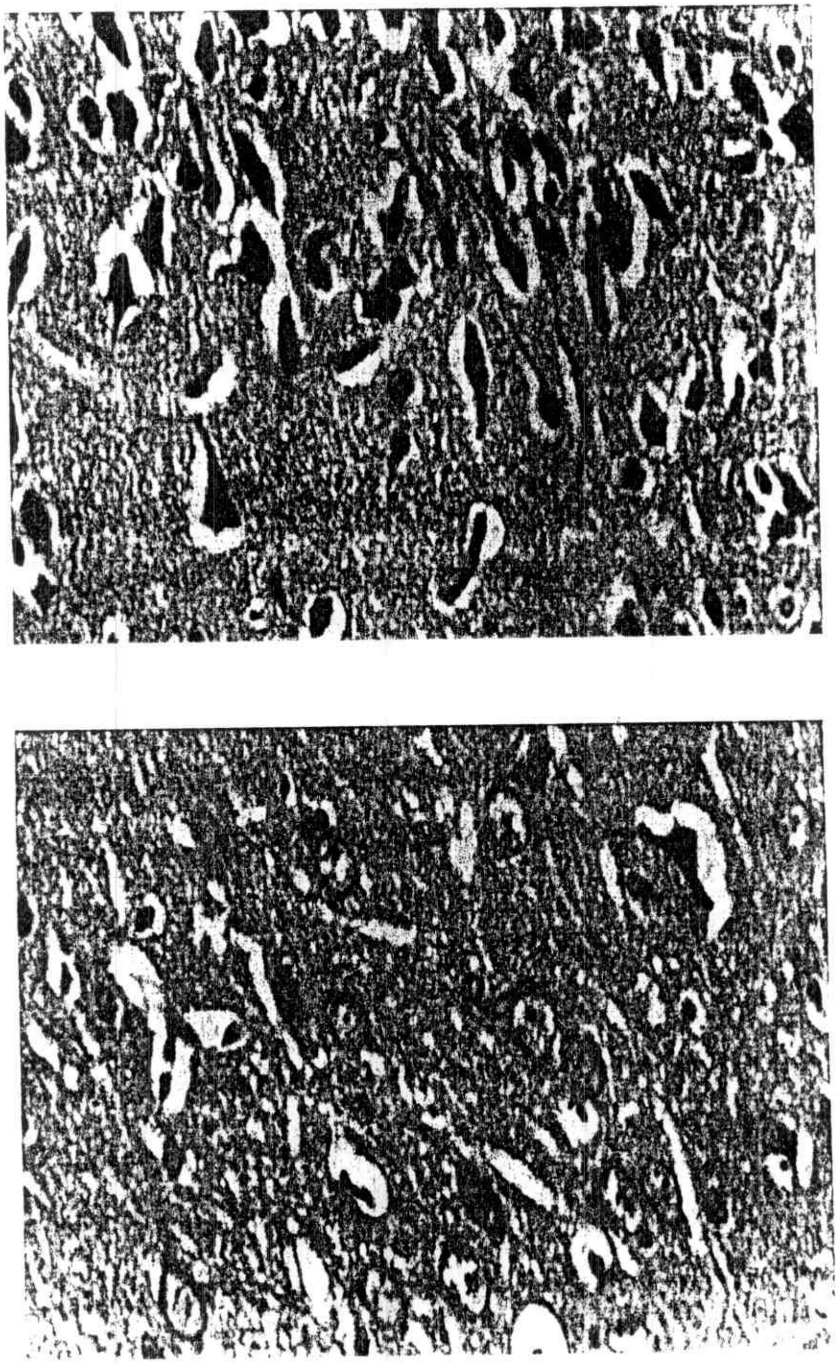


Fig 34: A photomicrograph of a section of the control rat brain showing, normal pyramidal cells and oval cells. (Hx. & E.x 400).

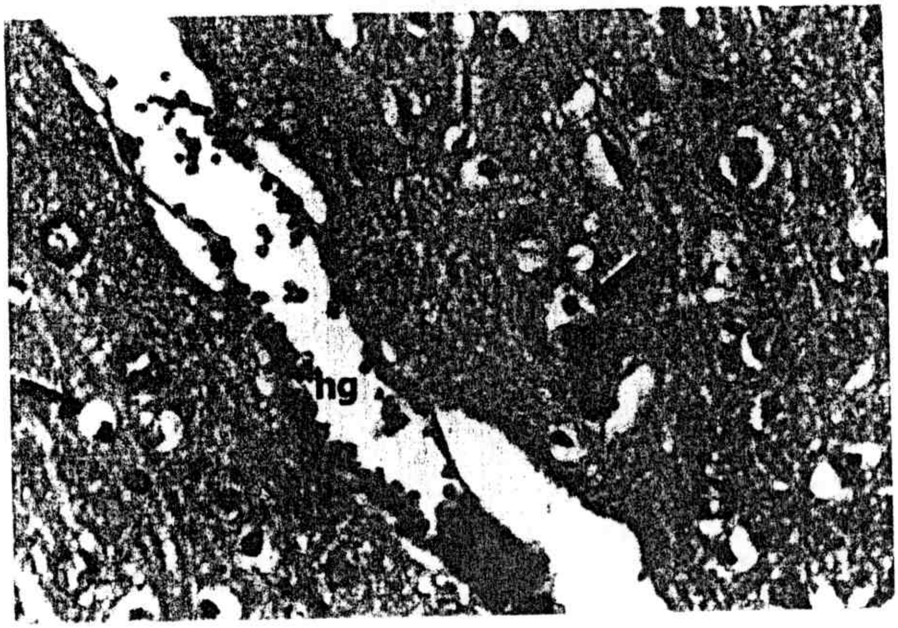


Fig 35: A photomicrograph of a section of the treated rat brain (*Thuja orientalis* 250 p.p.m) showing, vaculations o the cells (arrows) and haemorrhage (hg) between cells. (Hx. & Ex 400)

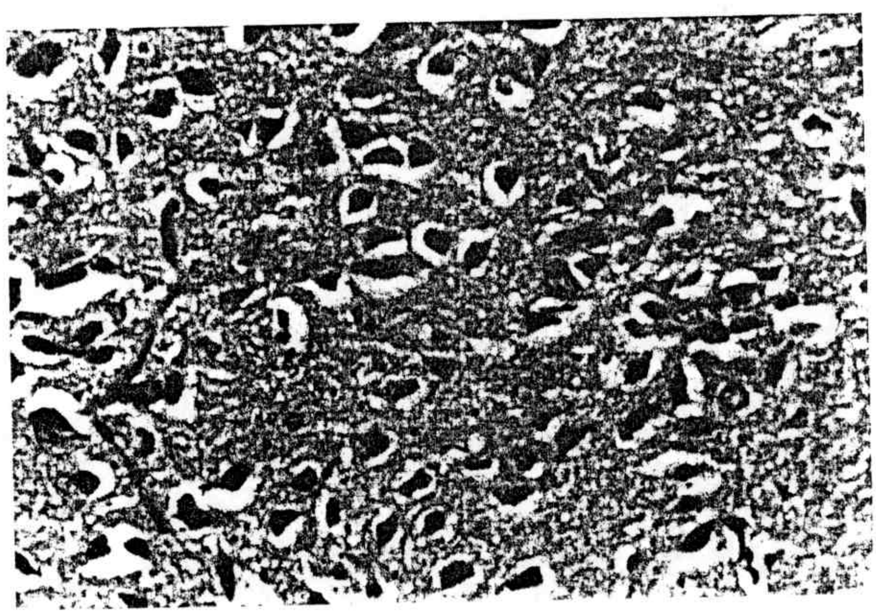


Fig 36: A photomicrograph of a section of the treated rat brain (*Thuja orientalis* 62.5 p.p.m) showing, pyramidal cells simulating normal cells. (Hx. & Ex 400)

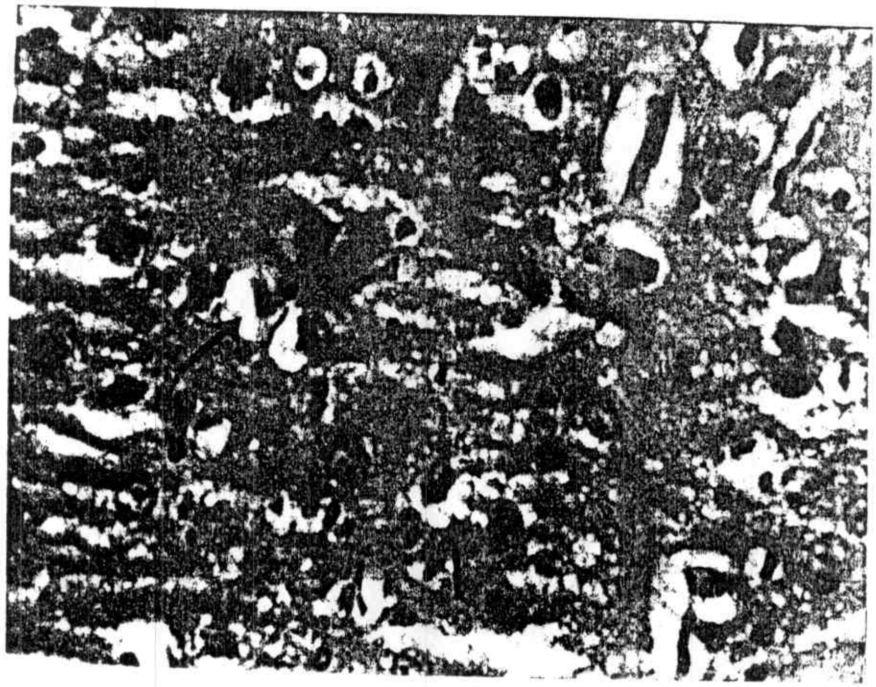


Fig 37: A photomicrograph of a section of the treated rat brain (*Schinus terbinthifolius* 250 p.p.m) showing, less vaculations o the cells. (Hx. & E.x 400).

Fig 38: A photomicrograph of a section of the treated rat brain (*Schinus terbinthifolius* 62.5 p.p.m) showing, infiltration with inflammatory cells (arrows). (Hx. & E.x 400).

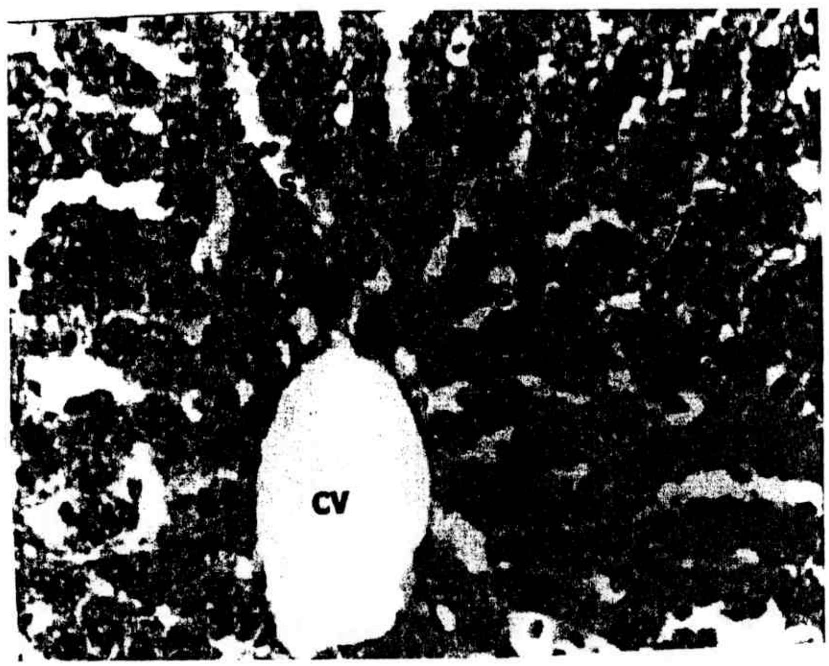


Fig 39: A photomicrograph of a section of the control rat liver showing, liver cell arranged in cords radiating from control vein (cv). Blood sinusoids (S) can bee seen. (Hx. & Ex 400)

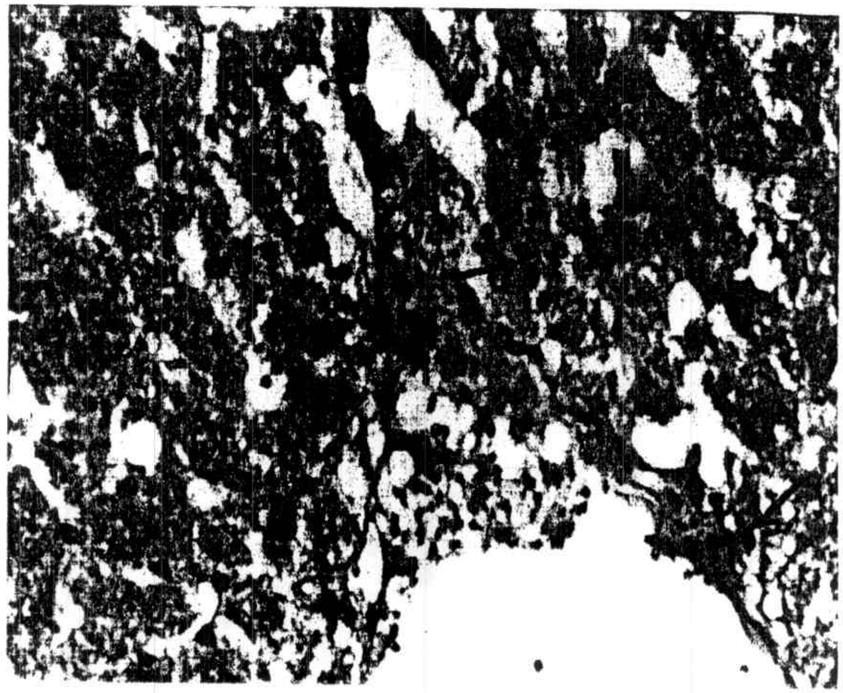


Fig 40: A photomicrograph of a section of the treated rat liver (*Thuja orientalis* 250 p.p.m) showing, disturbed liver cords with infilitration (e) of inflammatory cells (arrows). (Hx. & Ex 400).

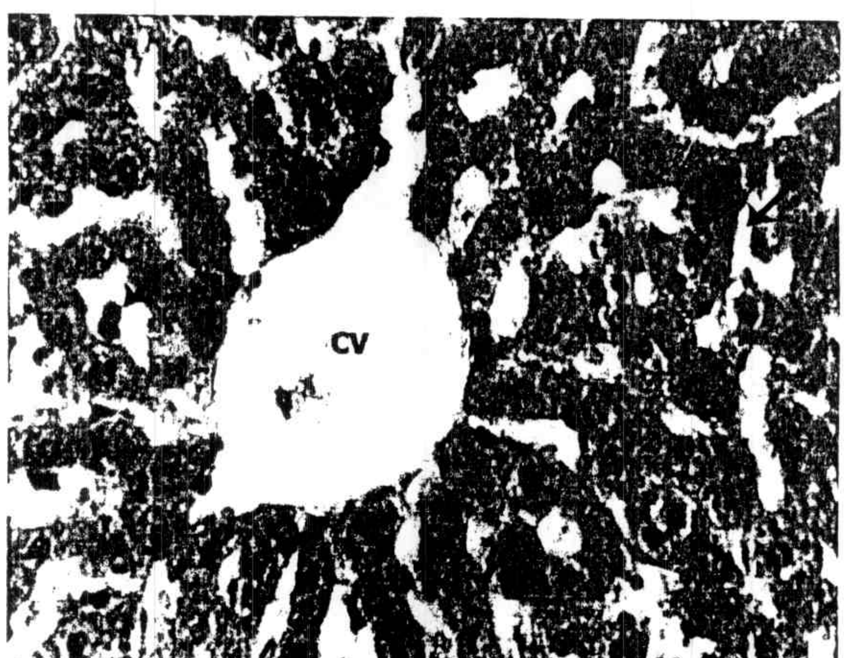


Fig 41: A photomicrograph of a section of the treated rat liver (*Thuja orientalis* 62.5 p.p.m) showing, dilated central vien (cv) and vacoulations of the liver cells (arrows). (Hx. & Ex 400).

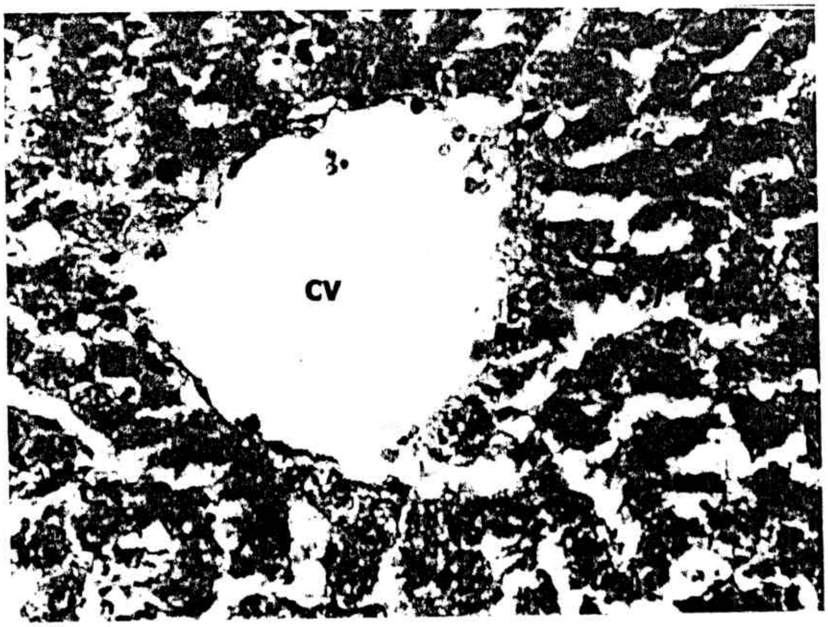


Fig 42: A photomicrograph of a section of the treated rat liver (*Schinus terbinthifolius* 250 p.p.m) showing, dilated central vien (cv) increased vacoulations and infilitration (e) of inflammatory cells can bee seen. (Hx. & Ex 400).

Fig 43: A photomicrograph of a section of the treated rat liver (*Schinus terbinthifolius* 250 p.p.m) showing, dilated congested central vien (cv) with some of inflammatory cells. (Hx. & Ex 400).

3.2.C – Effect on kidney :-

The two plant products were somewhat similar in their syomptoms in kidney of albino rat. The symptoms can be concluded in the following:-

Thickened basement membrane of the Bowman's capsules, infiltrations, inflammatory cells and decrease in the size of glomerulus (Fig 44 – 48)

3.2.D- Effect on testis :-

The comparison between untreated and treated Albino rat males testis appears in (Fig 49 – 53). A photomicrograph of section in a part of control rat testis shows normal semimferious tubule, normal series of spermatogonic cells up to the sperms inside the lumen.

After the treatment with plant products (essential oils) many symptoms appeared in the testis. Among these, disturbed somniferous epithelium with sloughing of spermatogoenic cells into the lumen (in the case of *Thuja* treatment) and hemorrhagic lumen between the nearly develop in sperms with *Schinus* treatment.

The previous data about histological studies lead to the conclusion that the use of plant products in the field of pest mangement is promising. Serious precautions have to considered before any recommendation. The use of plant products is worthy need of addition studies and investigations.

IV- Gas chromatography–mass spectrometry (GC/MS) analysis of *Thuja* and *Schinus* essential oils:-

The bioactivity of the extracts of *Thuja* and *Schinus* has been demonstrated. The repellent effect on the adults of *S. oryzae was obvious.* The possibility of harmful side effects on

Fig 44: A photomicrograph of a section of the control rat kindy showing, dilated normal glomerulus' s with normal basement membrane of Bowman s capsule (arrow). (Hx. & E.x 400).

Fig 45: A photomicrograph of a section of the treated rat kindy (*Thuja orientalis* 250 p.p.m) showing, thicknd basement membrane of Bowman s capsule and infilteration of inflammatory cells (arrows). (Hx. & E.x 400).

Fig 46: A photomicrograph of a section of the treated rat kindy (*Thuja orientalis* 62.5 p.p.m) showing, just decrease of the size of the glomerulus. (Hx. & E.x 400).

Fig 47: A photomicrograph of a section of the treated rat kindy (*Schinus terbinthifolius* 250 p.p.m) showing, infilteration of the best membrane(e) of few inflummotery cells (arrows). (Hx. & E.x 400).

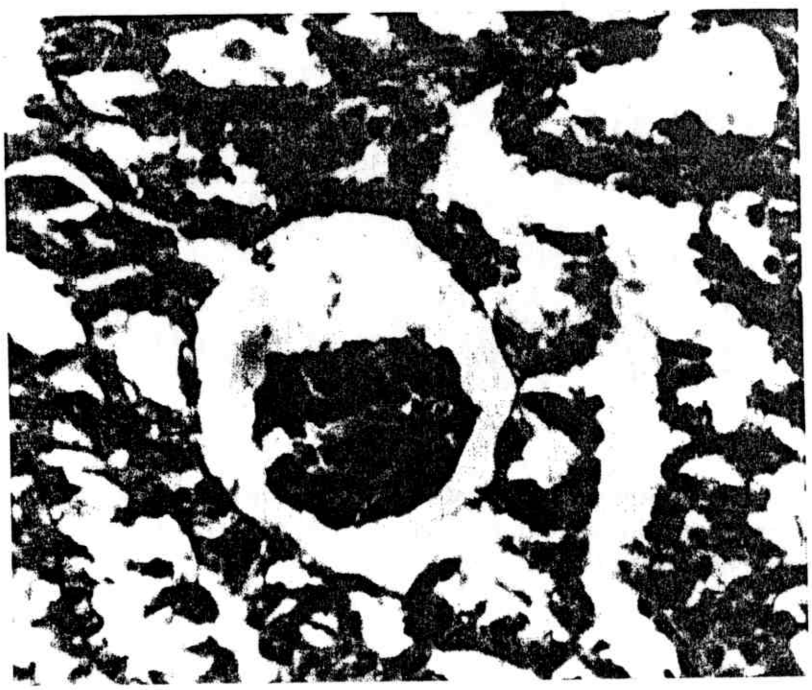


Fig 48: A photomicrograph of a section of the treated rat kindy (*Schinus terbinthifolius* 250 p.p.m) showing, slylit decrease of the size of the glomerulus. (Hx. & E.x 400).

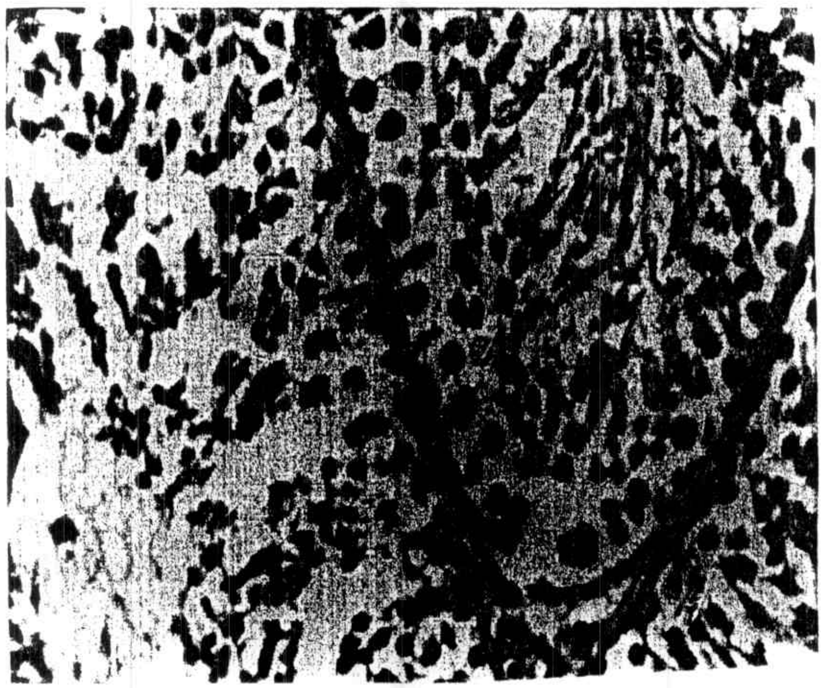


Fig 49: A photomicrograph of a section of the treated rat testis showing, a normal seminiferous tubule normal series of spermatoginc cells up to the sperms inside the lumen (sp).

Fig 50: A photomicrograph of a section of the treated e (*Thuja orientalis* 250 p.p.m) showing, disturbed seminiferous epithelium with sloughing of the spermatogonic cells into the lumen (arrows).

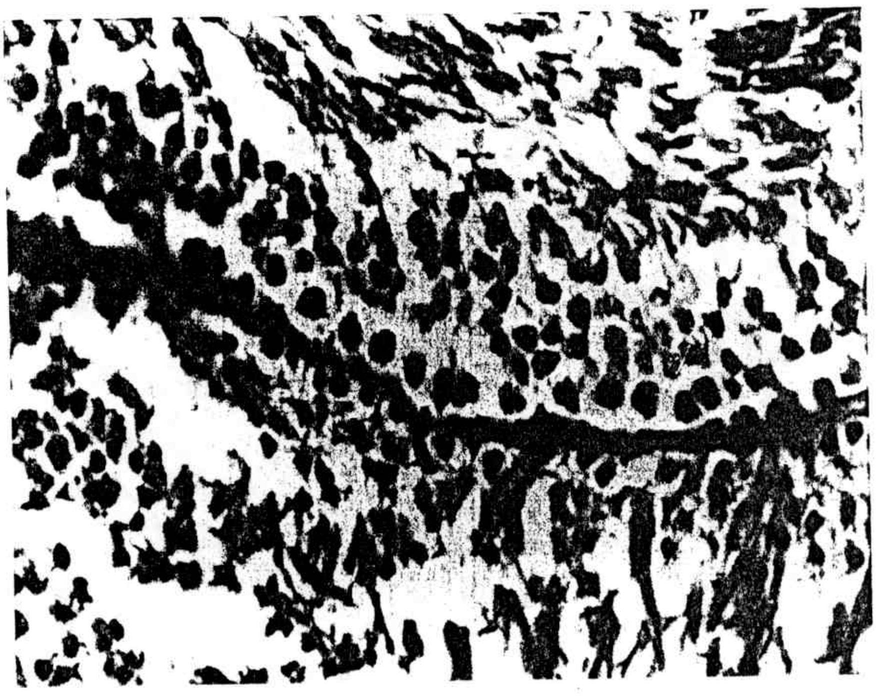


Fig 51: A photomicrograph of a section of the treated e (*Thuja orientalis* 125 p.p.m) showing, nearly seminiferous epithelium.

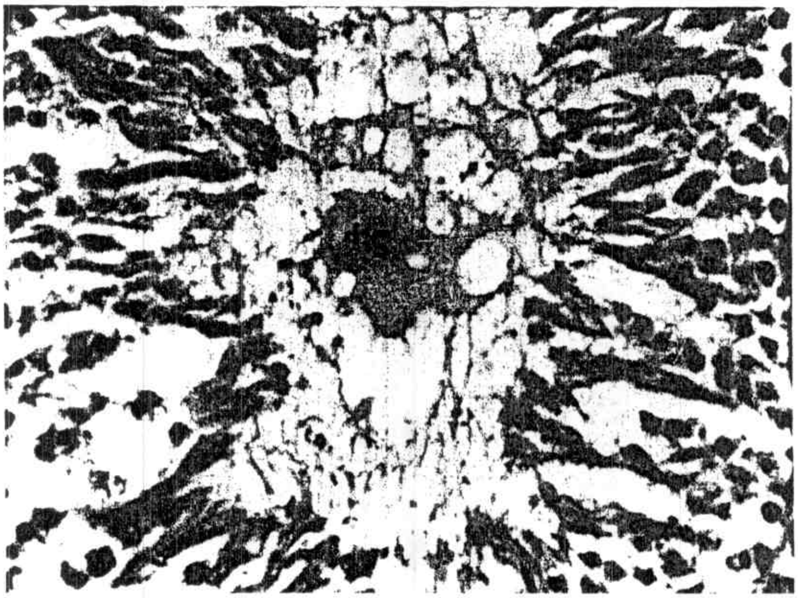


Fig 52: A photomicrograph of a section of the treated e (*Schinus terbinthifolius* 250 p.p.m) showing, hemorrhagic lumen (hg) between the nearly developing sperms.

Fig 53: A photomicrograph of a section of the treated e (*Schinus terbinthifolius* 250 p.p.m) showing, nearly normal seminiferous epithelium.

mammals were not excluded. Determination of the constituents of these essential oils will allow us to go forward GC/ MS analysis was run to know more informations about the compounds which can be separated and identified in these plant extracts.

IV.1-Analysis of *Thuja orientalis* essential oils :-

GC / MS analysis of *Thuja* essential oils are in Table (51) and Fig (54-60). Results revealed the presence of 65 peaks. A number of these has been identified. The previous Table (51) list the identified oils [alpha –cedrol, linalool , beta –carrophllene. germacrene–d, germacrene – b, camphene, alpha – phellandrene, limonene. beta – phellandrene, alpha –elemene, (+)-2-carene, valencene, beta – pinene, sabinene and T- muurolol].

Data in the previous table and Figs (54-60) showed that α cedrol was the most abundant with (14.46 %) among all the other components followed by B – carophyllene (7.91%), germacrene – D (6.05%), germacrene B (4.5%), camphene (3.97%) and α phyllandrene recording 3.37% and followed by other constituents of the oil sample.

IV.2- Analysis of *Schinus terebinthifoilus* essential oil :-

The results in Table (52) and Figures (61-66) show the GC/MS analysis of essential oil of *Schinus terebinthifolius.* The data revealed the presence of 64 packs. As in the case of the previous plant only 15 component were identified as .δ – cadinene, β –elemene , 1- phellandrene, δ – elemene, β – pinene, delta 3- carene, para – cymene chloroform , delta
– cadinene, delta – gurjunene, sabinene, alpha – pinene, (z) bis – 1,2 tri-methyl –silyloxy ethylene, δ – terpinene and α terpinene. Gamma – cadinene come in the first and was the major

Table (51) GC/Ms analysis of *Thuja orietalisi* L. essential oil

Peak No.	Identifed consitituents	Retention time	Concentration %	MS (mle)		
				M+	Base peak	Main significant fragments
51	alpha - cedrol	30.86	14.46	222	150	43,55,69,81,95,107,121,135,150,165,177,189,207,222
32	linalool	15.40	0.12	154	41	27,31,41,45,51,55,59,63,67,71,80,84,93,97,103,107, 111,115,121,136,140,150,
35	Beta-carophyllene	17.71	7.91	204	41	27,41,55,69,93,107,133,147,161,175,189,204
38	Germacrene-D	20.59	6.05	204	161	55,67,79,91,105,119,133,147,161,189,204
40	Germacrene-B	23.38	4.50	204	121	29,41,55,67,81,93,105,121,133,147,161,175,189,204
37	Camphene	19.66	3.97	136	93	41,53,67,79,93,107,121,136
10	Alpha - phellandrene	6.14	3.37	136	93	39,55,77,93,121,136
11	Limonene	6.76	1.70	136	68	53,68,80,77,93,107,121,136
12	Beta-phellandrene	6.89	1.66	136	93	93,51,65,77,93,107,121,136
39	Alpha-elemene	21.82	1.57	204	161	41,67,91,119,135,161,177,204
15	(+)-2-Carene	8.26	1.49	136	93	41,53,67,79,93,105,121,136
52	Valencene	31.46	1.40	204	161	41,55,61,67,73,79,87,93,105,111,119,127,133,141,147, 161,175,189,204,
8	Beta-pinene	5.27	1.23	136	93	41,53,69,81,93,107,121,137
9	Sabinene	5.45	1.06	136	93	53,65,77,93,105,121,137
55	T-Muurolol	32.81	0.82	222	95	71,81,95,109,121,137,149,161,189,204,222

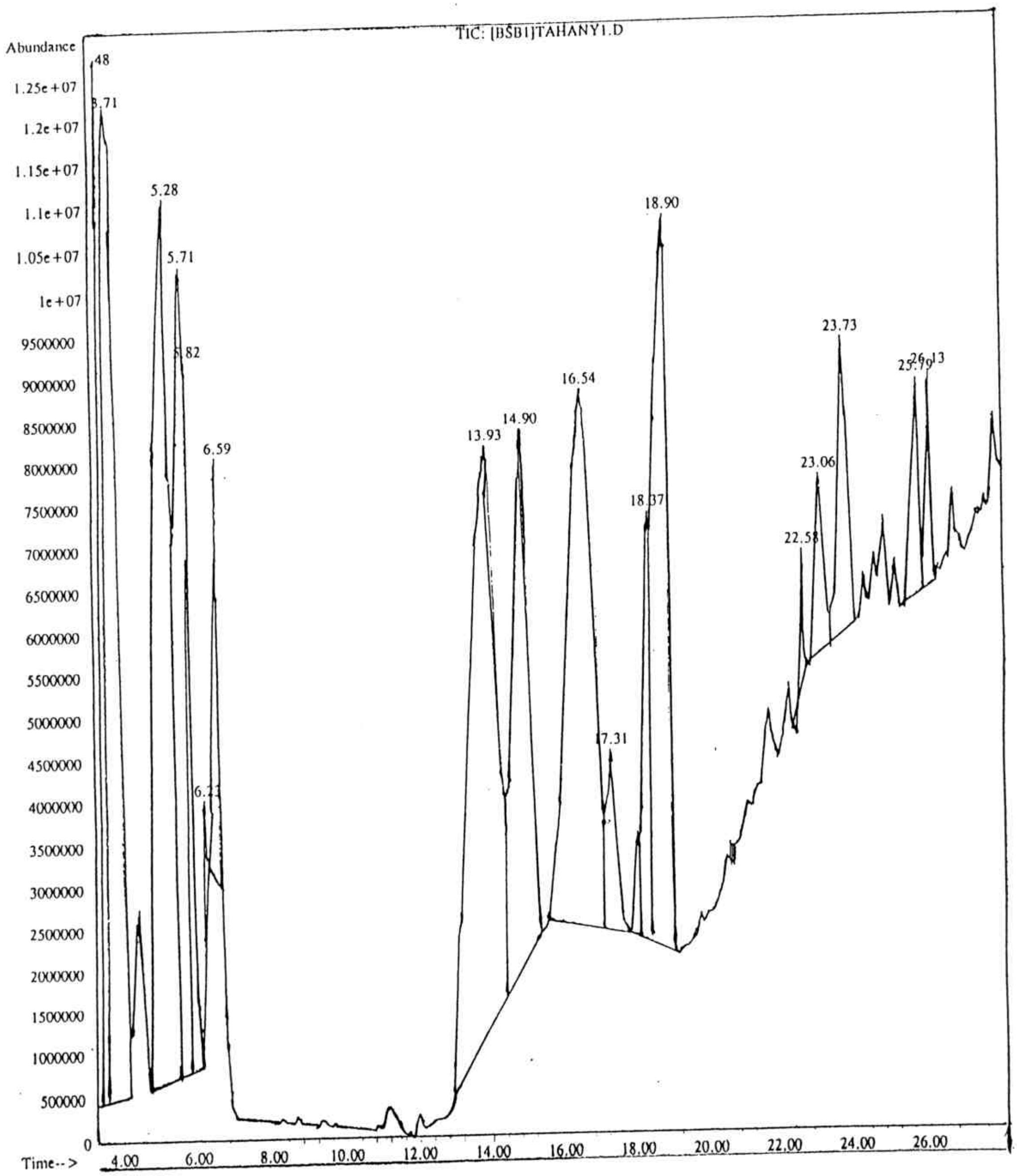


Fig . (54) : G C / M S chromatogram of *Thuja orientalis* essential oil

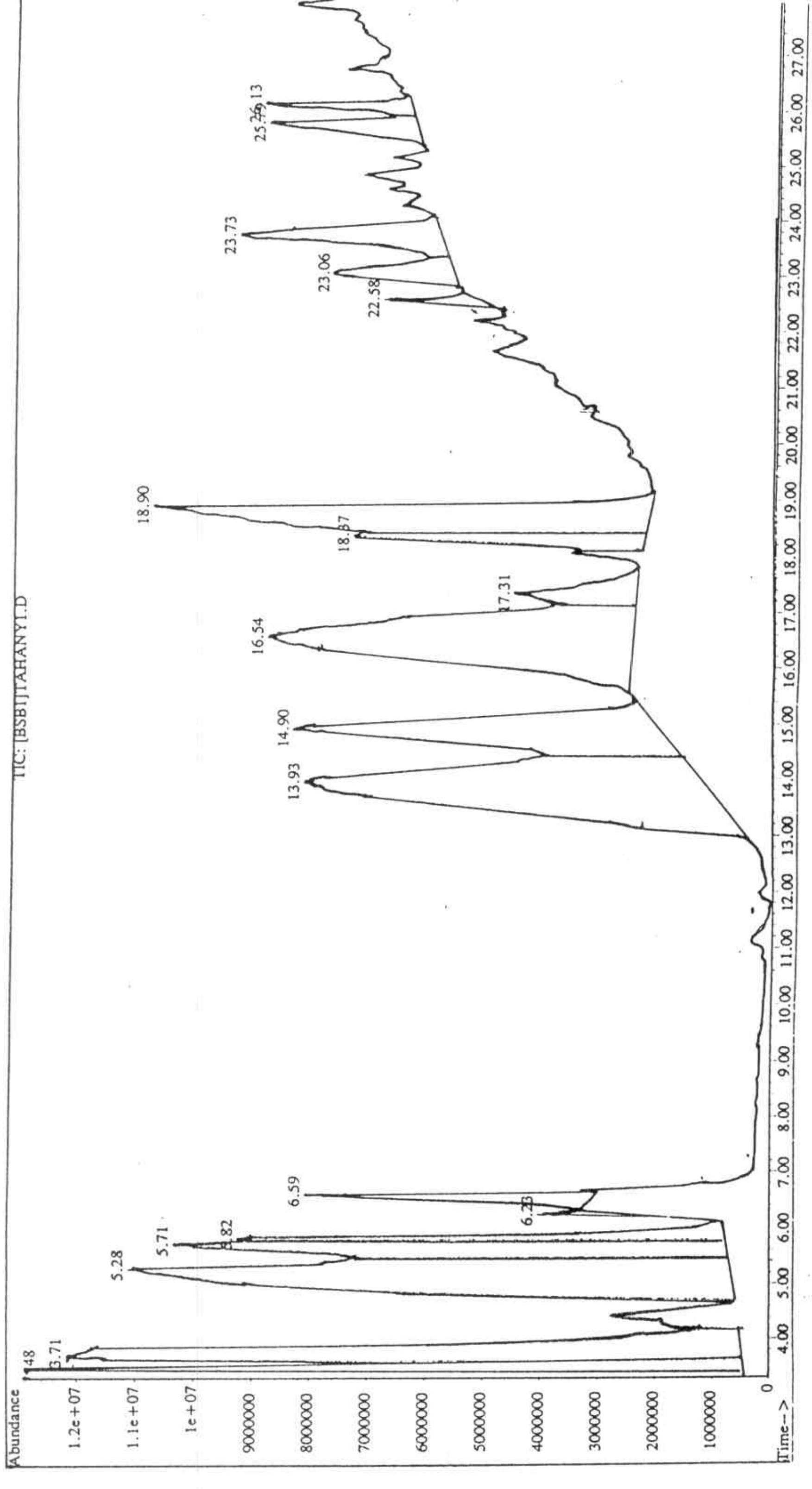


Fig. (55) : G C / M S chromatogram of *Thuja orientalis* essential oil

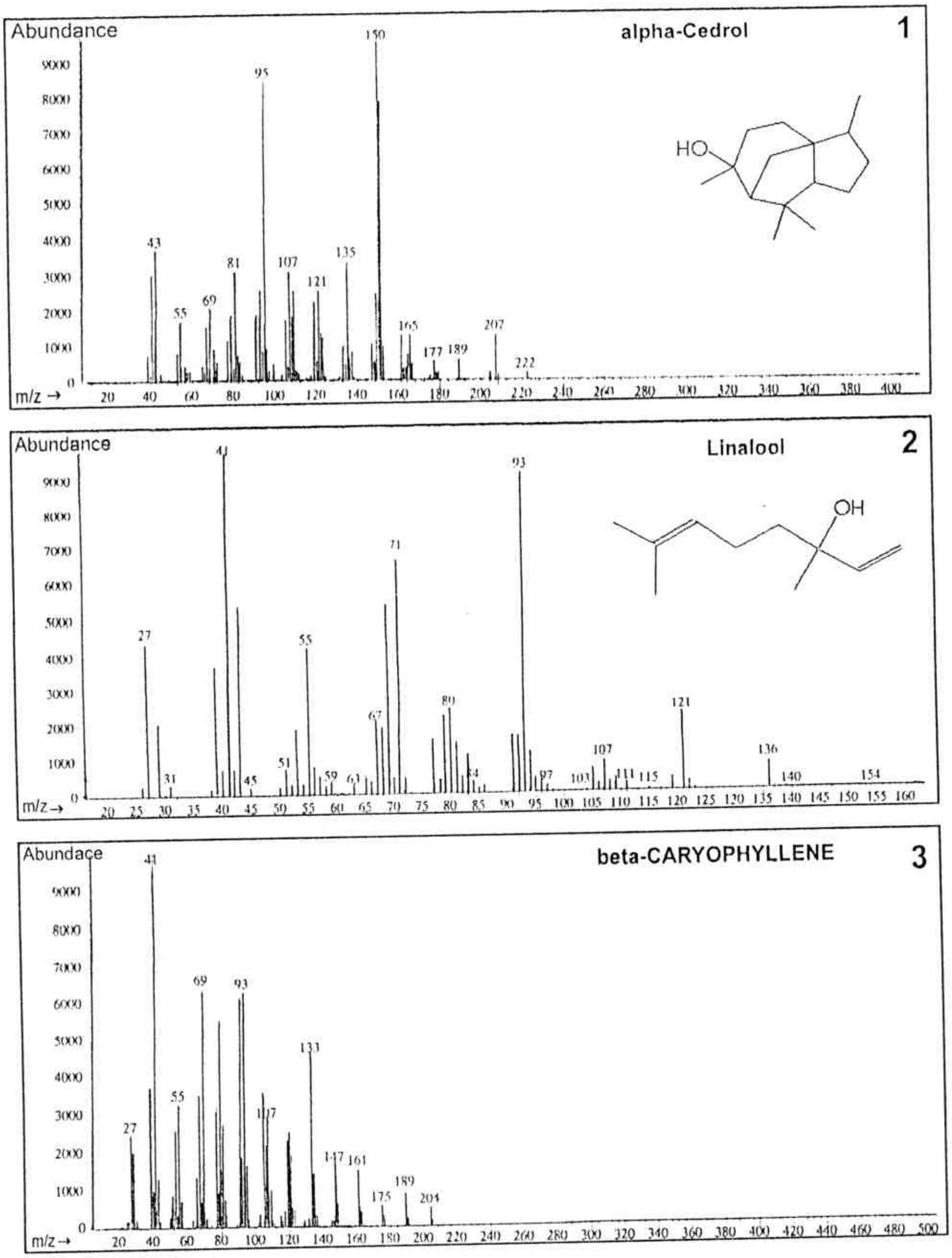


Fig. (56): GC/MS of compound (1, 2 and 3) of *Thuja orientalis* essential soil.

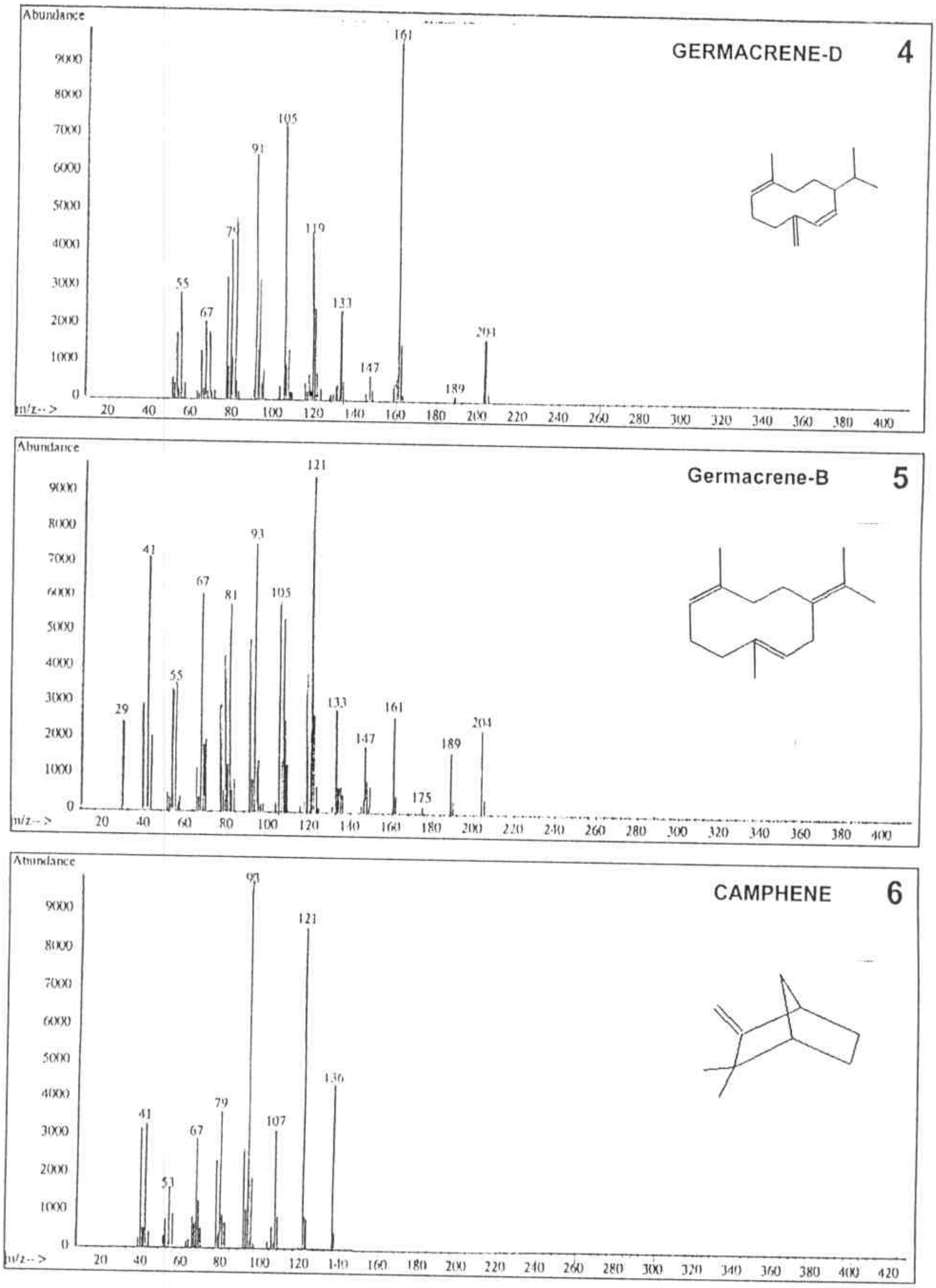


Fig. (57): GC/MS of compound (4, 5 and 6) of *Thuja orientalis* essential soil.

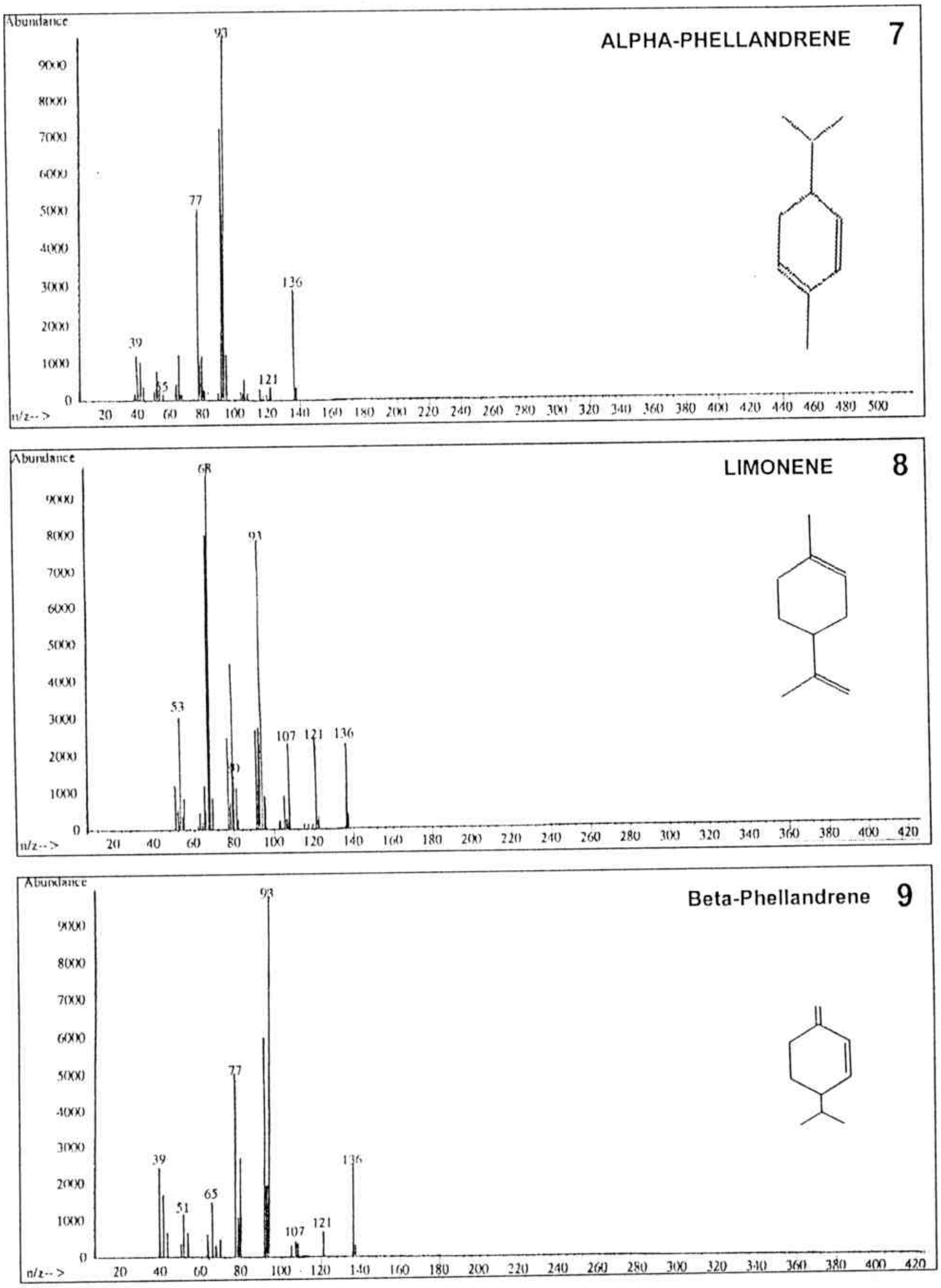


Fig. (58): GC/MS of compound (7, 8 and 9) of *Thuja orientalis* essential soil.

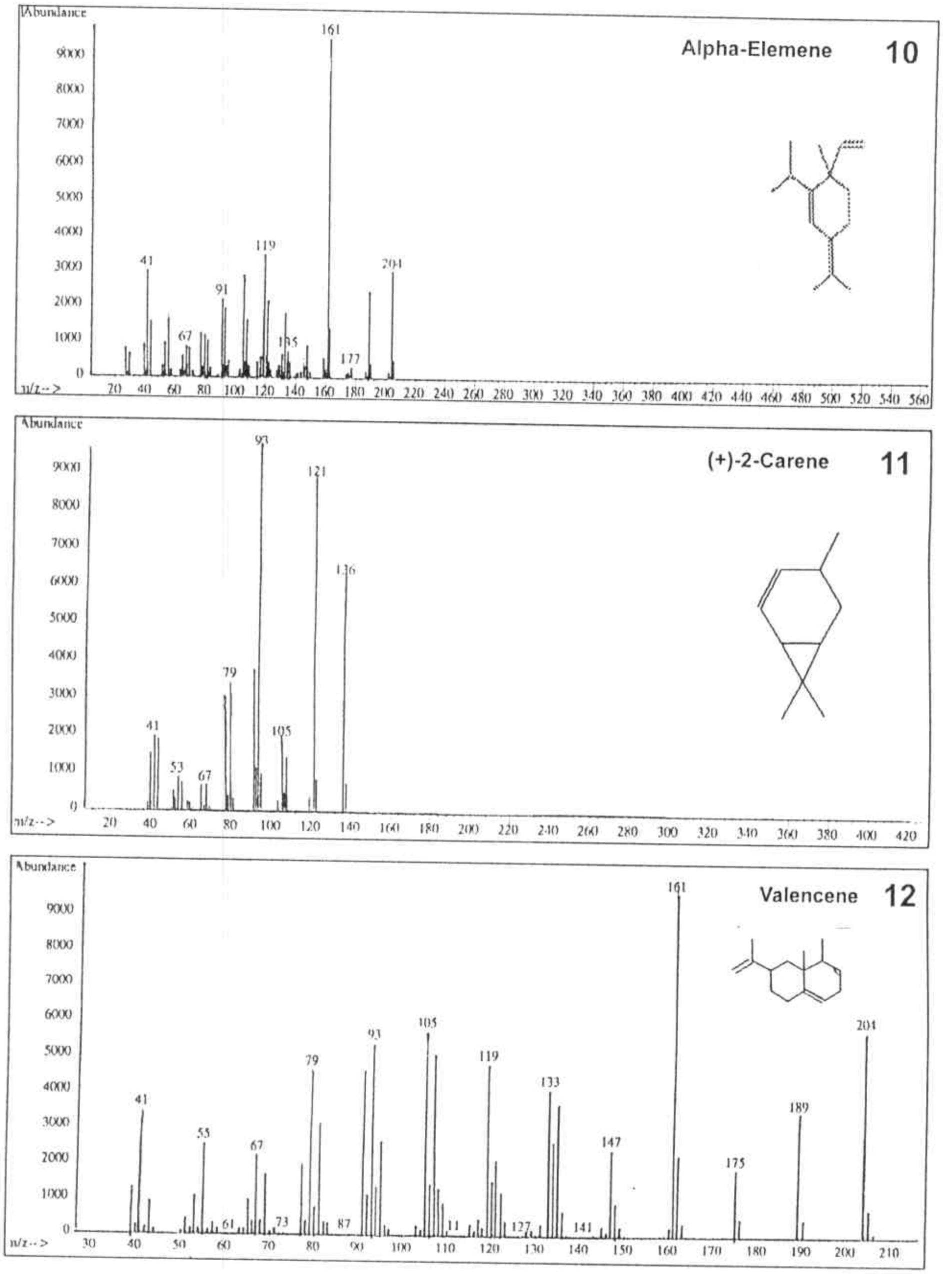
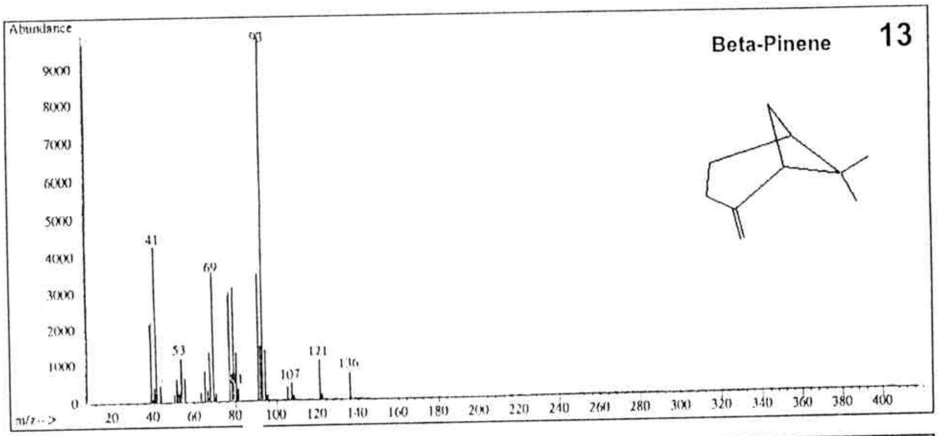
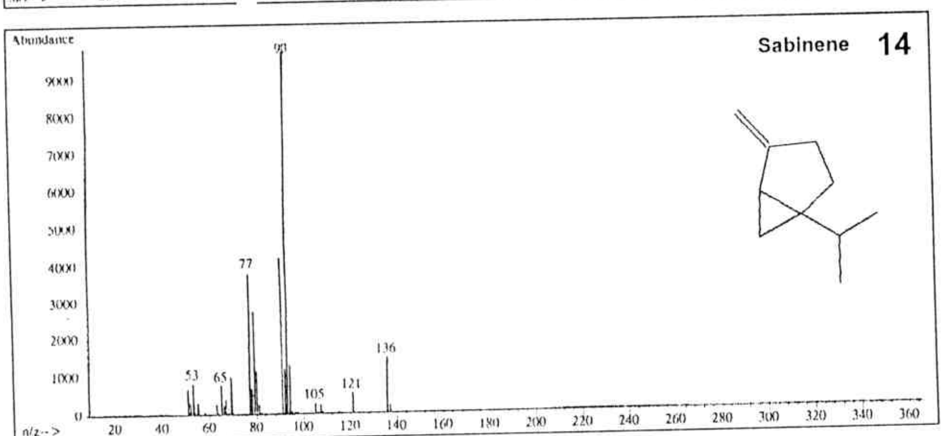


Fig. (59): GC/MS of compound (10, 11 and 12) of *Thuja orientalis* essential soil.





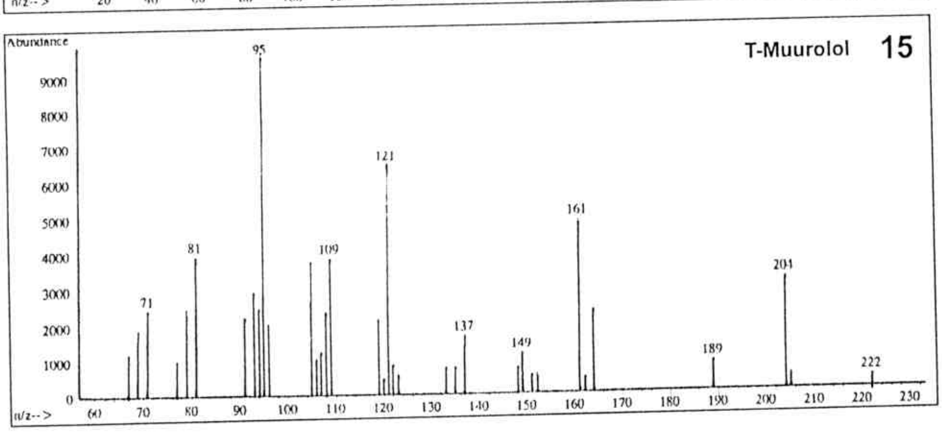


Fig. (60): GC/MS of compound (13, 14 and 15) of *Thuja orientalis* essential soil.

ble (52) GC/Ms analysis of *Shinus terebinthifolius* L. essential

Peak No.	Identifed consitituents	Retention time	Concentration %	MS (mle)		
				M+	Base peak	Main significant fragments
21	gamma - cadinene	16.55	13.16	204	161	41,55,67,79,91,105,119,133,148,161,176,189,204
19	Beta - elemene	13.92	12.13	204	93	41,53,67,81,93,107,121,133,147,161,175,189,204
5	1- phellandrene	5.28	10.54	136	93	41,51,55,65,69,77,81,89,93,105,117,121,136
20	gamma - elemene	14.90	7.64	204	121	29,41,55,67,79,93,107,121,136,147,161,175,189,204
3	Beta - Pinene	3.71	7.32	136	93	53,65,77,93,105,121,136
6	delta -3- carene	5.71	4.93	136	93	77,93,105,121,136
9	Para - cymene	6.58	2.78	134	119	39,45,51,58,65,77,85,91,97,103,113,119,128,134,
2	chloroform	3.49	2.52	120	83	37,47,59,70,83,120
22	Delta - cadinene	17.30	2.30	204	161	92,106,119,134,147,100,000,000
24	Delta - gurjunene	18.37	2.12	204	105	105,121,133,147,161,000,000
7	sabinene	5.81	2.10	136	93	41,53,65,77,93,105,115,121,136
4	alpha - pipene	4.43	1.67	136	93	32,39,44,53,58,67,77,82,93,105,115,121,136
40	(z) - Bis - 1, 2 Tri-methyl -silyloxy e	25.79	1.51	204	73	28,45,59,73,101,116,133,144,189,204
8	gamma - terpinene	6.23	1.09	136	93	51,58,65,77,87,93,105,115,121,136
14	alpha - terpeipene	11.14	0.65	136	121	51,65,77,93,105,121,136

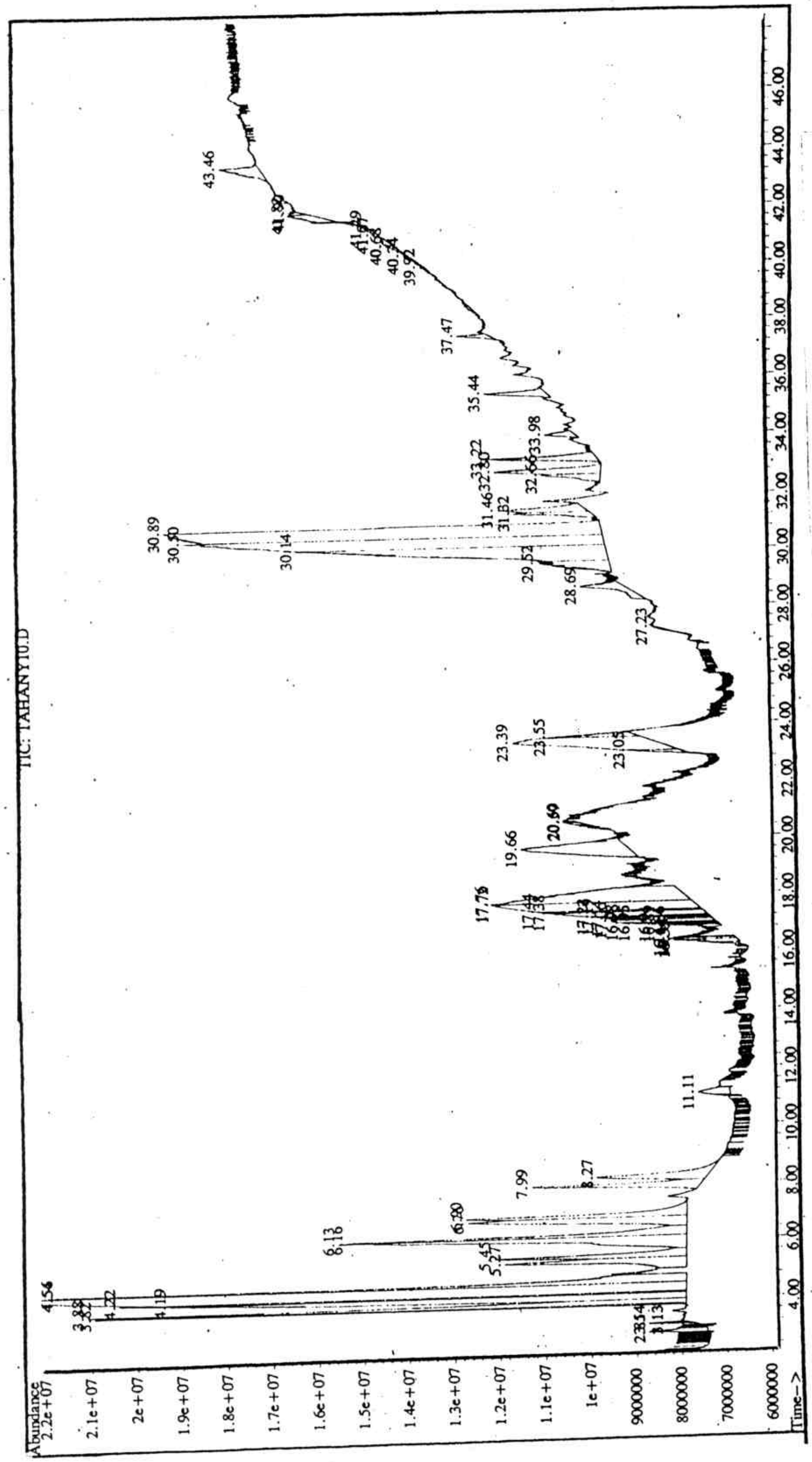


Fig . (61) : G C / M S chromatogram of *Schinus terbinthifolius* essential oil

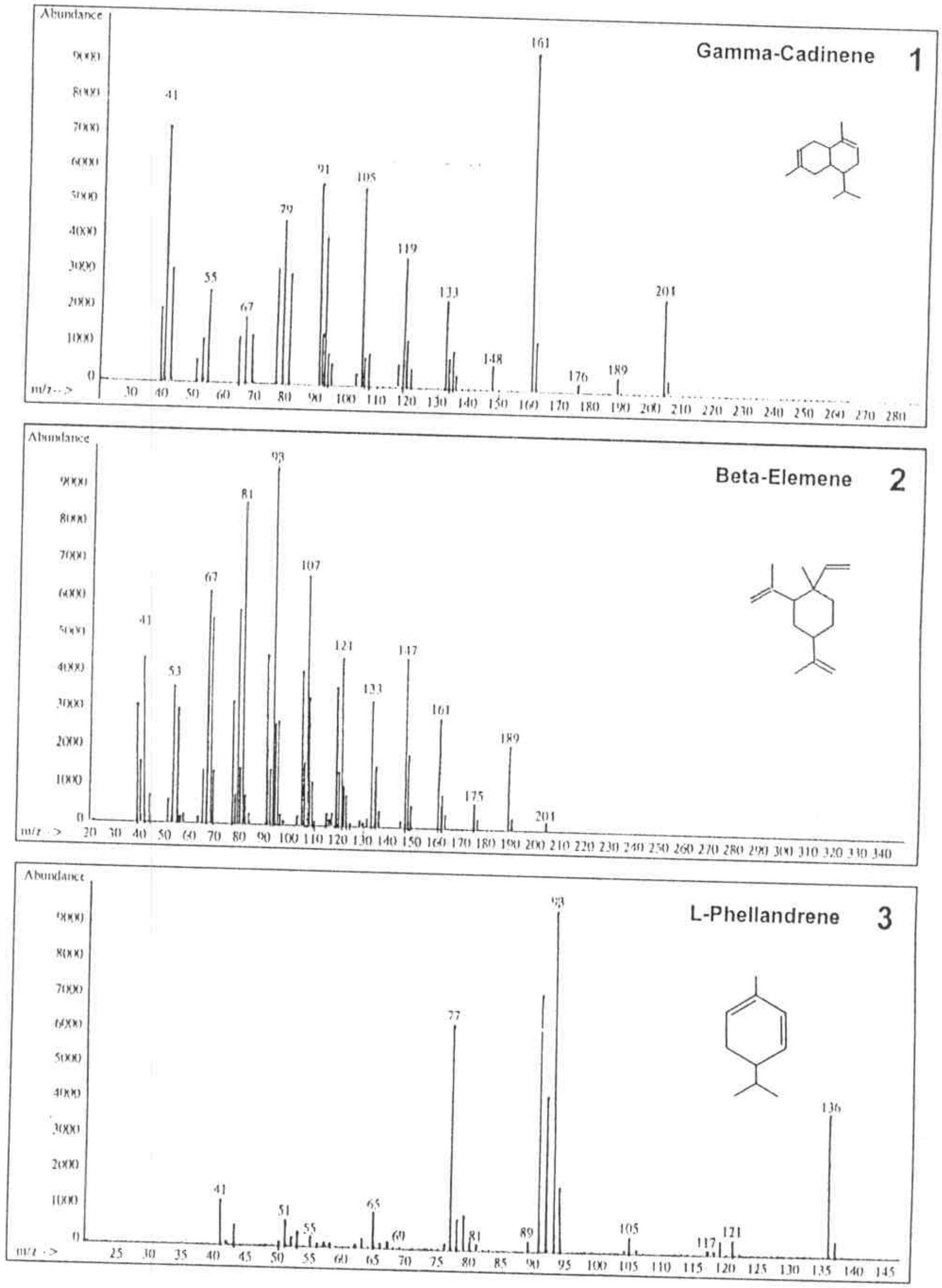
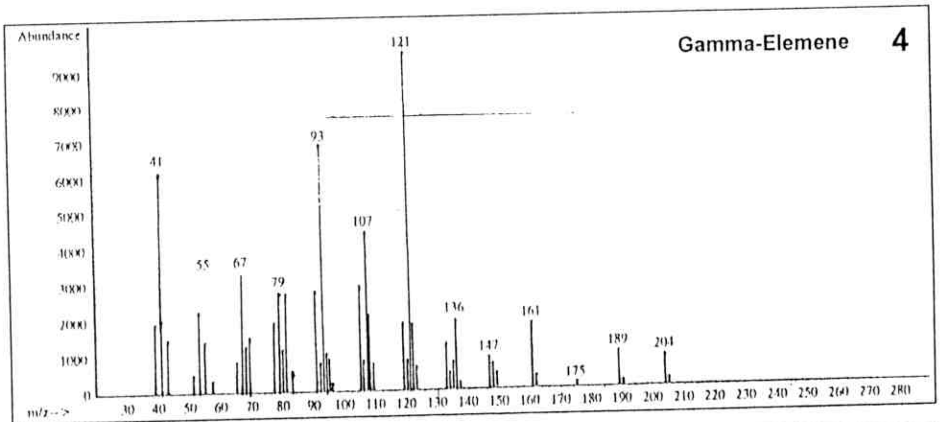
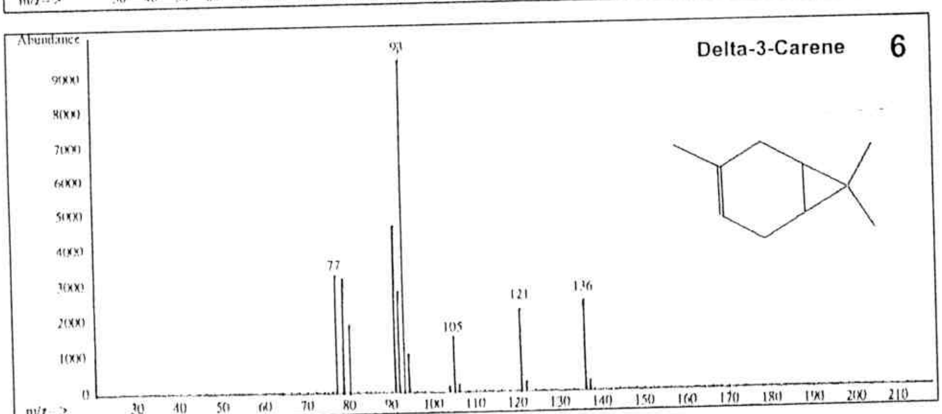


Fig. (62): GC/MS of compound (1, 2 and 3) of *Schinus terebinthifolius* essential soil.





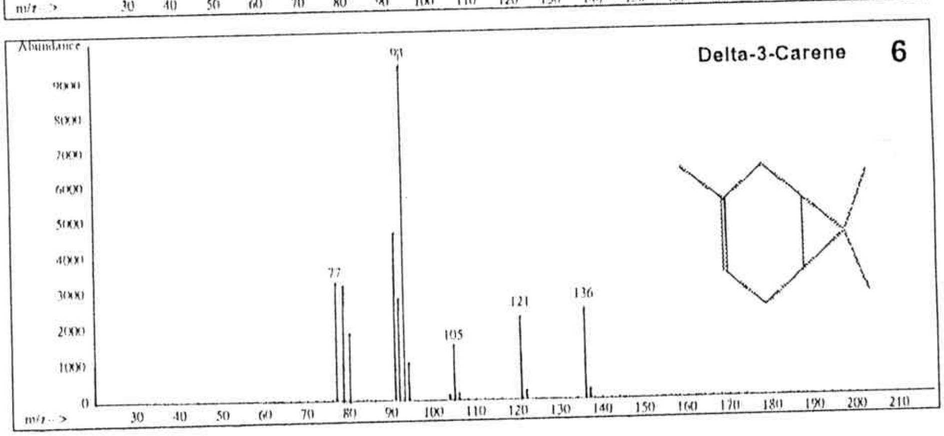


Fig. (63): GC/MS of compound (4, 5 and 6) of *Schinus terebinthifolius* essential soil.

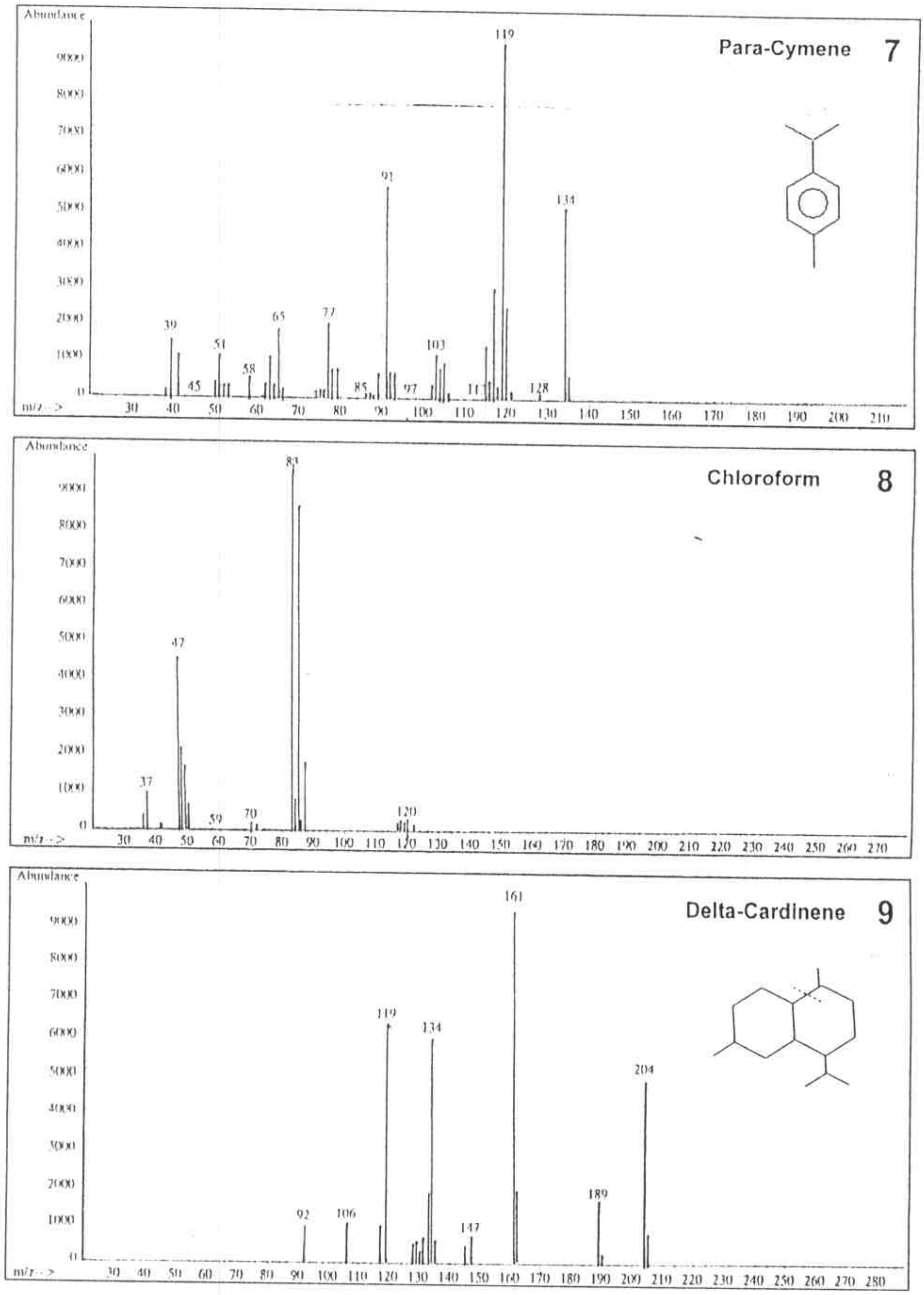


Fig. (64): GC/MS of compound (7, 8 and 9) of *Schinus terebinthifolius* essential soil.

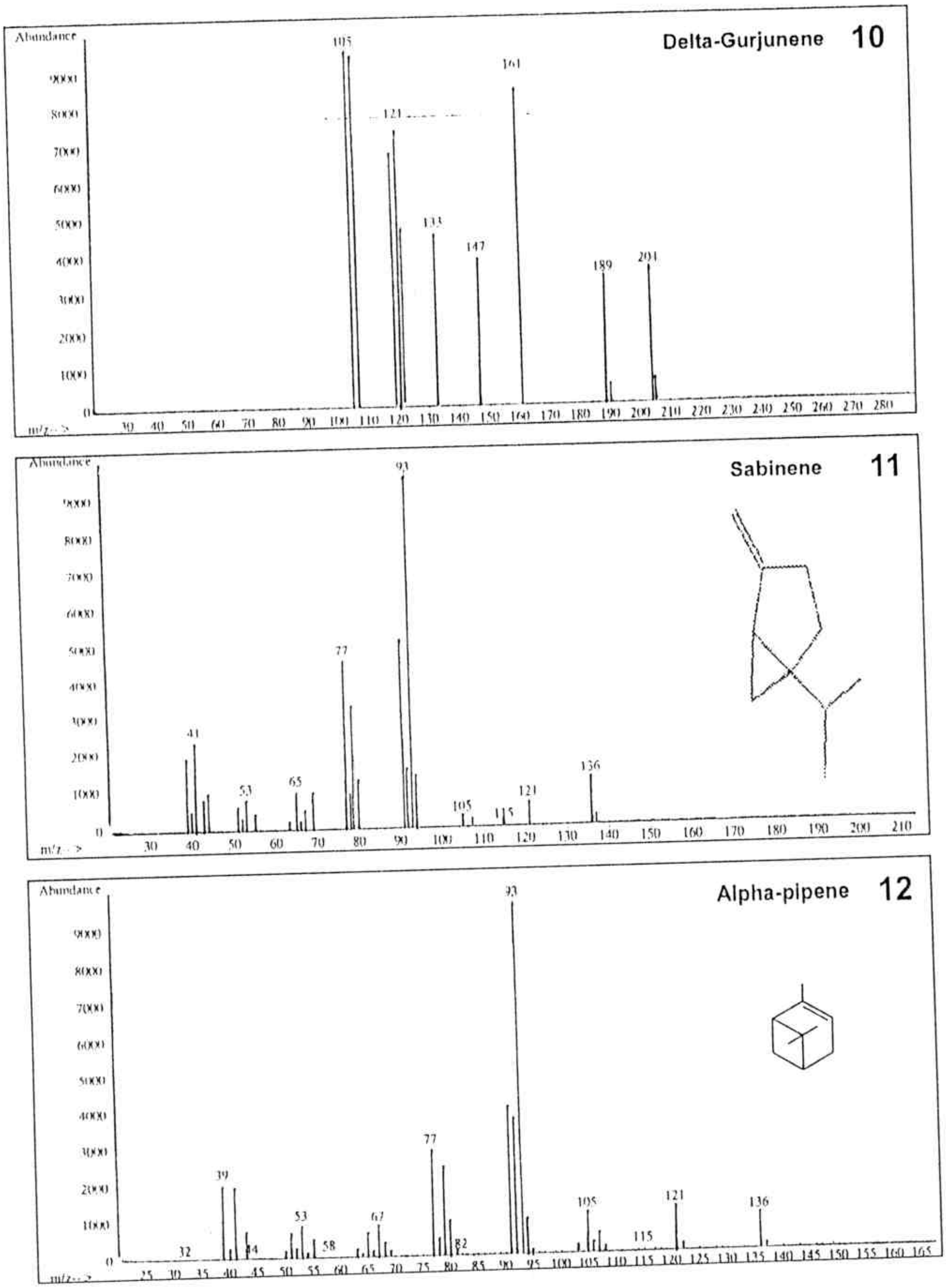


Fig. (65): GC/MS of compound (10, 11 and 12) of *Schinus terebinthifolius* essential soil.

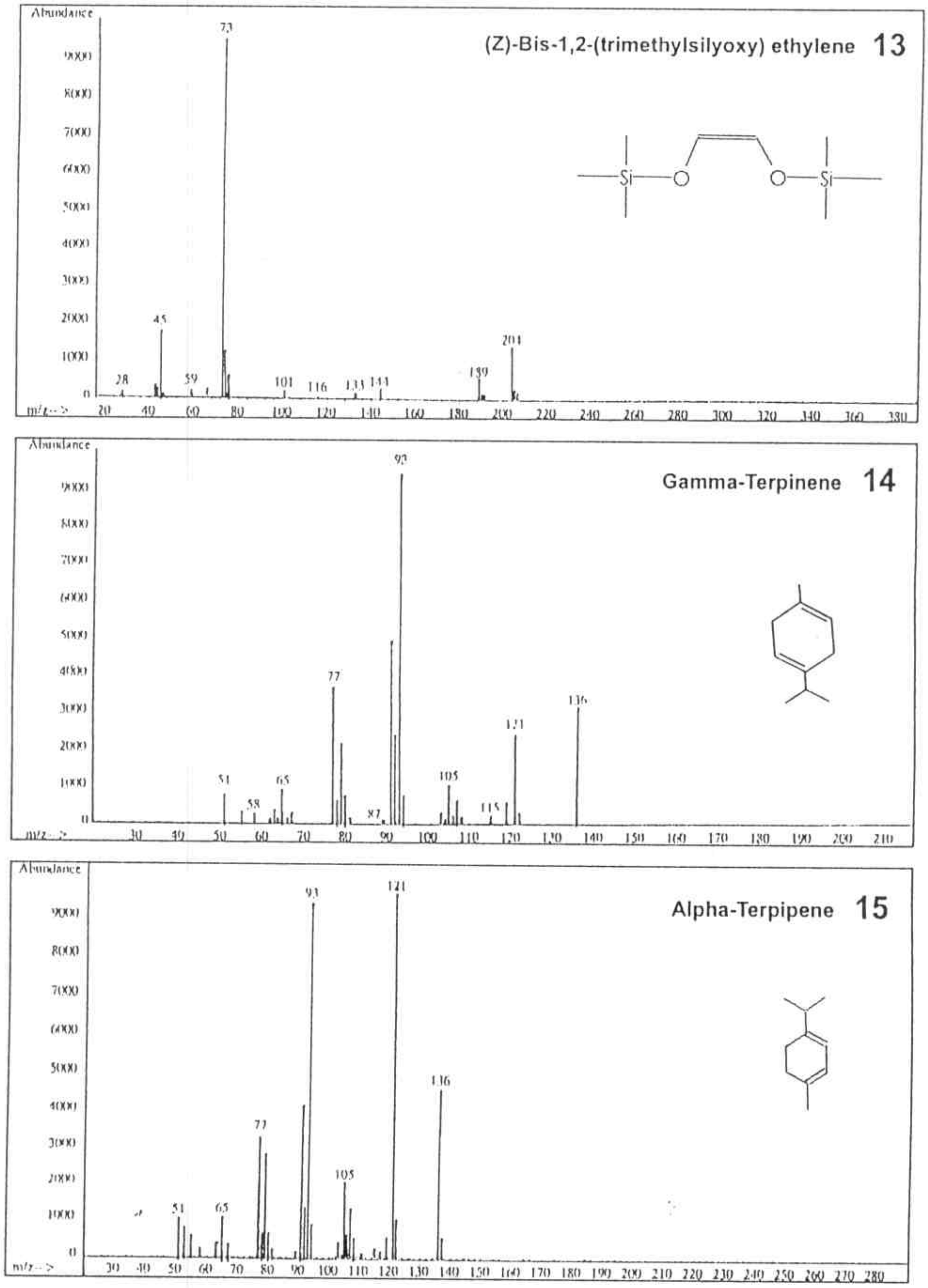


Fig. (66): GC/MS of compound (13, 14 and 15) of *Schinus terebinthifolius* essential soil.

constituent in this oil (13.16) followed by beta –elemene (12.13), 1- phellandrene (10.54) gamma –elemene (7.64), beta –pinene (7.32), delta -3 carene (4.93).

V-Effect of five components of essential oils of *Thuja* and *Schinus* on *S. oryzae* adults and on treated grains

More advanced experiment were carried out to determine the effect of the most five components present in essential oils against *S. oryzae* as a repellent and also their effect on wheat grains.

V.1-Repellent effect on *S. oryzae*

Data on the repellent effect of cedrol , B pinene, α phyllanderene, α pinene on the adults of *S. oryzae* are in Table (53). Five concentrations of each of the five components were tested. The percentages of repellency after 3,7, and 15 days were recorded. Also the reduction in F1 progeny was estimated . Data revealed that all the fives essential oil constituents exhibited biological activity. Namely repellency against *S. oryzae* adult more than that in control. Cedrol either at 500 or 250 ppm ocuppied the first class in repelling *S. oryzae* adults. The concentration at 500 ppm showed excellent repellency, 100 % after 3 days and continued up to 15 days from the treatment. The repellency percentages depended on the kind of components and its concentration. The cedrol at 250 ppm gave 93.3 % repellency.

The second effective repellent component was α phyllanderene causing repellency varied between 9.8 % at the lowest concentration to 86.7 % at highest one. α pinene occupied the third order driving away between 20.2 to 79.8 % followed by trans – caryophyllene which caused repellency percent ranged

Table (53)Effect of different essential oil on repellency and reduction in F1 progeny of the rice weevil adults (*Sitophilus oryzae* L.)

Compound	Conc.	No. of adult used	% repellency after exposure days			No. of Emerged Adults after 45 days	Reduction in F1 progeny %
			3	7	15		
(±)- Cedrol	500	25	100.0	100.0	100.0	30±1.1	68.0
	250	25	93.3	93.3	93.3	23±2.5	77.0
	125	25	73.3	73.3	73.3	19±2.0	80.0
	62.5	25	45.3	45.3	45.3	30±0.3	67.0
	31.25	25	26.7	26.7	26.7	37±0.2	66.0
(-)-B pinene	500	25	60.2	53.4	53.4	20±2.0	79.0
	250	25	53.3	40.9	40.9	33±1.5	63.0
	125	25	33.3	29.8	29.8	39±3.0	60.0
	62.5	25	26.7	20.1	20.1	40±1.9	58.0
	31.25	25	13.3	10.3	10.3	55±1.3	42.0
α -phellamdrene	500	25	86.7	86.7	70.11	19±0.1	80.0
	250	25	66.7	66.7	58.8	25±2.0	76.0
	125	25	53.3	53.3	40.1	20±2.5	78.0
	62.5	25	33.3	33.3	20.3	27±3.1	72.0
	31.25	25	16.8	16.8	9.8	30±3.1	68.0
(-)-trans-caryo-phyllene	500	25	69.3	69.3	69.3	25±0.3	73.0
	250	25	46.8	46.8	46.8	18±0.3	80.0
	125	25	26.2	26.2	26.2	30±2.1	68.0
	62.5	25	20.1	20.1	20.1	30±0.3	70.0
	31.25	25	12.7	12.7	12.7	22±1.3	78.0
α-pinene	500	25	70.5	79.8	79.8	39±2.1	60.0
	250	25	61.3	67.3	67.3	30±4.2	69.0
	125	25	50.1	60.9	60.9	37±3.1	62.0
	62.5	25	37.6	40.2	40.2	40±2.0	59.0
	31.25	25	20.2	33.1	33.1	40±4.0	58.0
control	**0.0**	**25**	**0.0**	**0.0**	**0.0**	**89±0.1**	

from 12.7 to 69.3 %.β pinene was the weakest component among the essential oils extracted from *Thuja* or *Schinus* recording between 10.3 to 60.2 % percentage of repellency.

There was no evidence of relation between different constituents or different concentration and the reduction of F_1 progeny. There were fluctuations in the reduction of F_1 progeny. Most probably, resulted from other factors not related to the investigated parameters.

The previous data led to the conclusion that the constituents of essential oils have profound repellentt effects on insects. Among the five constituents cedrol is certainly the most active one as a repellent. cedrol is in need to further study.

V.2-Effect of tested essential oil isolated from *Thuja orientalis* and *Schinus terbenthifolius* oil on germination of wheat grain stored for 8 weeks

Germination of wheat grains treated with the used essential was highly affected as exhibited in Table (54).

The reduction in grains germination was most apparent at high concentration of 500 ppm which recorded 56.66, 31.11, 45.55 ,53.33 and 8.88 with (+)- cedrol, β pinene, α phellandrene, trans caryophllene and α pinene respectively. Although reduction of germination percentages decreased after 8 weeks of storage in the treated grains with the tested oil which recorded 82.22, 52.22, 71.11, 77.77, 34.44 at 500 p.p.m with the same compounds respectively compared with the control which gives a value of 97.77%.

Data in Table (54) indicated that α pinene was the highest material causing the highest reduction in germination ,28.88 % at 500 p.p.m compared with the control 93.21 %. After the

Table (54): Residual effect of volatile materials on wheat grain germination percentage

Period weeks	Conc. ppm	(±)-Cedrol		(-)-Pinene		αphellandrene		(-)-trans-caryophllene		αpinene	
		Germination %	Germination rate	Germination %	Germination rate	Germination %	Germination rate	Germination %	Germination rate	Germination %	Germination rate
Initial	500	56.66	60.78	31.11	70.23	45.55	76.42	53.33	67.36	28.88	67.94
	250	68.88	70.43	52.22	62.22	53.33	67.36	63.33	69.59	51.11	63.04
	125	70.00	67.19	55.55	64.66	60.00	72.22	75.55	68.13	56.66	65.35
	62.5	76.66	66.18	64.44	68.96	71.11	71.87	76.66	67.63	66.66	67.77
	31.25	77.77	70.47	70.00	67.72	75.55	68.62	86.66	66.23	67.77	67.75
	Control	**93.21**	**67.06**	**93.21**	**67.06**	**93.21**	**67.06**	**93.21**	**67.06**	**93.21**	**67.06**
8 weeks	500	82.22	66.21	52.22	65.30	71.11	68.22	77.77	68.09	34.44	71.11
	250	85.55	67.09	62.22	66.66	72.22	70.90	84.44	67.98	40.00	67.59
	125	87.77	68.35	68.88	67.20	80.00	67.12	86.66	65.35	58.88	69.81
	62.5	98.88	67.04	76.66	65.70	83.33	65.72	90.00	67.48	76.66	69.08
	31.25	100.00	66.66	78.88	68.54	87.77	67.51	97.77	66.66	82.22	67.11
	Control	**65.90**	**65.90**	**65.90**	**65.90**	**65.90**	**65.90**	**65.90**	**65.90**	**65.90**	**65.90**

storage of the treated grains for a period of 8 weeks it recorded a reduction in germination of 34.44%
at the same concentration of 500 ppm while it was 97.77 % in the control test.

On the other hand (+) – cedrol essential oil has the lowest in its effect on the grain germination it recorded 56.66 % at a concentration of 500 ppm concentration initially and 82.22 % at the same concentration after storage the treated grain for a period of 8 weeks. The reduction in the grain germination low effect of some products after the storage of the treated grain may be explained by the degradation of some of these unstable volatile compounds. These materials can be consider as potential pesticides to be used to protect the wheat grain. Namely, those which demonstrated un significant effect on germination.

V.3- Effect of different essential oil on the chlorophyll content of seedlings wheat grain

Table (55) showed that essential oil decreased the amount of chlorophyl at the initial time. This effect increased with the increase in the concentration. Although these of chlorophyll content levels increased after 8 weeks of storage of the grains. The stored wheat grains recorded a chlorophyll content of 12.73, 23.03, 14.50, 20.56 and 20.66 when treated with a concentration of 500 ppm with cedrol, β pinene, α phellandrene, trans caryophyllene and α pinene, respectively.

VI-Effect of saponifiable and unsaponifiable fraction of *Glycine hispida* and *Aptenia cordifolia* on the mortality of *A. ipsilon* larvae and the adults of *S. oryzae*.

The extract of *Glycine* and *Aptenia* were fractioned to saponifiable and un saponifiable in an attempt to examine the

Table (55): Effect of volatile materials on the chlorophyll content of wheat shoots.

Period week	Conc. p.p.m	Chlorophyll content				
		(±)-cedrol	(+)-B Pinene	α phellandrene	(-)-trans-caryophyllene	α pinene
Initial	500.0	12.33	20.70	12.86	18.6	19.93
	250.0	11.80	22.30	23.10	21.2	23.50
	125.0	19.53	22.93	23.80	23.13	26.86
	62.50	27.13	23.73	26.50	25.8	28.53
	31.25	29.43	25.26	28.6	26.7	30.93
	Control	58.21	58.21	58.21	58.21	58.21
8 weeks	500.0	12.73	23.03	14.50	20.56	20.66
	250.0	16.93	23.26	22.86	23.60	21.80
	125.0	19.76	24.50	24.20	25.43	23.90
	62.50	29.03	25.66	27.26	25.53	26.66
	31.25	30.4	29.86	29.33	27.06	27.73
	Control	65.13	65.13	65.13	65.13	65.13

toxic effect of the oily compounds and the non oil compounds of the extracts. The toxicity of these two fractions were examined on the 4th instar larvae of *A. ipsilon* and the adults of *S. oryzae.*

Data in Table (56) showed that the sap. fraction has higher effect on the two tested insects. The adults of *S. oryzae* were more suseceptible to *Glycine* fractions than the larvae of *Agrotis ipsilon* .Data in the formentioned table indicated that the 1000 ppm concentration of *Glycine* caused 100 % mortality after 3 days of treatment of larvae while it was 97.5% and 98.5 % mortality after 24 and 48 h. of treatment, respectively. The concentration of 500 p.p.m of the sap fraction gave initial kill of 80.2% and increased to 82.5 % after 3 days.

The initial kill after the treatment with a concentration of 250 ppm of *Glycine* sap. fraction was 60.4 %. This value of mortality increased to 75.3 % and 77.1 % after 48 h. and 72 h., respectively.

Sap and unsap fraction of *A. codifolia* were very low in its effect on the larvae of *A. ipsilon*. The highest recorded mortality was 46.7 % after 3 days of treatment with sap. fraction a concentration of 1000 ppm.

Concerning the effect on the adults of *S. oryzae,* the sap. fraction was more effective than the unsap one. Using *Glycine* extract, 100 % initial mortality was recorded after the treatment with a concentration of 1000ppm. The mortality was decreased by lowering the concentration, as well as by prolonging the exposure period.

In general sap. or unsap. fraction of *A. codifolia* show moderately toxic effect. The mortality did not exceed 60.2 % after the treatment with 1000 p.p.m of unsap fraction after 15

Table (56): Percentage mortalities resulted from exposing 4th larval instar of Agrotis ipsilon and adults of Sitephilus oryzae to different extraction.

Insects		*Agrotis ipsilon*							*Sitophilus oryzea*					
Plants	Conc. ppm	Sap			Unsap			Conc. ppm	Sap			Unsap		
		% mortality			% mortality				% mortality			% mortality		
		24h.	48h.	72h±S.E	24h.	48h.	72h±S.E		3 days	7days	15days ± S.E	3 days	7days	15days ± S.E
Glycie hispida	1000	97.5	98.5	100±0.0	27.5	30.0	42.5±0.5	1000	100	100	100±0.0	55.13	60.2	60.2±0.2
	500	80.2	82.5	82.5±0.3	20.3	23.4	30.1±0.4	500	65	77.5	87.5±0.6	40.2	50.1	55.0±0.3
	250	60.4	75.3	77.1±0.4	12.5	17.5	23.2±0.1	250	55.15	72.5	77.5±0.3	23.4	35.7	40.9±0.1
	125	35.5	52.5	60.0±0.4	8.2	11.71	20.1±0.2	125	50.2	67.5	73.5±0.5	12.5	27.5	45.0±0.2
	62.5	27.5	33.3	47.0±0.2	5.3	7.5	17.5±0.6	62.5	41.2	53.9	60.1±0.2	9.18	20.7	33.0±0.5
Aptenia cordifolia	1000	26.7	40.2	46.7±0.1	22.03	25.13	31.8±0.1	1000	49.4	53.4	57.8±0.2	40.2	53.3	60.2±0.1
	500	20.1	33.3	35.2±0.6	19.94	21.1	24.73±0.2	500	23.8	26.8	30.2±0.5	33.3	43.3	53.3±0.2
	250	17.5	20.3	22.0±0.3	11.7	13.8	20.0±0.6	250	20.1	25.9	26.7±0.3	30.2	33.1	46.7±0.5
	125	10.2	15.2	17.3±0.2	7.69	9.5	12.67±0.1	125	12.1	17.5	22.0±0.6	13.3	13.3	26.7±0.6
	62.5	5.33	8.5	12.1±0.3	5.1	8.6	8.6±0.1	62.5	6.7	9.22	13.3±0.1	9.22	10.12	15.7±0.6
control	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Values are means (± SE) N =3

days from the treatment. The other concentrations of sap. and unsap. fraction were low in mortality percentage in the case of sap. Fraction. The mortality was moderate in the highest three concentrations of 1000,500 and 250 ppm. Although the case of unsap. fraction was low in mortality with the lowest concentrations of 125 and 62.5 ppm.

V.II-Chemical analysis and identification of fatty acids of *Glycine hispida*

Petroleum ether extract of *Glycine hispida* was fractionated to sap. and unsap. fractions. The free fatty acids were liberated from known weight of pet. ether extracts. The liberation of fatty acids was carried out according to **Kinsella (1966).**

The resulting fatty acids were separated using GLC (Gas liquid chromatography) then identified by comparing their relative relention time (R.R.T) with those of authentic. The relative percentage of each fatty acid was calculated. Table (57) and Figure (67) illustrated that the Myristic acid was the predominant unsaturated Fatty acid in the composition of *Glycine hispida.* With a percentage of (60.691 %), followed by stearic acid with concentration of (24.258 %). Other Fatty acids were identified namely lauric acid, palmitoleic acid. Traces of other acids like linoleic acid, caproic acid and caprylic were determined.

V.III-Effect of *Aptenia cordifolia* ethyl acetate extract fraction on larvae of *Agrotis ipsilon* and adults of *Sitophilus aryzae* and *culex pipiens*

Ethyl acetate extract of *A. cordifolia* was the most effective in the preliminary tests. Among all the other tested

Table (57). GLC analysis of fatty acid methyl esters of *Glycin hispida*

Peank No.	Fatty acid	Type	Concentration (%)	RRt.*
1	Caproic (c6:0)	BT	0.327	3.250
2	caproic (c8:0)	BV	0.244	7.167
3	Caproic (c10:0)	VB	9.770	9.867
4	Myristic (c14:0)	BV	60.691	15.033
5	Palmitoleic (c16:0)	VB	4.239	17.517
6	stearic (c18:0)	BB	24.258	19.983
7	Linoleic (c18:2)	BB	0.471	23.750

RRt* :Rt of fatty acid relative to Rt of Palmetic acid.

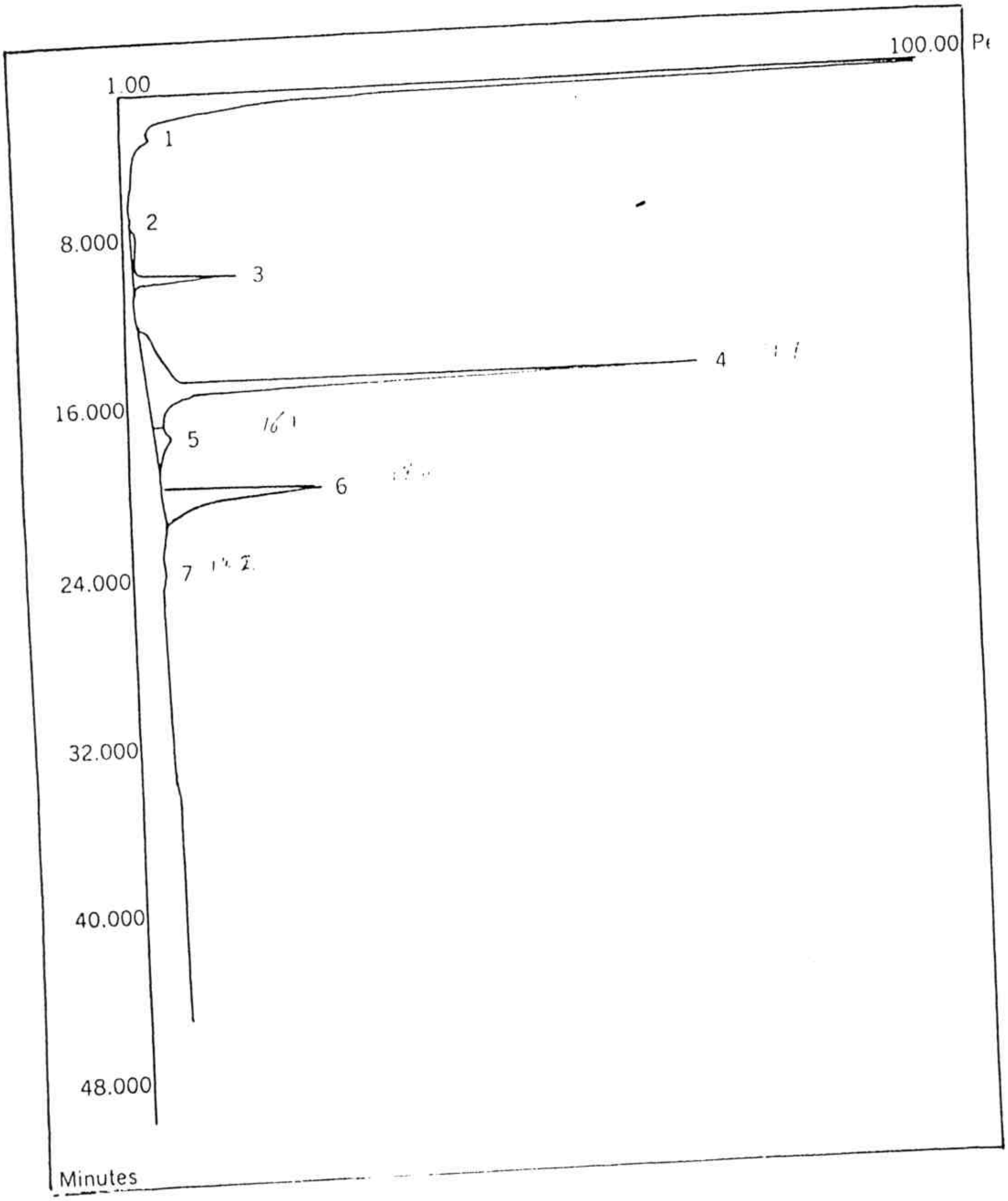


Fig. (67) : G.L.C chromatogram of *Glycine hispida* fatty acid methyl estar extract. For this reason, this extract was subjected to thin layer chromatography analysis. Ten spots were separated and appeared in these TLC plates (Fig 68-69) The above spots were checked biologically against *A. ipsilon, S. oryzae* and *Culex pipiens.*

I.X-Toxic effect of compounds separated by TLC on *A. ipsilon* larvae and *S. oryzae* adults

The ten spots or bands separated and tested on 4^{th} instar larvae and adults of *S. oryzae.* Data in Table (58) showed that six bands from ten were more effective and four of them were of weak effect. The band No. (7) was the highest one recording 94.07 % and 89.15 % mortality for the larvae of *A. ipsilon* and the adults of *S. oryzae* after 3 days for the first and 15 days for the second, respectively. Records of mortality of the different spots are shown in Table 58.(GC/MS) analysis of band No. 7 (Fig 70-79).

I.X.1-Toxic effect of compounds separated by TLC on *Culex pipiens:-*

Table (59) indicate the results of the effect *Aptenia cordifolia* bands on the larvae of *Culex pipiens.*

Regarding the susceptibility of these insect larvae to low concentrations. Isolated bands were checked against the larvae of *Culex pipiens*.The amount used in this experiment varied from 10 p.p.m to 100 p.p.m of separated materials. Data showed that all these bands were effective compared with control . The 6,1,7 and 9 bands were the most effective band in killing the larvae of *C. pipiens* after 24 h. These three bands with the highest used concentration 100 ppm killed all the tested larvae. The mortality percentages decreased by decreasing the concentrations of bands used.

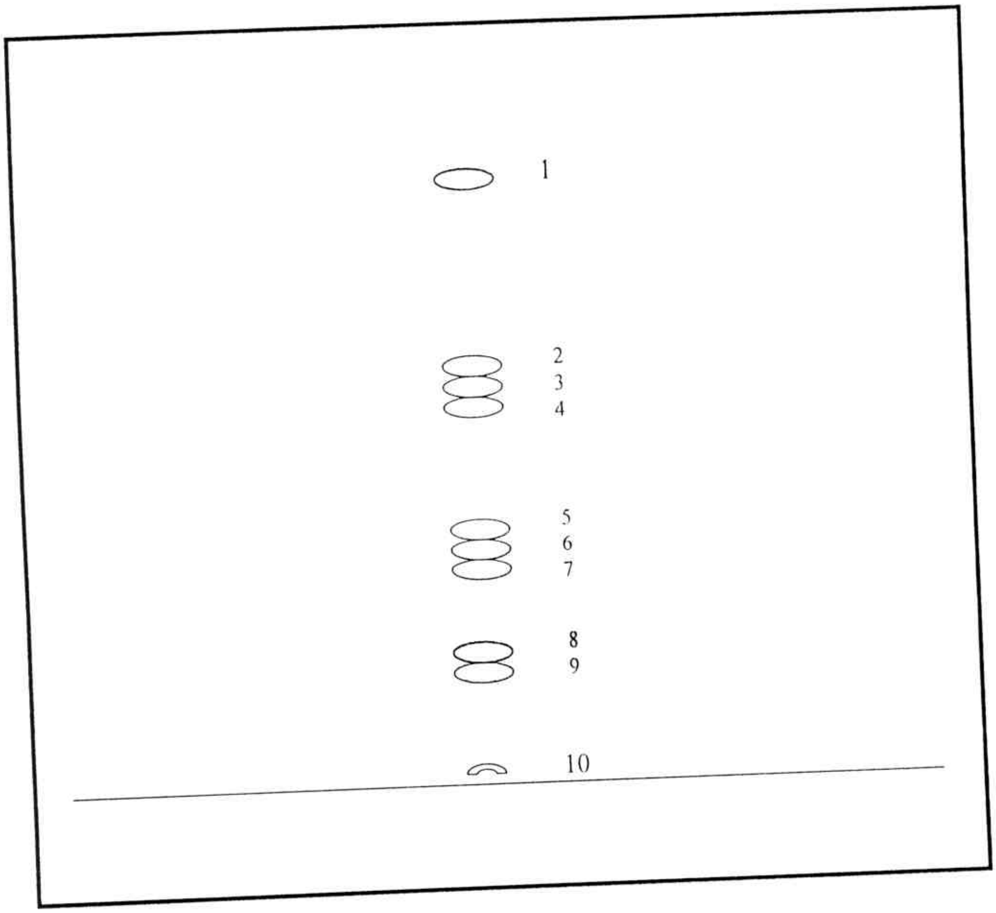


Fig (68) TLC of ethyl acetate extracts of *Aptenia crdifolia.*

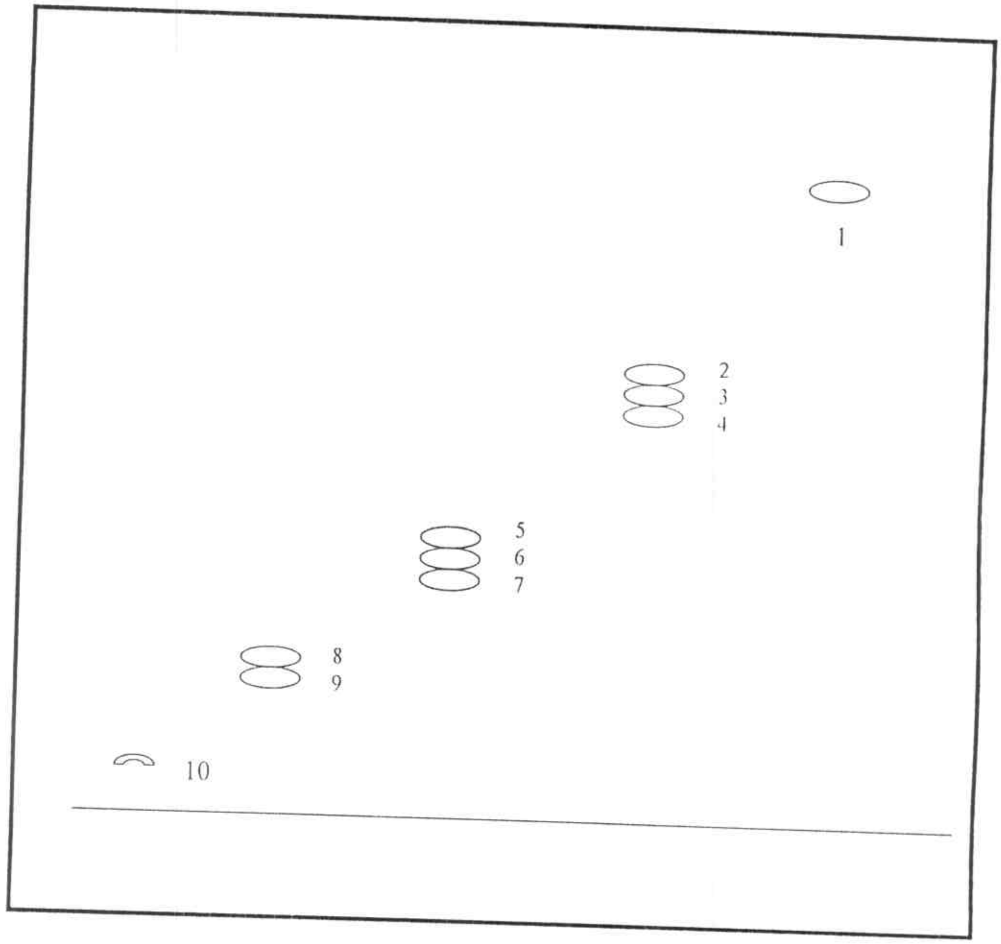
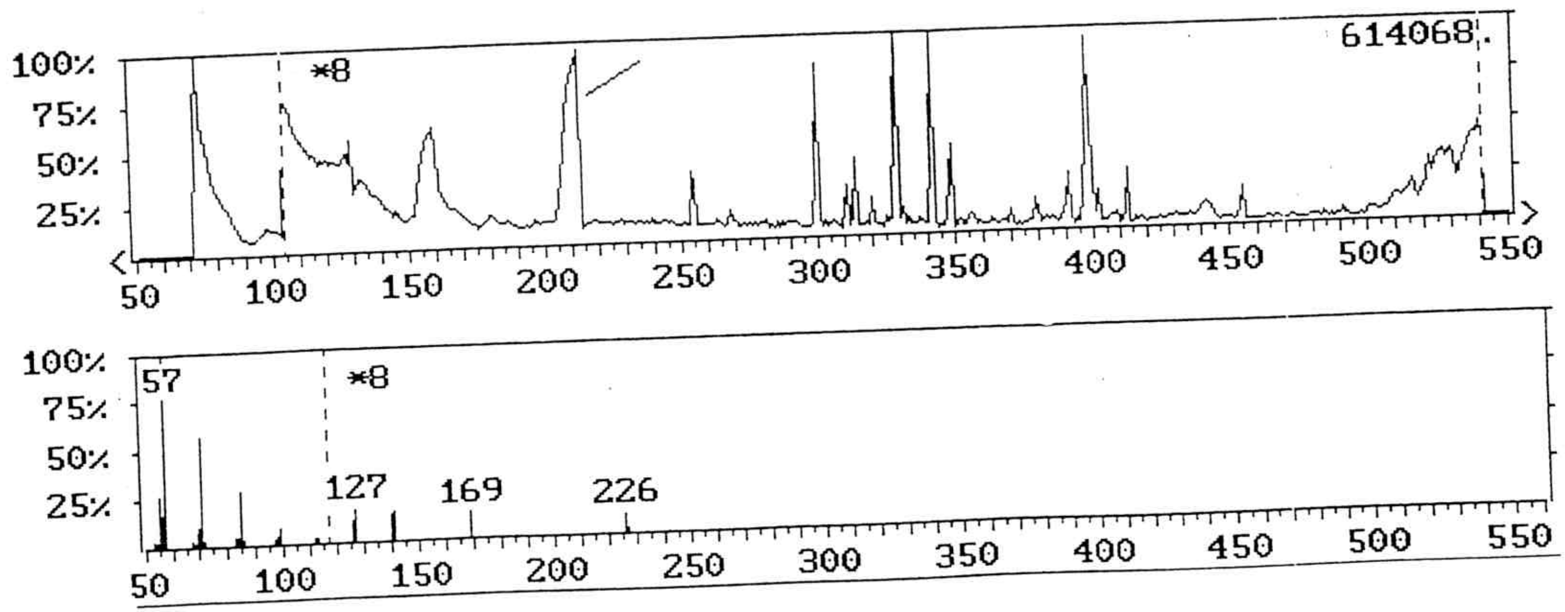
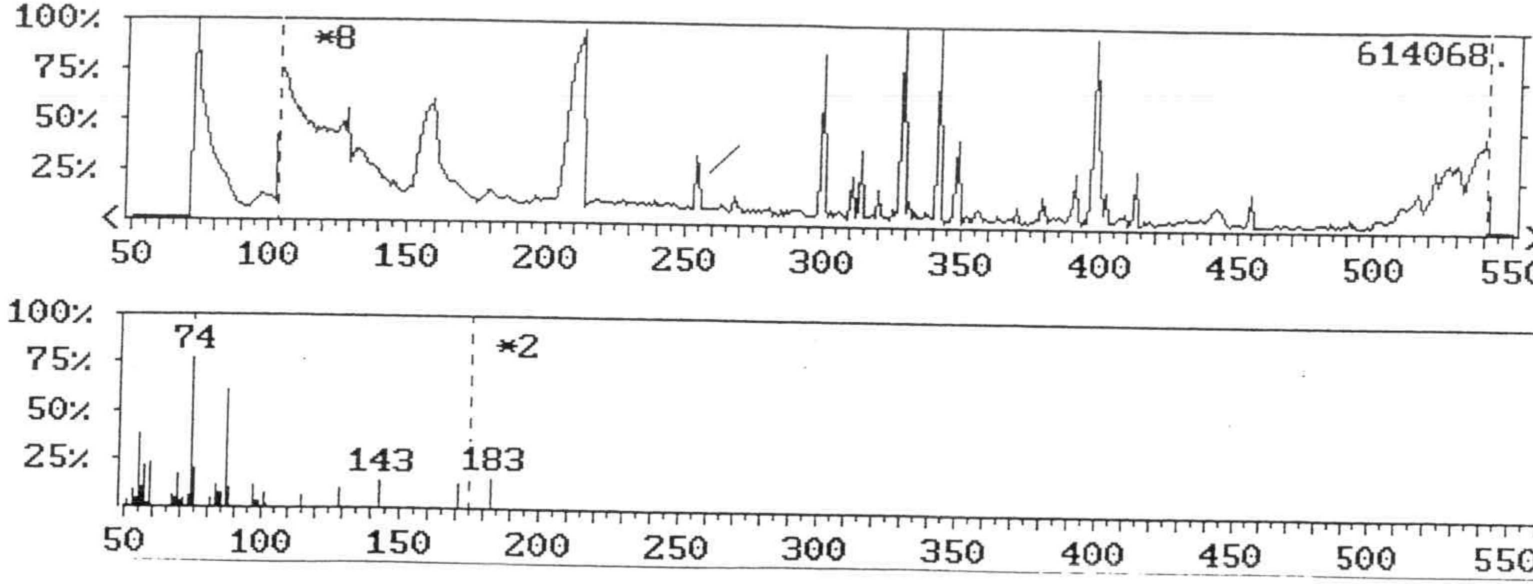


Fig (69) TLC of ethyl acetate extracts of *Aptenia crdifolia*



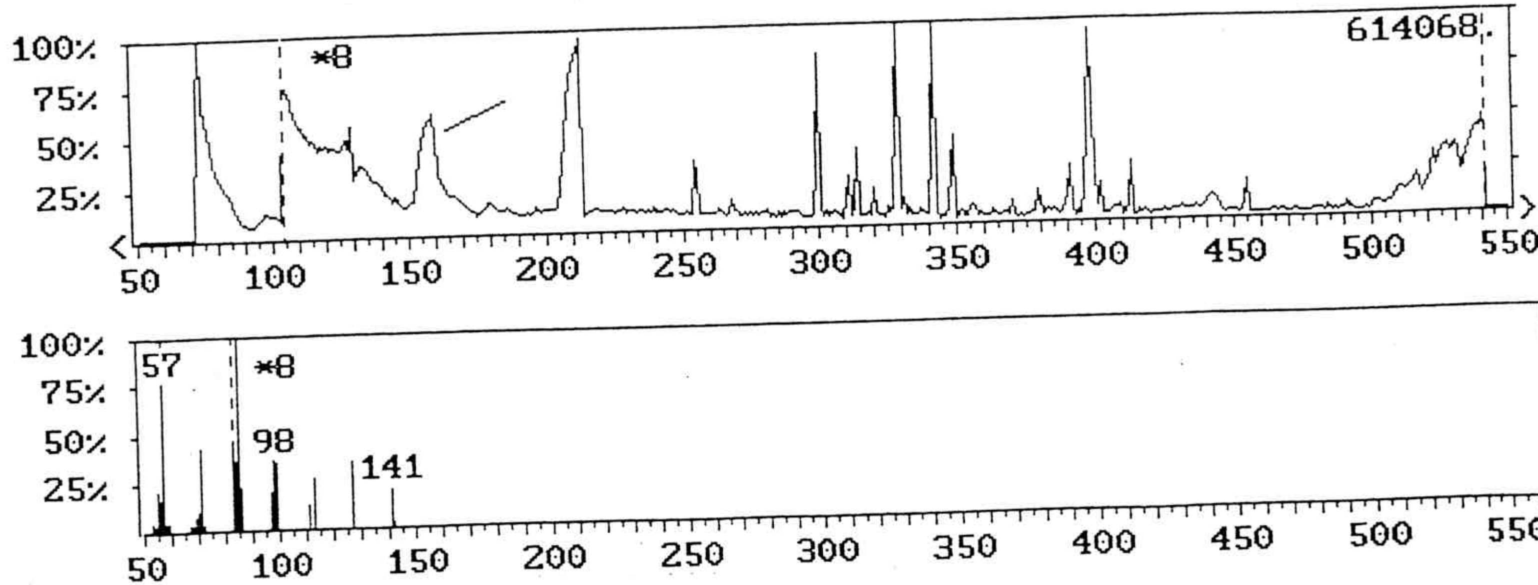
Hexadecane

Fig. (70): GC/MS analysis of *Aptenia cordifolia.*



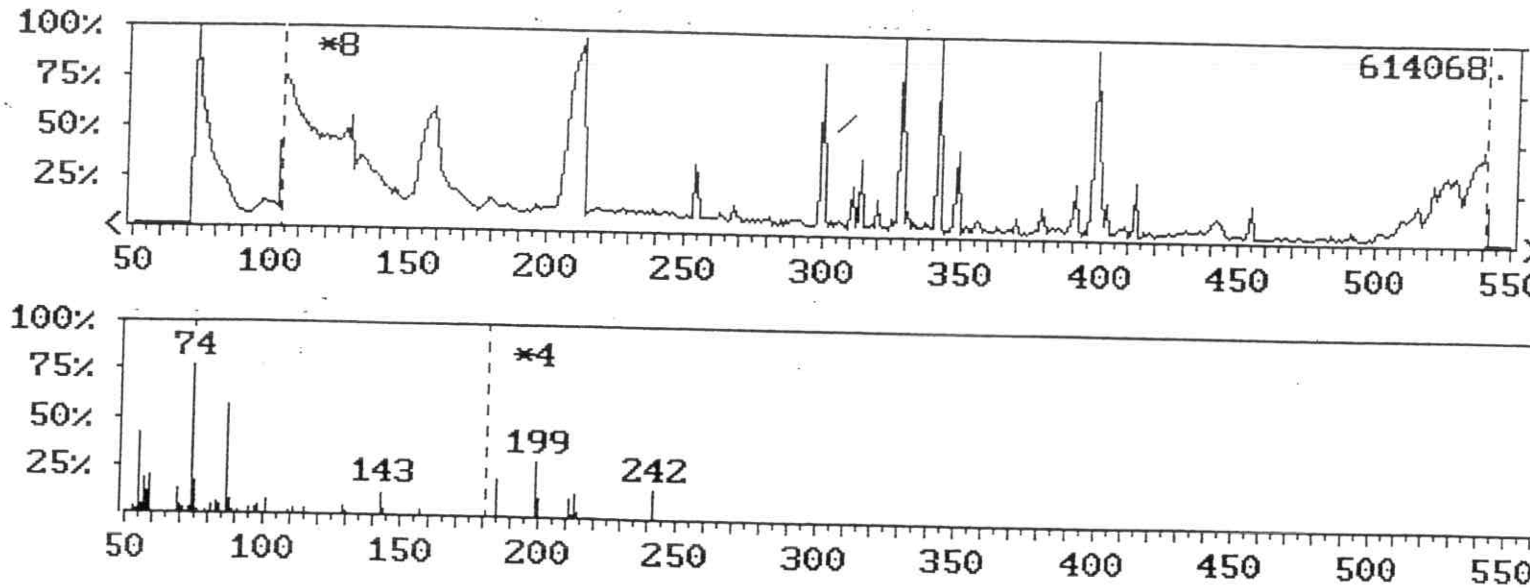
Caprate

Fig. (71): GC/MS analysis of *Aptenia cordifolia.*



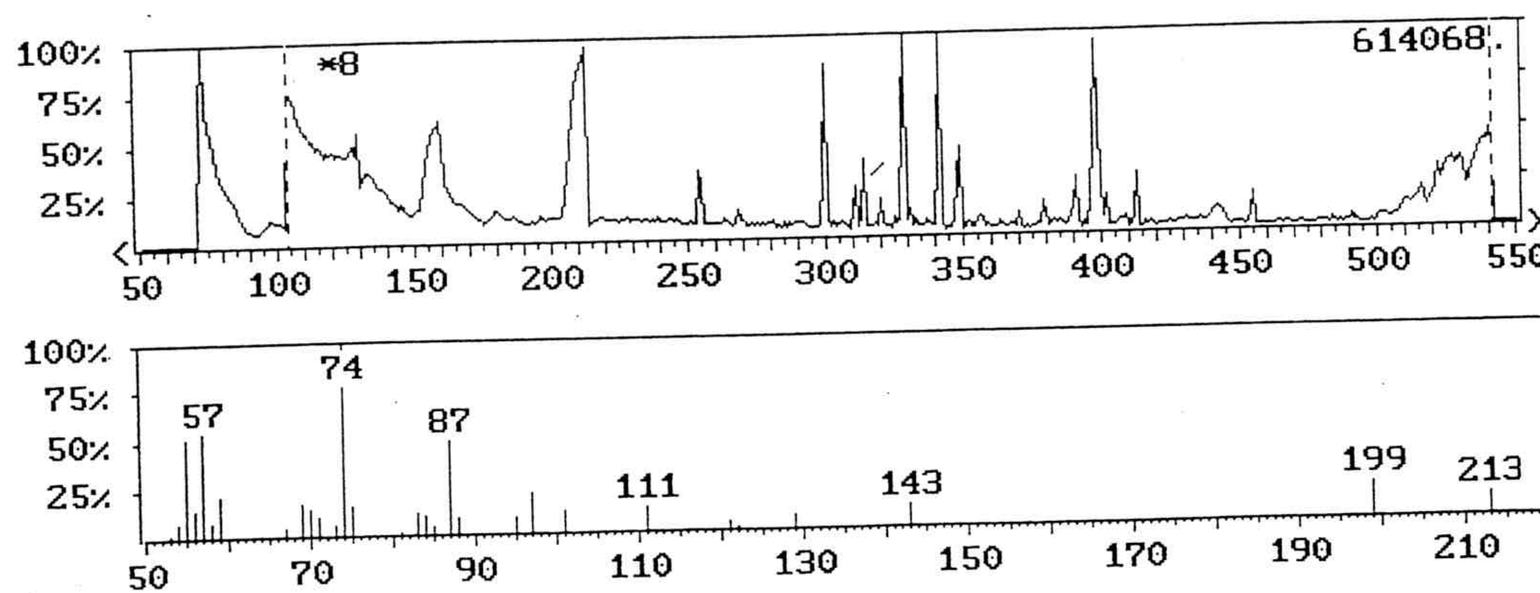
Undecanoic acid

Fig. (72): GC/MS analysis of *Aptenia cordifolia*.



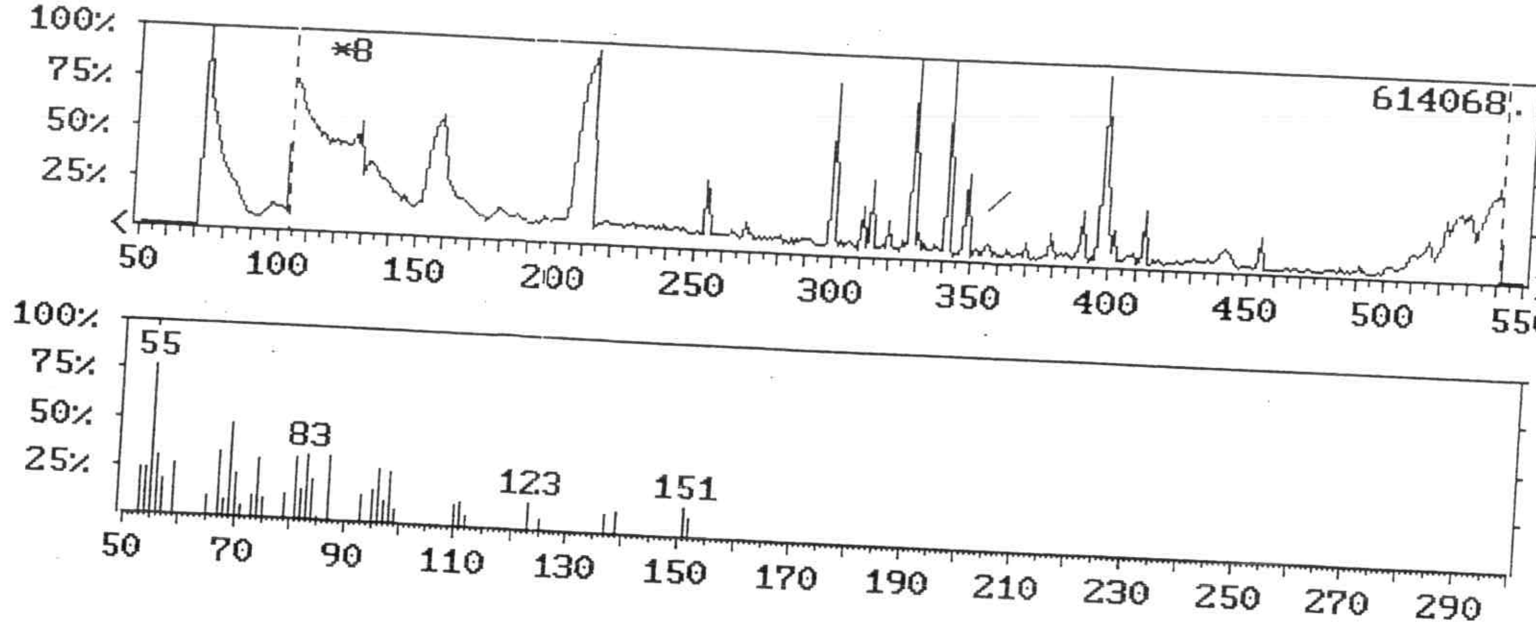
Tetradecanioc acid, methyl ester.

Fig. (73): GC/MS analysis of *Aptenia cordifolia.*



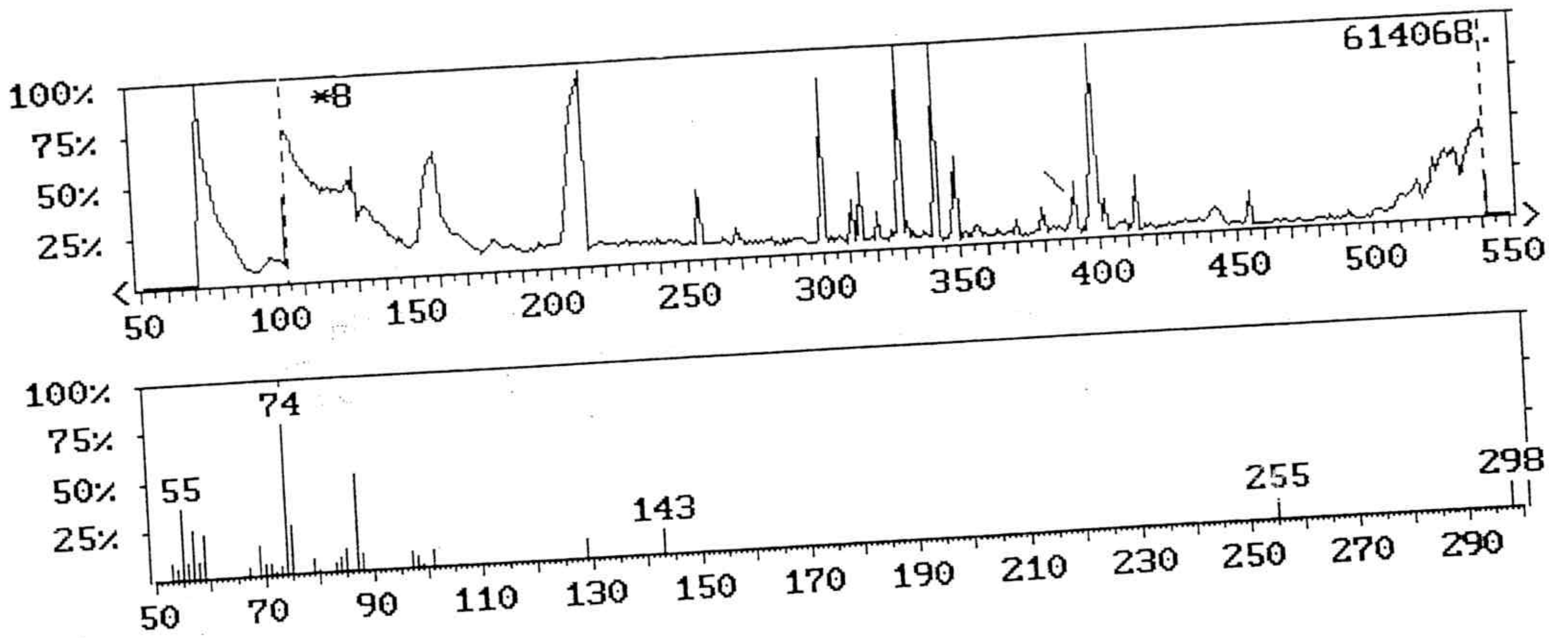
Laurate

Fig. (74): GC/MS analysis of *Aptenia cordifolia.*



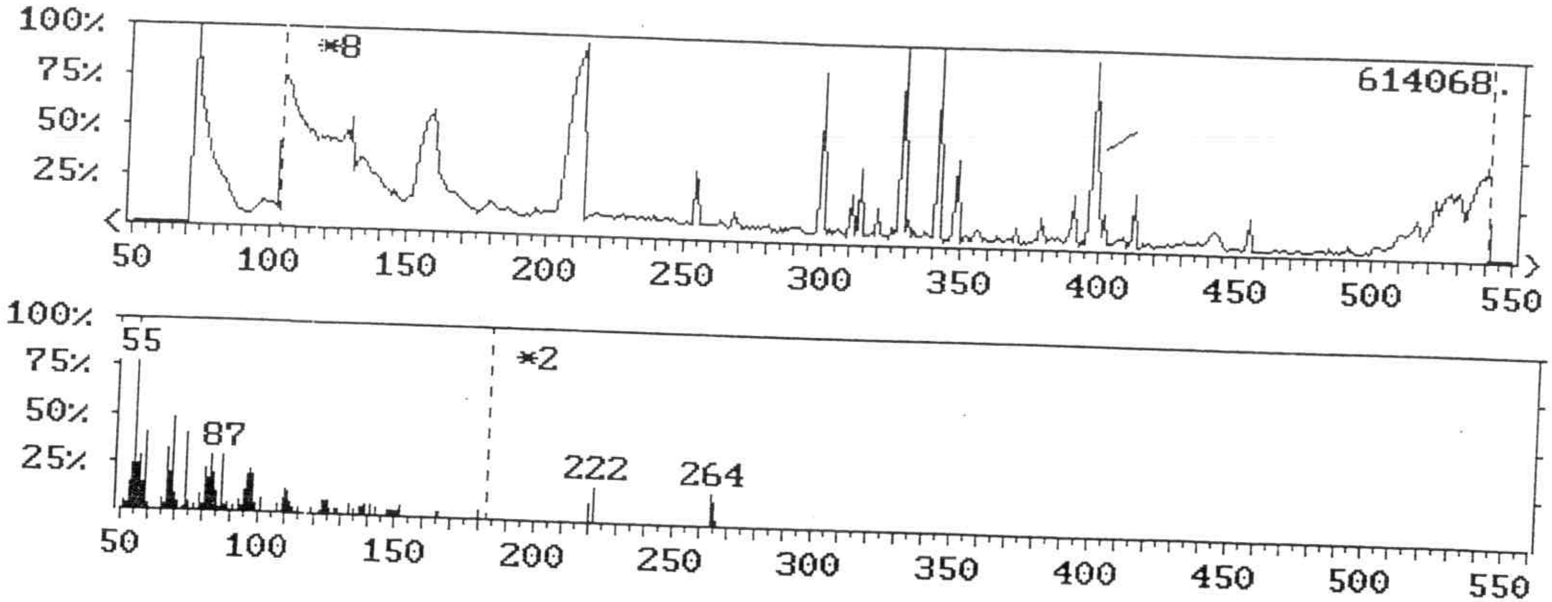
7-Nonenoic acid, methyl ester

Fig. (75): GC/MS analysis of *Aptenia cordifolia*.



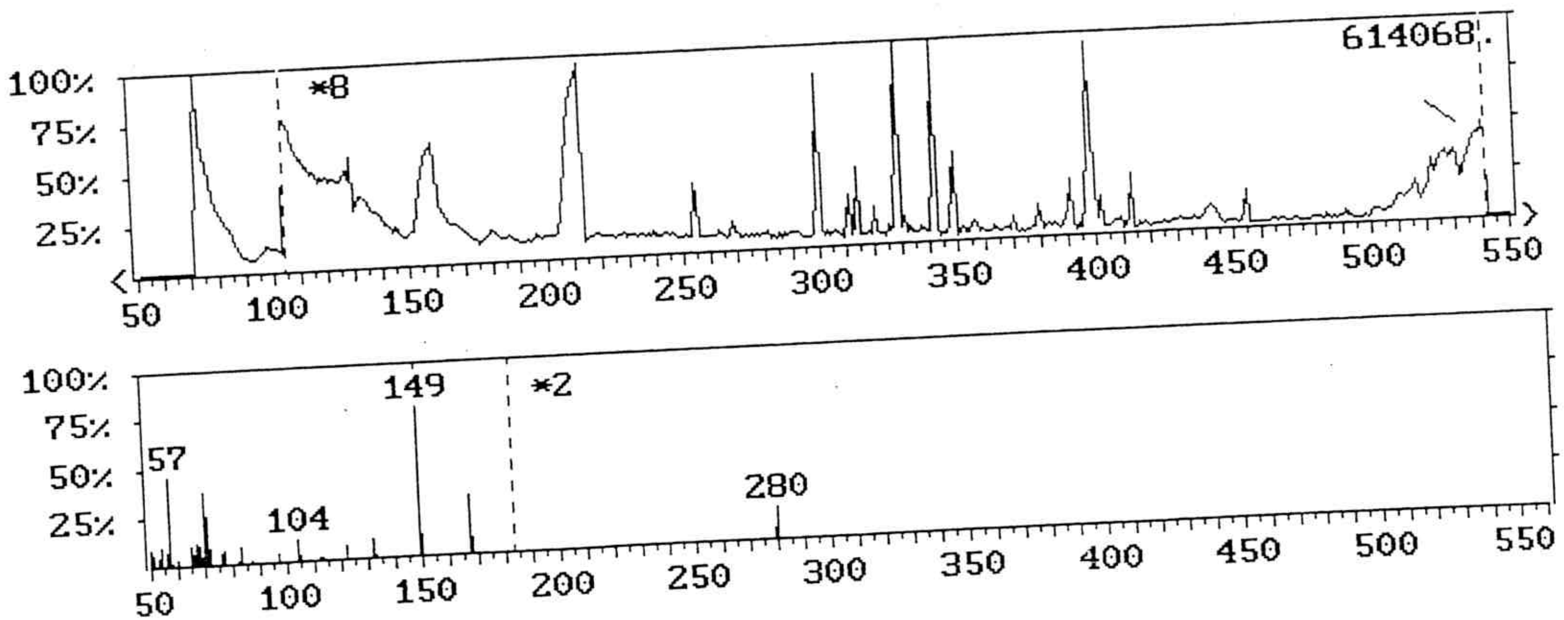
Octadecanoic acid, methyl ester

Fig. (76): GC/MS analysis of *Aptenia cordifolia.*



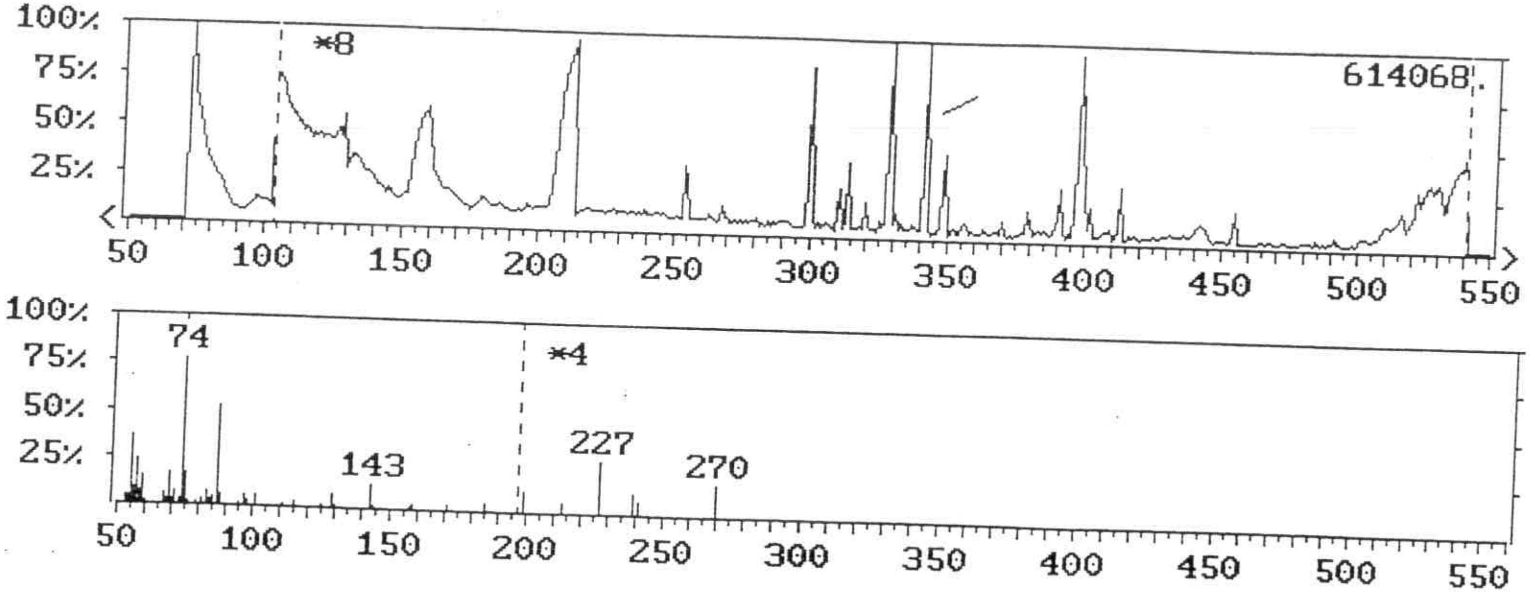
11-Hexadecanoic acid, methyl ester

Fig. (77): GC/MS analysis of *Aptenia cordifolia.*



1, 2-Banzenedicarboxylic acid, mono (2-ethylhexyl) ester

Fig. (78): GC/MS analysis of *Aptenia cordifolia.*



Pentadacanoic acid, 14-methyl, methyl ester

Fig. (79): GC/MS analysis of *Aptenia cordifolia.*

Table (58): Effect of *Aptenia cordifolia* on mortality percentages of 4th instar larvae of *Agrotis ipsilon* and adults of *Sitophilus oryzea.*

Com-pound	Conc. ppm	*A. ipsilon* 72h±S.E	*S. oryzae* 15day±S.E	Com-pound	Conc. ppm	*A. ipsilon* 72h±S.E	*S. oryzae* 15day±S.E
1	1250	80.07±0.6	78.91±1.2	6	1250	81.03±0.66	77.14±0.21
	1000	66.7±0.3	60.0±2.5		1000	67.11±0.33	66.19±0.33
	500	43.3±0.13	53.3±0.6		500	50.0±0.21	50.2±0.41
	250	36.7±0.13	46.7±0.3		250	43.3±0.10	40.0±0.31
	125	33.3±0.41	26.7±0.33		125	36.7±0.2	24.8±2.1
	62.5	23.3±0.20	20.0±1.2		62.5	30.2±0.21	13.3±1.33
2	1250	77.55±0.13	70.13±0.51	7	1250	94.07±0.33	89.15±0.2
	1000	63.3±0.0	63.42±0.33		1000	86.7±1.5	80.0±1.5
	500	43.3±2.0	46.7±0.20		500	73.3±1.3	53.13±1.25
	250	23.3±1.2	40.0±1.33		250	53.3±0.2	46.7±0.61
	125	20.0±0.3	31.7±1.10		125	40.9±0.3	20.11±0.49
	62.5	10.22±0.41	20.0±0.9		62.5	22.8±0.2	13.1±0.61
3	1250	70.72±0.41	69.5±2.5	8	1250	78.1±0.33	67.02±2.5
	1000	56.7±1.5	53.3±1.2		1000	69.15±0.23	52.33±1.2
	500	46.7±1.3	36.7±0.98		500	53.3±0.96	40.0±0.99
	250	40.0±2.5	20.0±0.0		250	26.7±0.13	35.3±0.94
	125	33.3±0.6	10.0±0.33		125	20.0±1.1	25.12±0.34
	62.5	30.0±0.33	909±0.67		62.5	13.3±1.3	10.0±0.11
4	1000	20.0±0.44	33.3±0.2	9	1000	40.0±1.5	25.9±0.9
	500	13.2±1.4	26.78±1.2		500	20.8±3.2	20.0±1.3
	250	60.7±0.1	22.5±0.51		250	13.3±1.6	10.1±0.33
	125	0.0±0.0	20.0±0.33		125	6.7±0.87	3.2±0.36
	62.5	0.0±0.0	16.7±0.2		62.5	6.7±0.36	0.0±0.0
5	1000	43.3±0.33	40.0±1.2	10	1000	15.9±0.32	5.9±2.1
	500	36.7±0.21	33.3±1.3		500	13.3±0.11	3.1±1.3
	250	30.0±0.4	30.0±1.5		250	6.7±1.21	0.0±0.0
	125	26.0±0.4	23.3±0.33		125	1.3±1.42	0.0±0.0
	62.5	23.1±0.0	11.7±0.31		62.5	0.0±0.0	0.0±0.0

Table (59): Effect of *Aptenia cordifolia* fractions on mortality percentages of 4th instar larvae of Culex pipiens.

Band	Conc. ppm	% mortality after 24h ±S.E	Band	% mortality after 24h ±S.E	Band	% mortality after 24h ±S.E	Band	% mortality after 24h ±S.E
1	100	100±0.0	4	75.3±0.22	7	100±0.0	10	75.3±0.3
	85	77.5±0.74		57.5±0.25		95.0±0.1		50.11±1.2
	70	72.5±0.56		55.0±0.65		90.0±0.2		30.14±0.1
	55	67.5±0.21		40.0±0.54		75.3±0.0		17.5±0.2
	40	50.0±0.41		35.1±0.61		50.7±0.2		17.5±0.2
	25	27.5±0.75		25.13±0.2		30.6±0.9		10.2±0.3
	10	12.5±0.35		12.2±0.41		17.5±0.1		7.32±0.1
2	100	93.1±0.31	5	82.5±0.25	8	80.1±0.8	control	00.00
	85	65.0±1.21		60.3±0.5		52.5±0.6		
	70	55.3±0.64		45.11±0.3		35.0±0.3		
	55	49.1±0.21		35.03±0.2		27.5±1.2		
	40	40.0±0.35		35.17±0.7		25.1±1.2		
	25	12.5±0.21		23.1±0.0		20.0±0.7		
	10	10.2±0.61		17.5±0.6		13.4±0.5		
3	100	85.0±2.2	6	97.5±0.2	9	100±0.0		
	85	72.5±1.3		80.0±3.0		97.5±0.2		
	70	62.5±0.80		52.5±1.2		95.3±0.2		
	55	32.7±0.22		35.1±0.1		82.5±0.4		
	40	25.3±0.17		27.5±0.2		60.1±0.3		
	25	20.0±0.33		25.13±0.1		42.5±0.6		
	10	17.5±0.76		20.1±0.9		30.0±0.1		

I.X.2-Lethal concentrations values of the bands (fractions) of *A. cordifolia* ethyl acetate extract separated by TLC

LC_{25}, LC_{50} and LC_{90} of the fractions of ethyl acetate extract of *A. cordifolia* were determined on the three test insects (*Culex pipiens* larvae, *A. ipsilon* 4th instar larvae and the adults of *S. oryzae*).

2.1- Values on *C. pipiens* 4th instar larvae

Data in Table (60) and figures (80-81) show the values of LC_{25}, LC_{50} and LC_{90} of investigated fraction of ethyl acetate extract of *A. cordifolia* on the 4th instar larvae of *Culex pipiens* exposure period of 24 h..

Data indicated higher susceptibility of the tested larvae to the fractions under investigation. The lethal concentration values were very low.

Focusing on the results shown in Table (60) the toxicity values of the tested fractions (bands) based on LC_{50} values could be arranged in descending order as follows fraction 9 (22.306 ppm), fraction 7 (29.975 ppm), fraction No 1 (36.421 ppm) and the fourth fraction was No. 6 (47.912).The fraction 10 come last recording LC_{50} values (90.879) ppm.

The slope values of the above mentioned fractions varied between 1.598 and 2.979. It is clear from Table (60) and fig (80-81) that the tested fractions with the larvae of *Culex pipiens* produced high slopes indicating that the response of the tested larvae to all fractions investigated was uniform.

The highest slopes were that of fraction 7 (2.979) and fraction 9 (2.602). The lowest slope values were 1.598 in the case of fraction No. 5 and 1.686 with the fraction No. 8.

Table (60):LC_{25}, LC_{50} and LC_{90} of investigated fractions derived from T.L.C of *Aptenia cordifolia* Culex pipens

compound	Slope ± S.E	LC_{25}	95% Confidence limits		LC_{50}	95%Confidence limits		LC_{90}	95%Confidence limits	
			lower	upper		lower	upper		lower	upper
1	2.592±0.302	20.004	10.114	28.017	36.421	25.316	47.766	113.722	79.530	239.521
2	2.450±0.314	27.323	11.465	39.048	51.502	35.087	76.406	171.751	103.642	775.625
3	1.991±0.281	24.648	8.066	37.310	53.771	34.975	91.528	236.694	122.308	2337.797
4	1.707±0.278	24.060	15.840	31.077	59.758	48.457	76.976	336.000	204.302	856.158
5	1.598±0.269	23.103	3.737	37.850	61.069	37.092	152.468	387.000	154.104	40580.571
6	2.028±0.277	22.278	-	-	47.912	-	-	205.271	-	-
7	2.979±0.315	17.796	7.715	25.892	29.975	18.560	40.963	80.719	56.812	169.616
8	1.686±0.288	31.141	11.220	46.634	78.246	52.430	199.686	450.500	184.49	16839.00
9	2.602±0.296	12.281	3.738	19.638	22.306	11.291	32.190	69.329	46.921	161.838
10	2.140±0.343	43.979	21.286	64.156	90.879	62.510	260.825	360.900	164.78	11007.00

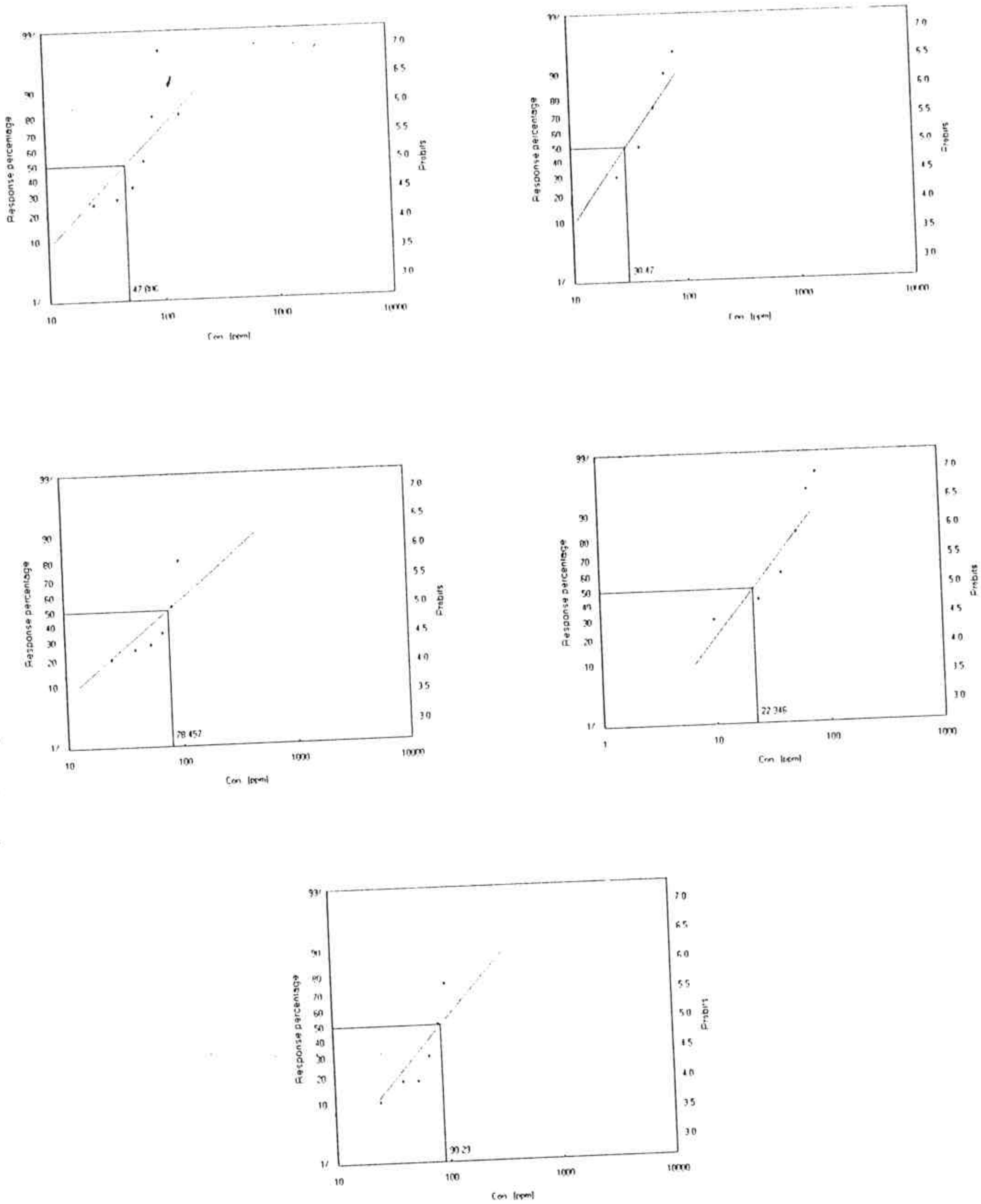


Fig (80) Lethal response after treatment 4th instar larvae ofCulex pipiens to Bands of *Aptenia cordifolia* leaves extracts after 72 hours

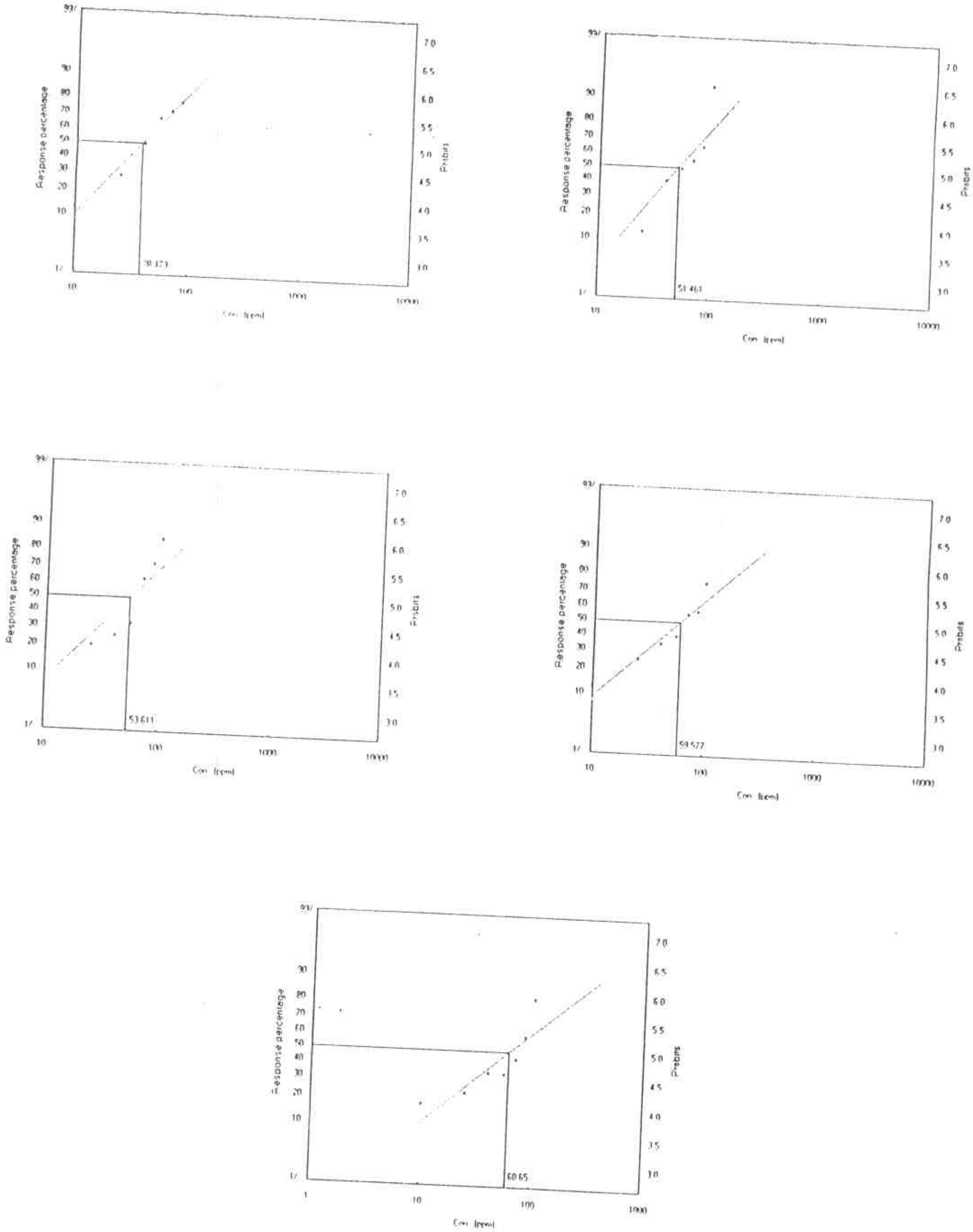


Fig (81) Lethal response after treatment 4^{th} instar larvae of*Culex pipiens* to Bands of *Aptenia cordifolia* leaves extracts after 72 hours

It may be concluded that the fraction no. 9 was the most effective toxicant followed by No 7 and No 1 among the tested 10 bands (fractions 0 of ethyl acetate extract of *A. codifolia* against the 4th instar larvae of *C. pipiens*. The fractions No. 10, 8,5 and 4 were the least effective of the fraction under investigation. The other bands among the 10 tested have moderate effect.

2.2-Relative toxicity of investigated fractions (bands) derived after TLC analysis to ethyl acetate extract of *A. codifolia*

2.2.a- against 4th instar larvae of *A. ipsilon*

Table (61) and Fig (82) show the results of relative toxicity (LC_{25}, LC_{50} and LC_{90}) of 6 fractions (spots) isolated by TLC analysis of ethyl acetate extract of *A. codifolia.*

To a certain extract the relative toxicity of these fractions on the larvae of *A. ipsilon* was, weak comparing to its effect on mosquito larvae. The values of lethal concentrations of band were higher than the other extracts and than against mosqutio larvae for the same fractions.

Comparing the LC_{50} values of the different spots (fractions),the most effective fraction was the fraction of No. 7 recording 203.629 ppm followed by the fraction No. 1 with LC_{50} of (432.658).The LC_{50} of fractions number 6, 3, and 2 were 433.698, 505.898 and 605.854. The lowest effective fraction was No. 8 recording an LC_{50} of 831.913 ppm .

Owing to higher or lower concentrations than the LC_{50} values, the arrangement of the potency of the above mentioned fractions would some what differ When LC_{90} was estimated for the six fractions, the fraction

Table (61):LC_{25}, LC_{50} and LC_{90} of investigated fractions derived from T.L.C of *Aptenia cordifolia* Culex pipens

compound	Slope ± S.E	LC_{25}	95% Confidence limits		LC_{50}	95%Confidence limits		LC_{90}	95%Confidence limits	
			lower	upper		lower	upper		lower	upper
1	1.130±0.152	109.507	15.712	222.964	432.658	208.380	927.409	5887.117	2008.072	196147.503
2	1.638±0.228	235.119	92.048	369.052	606.854	392.274	900.948	3677.126	2000.375	15130.850
3	0.749±0.139	63.551	20.297	115.619	505.898	332.796	841.209	26053.983	7964.773	310132.954
6	0.807±0.124	63.228	1.591	170.294	433.698	154.602	1098.583	16832.259	3703.899	9468033.346
7	1.692±0.164	81.329	55.469	107.835	203.629	161.195	249.146	1164.610	881.307	1698.210
8	2.158±0.439	405.095	49.685	641.465	831.913	400.055	1122.200	3264.948	1970.246	34706.752

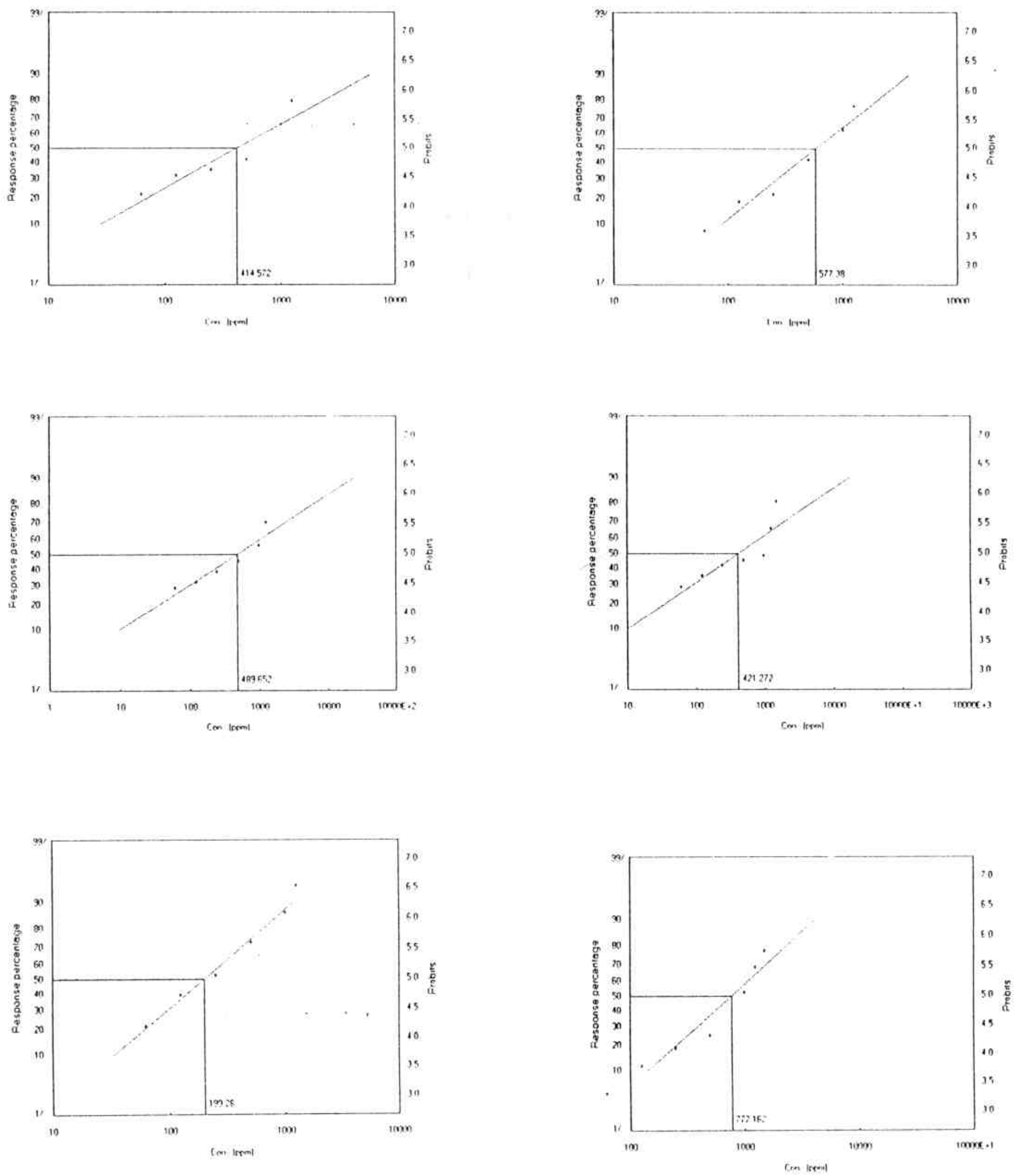


Fig (82)Lethal response after treatment 4th instar larvae of *Agrotis ipsilon* to Bands of *Aptenia cordifolia* leaves extracts after 72 hours

No. 7 also come in the first, followed by fraction 6, fraction 3, fraction 8, fraction2. The weakest was fraction No. 1.

2.2.b- against *S. oryzae* adults :-

The results of the relative toxicity of the fraction or spots isolated by TLC analysis of ethyl acetate extract of *A. codifolia* as shown in Table (62) and Fig (83).Content of six bands or spots were tested against the adults of *S. oryzae* and LC_{25}, LC_{50} and LC_{90} were calculated. The comparison between LC_{50} values of the different bands (fractions) showed that the band No. 7 was the most effective fraction with LC_{50} value 350.385 p.p.m followed by the fraction No. 1 and the fraction No. 6 . The lowest effective fraction (the highest value of LC_{50}) was the fraction No. 2 (1139.173ppm).

When LC_{90} values were taken into consideration, also the fraction No. 7 took the first pesition followed by fraction 2 and fraction 6. While the fraction No. 8 was the lowest effective band recording 7179.282 ppm.

The above results may be taken to indicate that these fractions or spots are worthy of more detailed investigation to identify these fractions or components.

Table (62):LC_{25}, LC_{50} and LC_{90} of investigated fractions derived from T.L.C of *Aptenia cordifolia* Culex pipens

compound	Slope ± S.E	LC_{25}	95% Confidence limits		LC_{50}	95%Confidence limits		LC_{90}	95%Confidence limits	
			lower	upper		lower	upper		lower	upper
1	1.154±0.149	107.483	37.510	184.622	412.973	256.321	673.585	5328.952	2312.849	33643.227
2	0.915±0.138	208.586	77.542	356.033	1139.173	692.592	2524.057	28674.299	8331.067	555739.644
3	1.762±0.327	343.317	193.460	467.016	829.070	648.837	1063.669	4426.954	2704.763	12150.051
6	1.406±0.162	149.841	99.214	201.425	452.338	355.317	577.040	3691.107	2364.661	7231.680
7	1.841±0.187	150.716	78.153	223.077	350.385	239.996	480.670	1740.549	1127.924	3707.111
8	1.526±0.167	373.421	192.553	566.484	1038.561	692.546	1887.539	7179.282	3272.827	44751.364

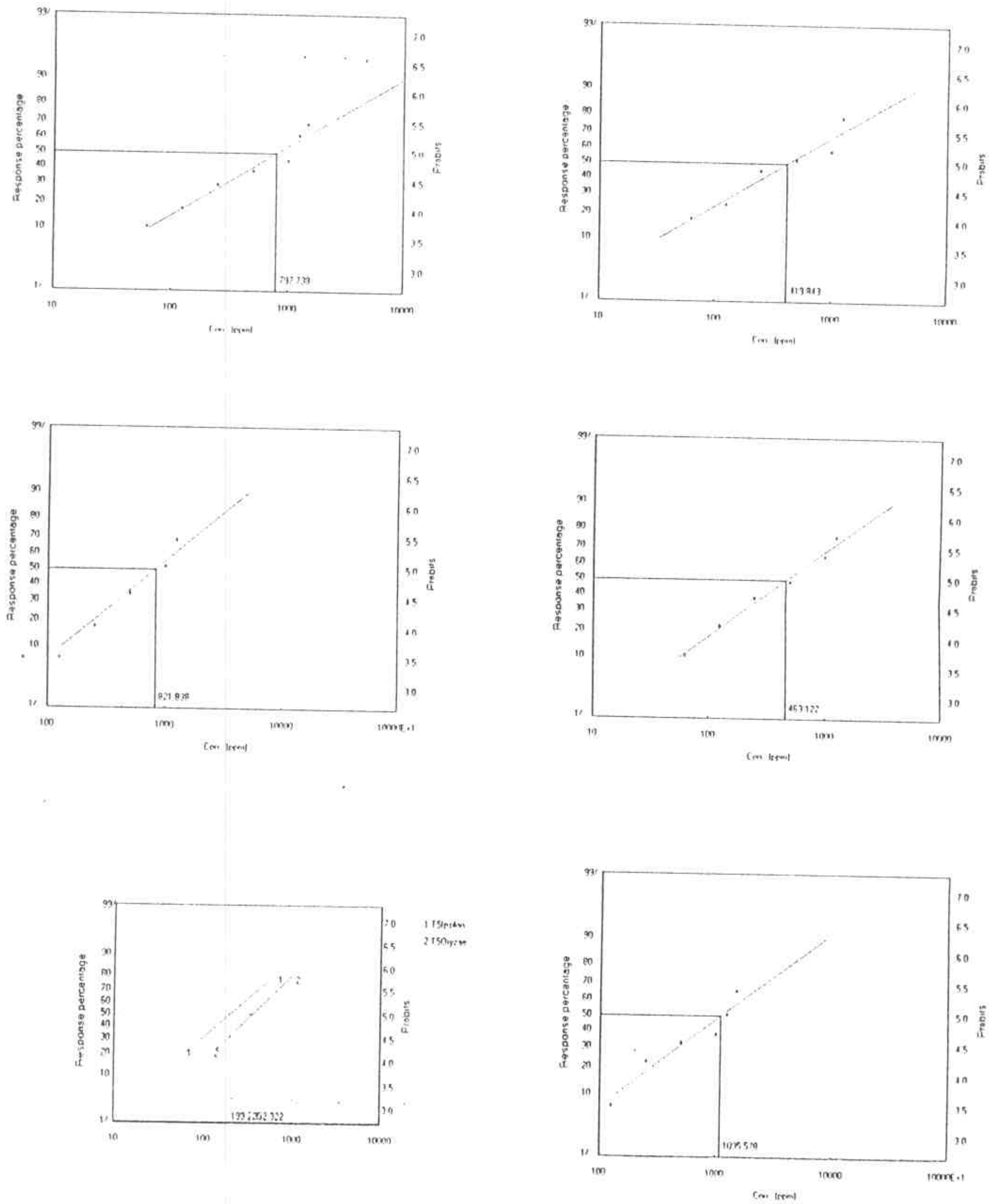


Fig (83)Lethal response after treatment adults of *Sitophilus oryzae*to Bands of *Aptenia cordifolia* leaves extracts after 14 days