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RESEARCH REPORT ON THE BIOACTIVITIES OF ETOGROWTH™-T235

ON YELLOW STRIPPED FLEA BEETLE (*Phyllotreta Striolata Fabricius*).

The objective of this experiment is to determine the mode of action of ETOGROWTH™-T235 on yellow striped flea beetle (*Phyllotreta Striolata Fabricius*).

Table 1: Contact Toxicity of ETOGROWTH™-T235 on Larvae of Yellow Stripped Flea Beetle (*Phyllotreta Striolata Fabricius*).

No of Hrs Treatment	Mortality Rate (%)						Relative Growth Rate	Duncan's Multiple Test (1%)
	12 hrs	24 hrs	36 hrs	48 hrs	60 hrs	72 hrs		
1:100	45.8	56.3	60.4	64.6	64.6	68.8	1.370	A
1:200	42.1	50.6	53.5	53.5	61.2	61.2	1.542	B
1:300	41.2	50.0	52.4	54.1	58.5	59.5	1.570	B
1:400	28.2	30.1	30.1	35.7	42.4	42.4	2.061	C
1:500	23.2	28.2	30.3	36.3	38.5	38.5	2.122	CD
1:600	22.0	29.0	29.0	31.5	31.5	36.3	2.195	D
Control	0.0	0.0	4.3	4.3	8.3	8.3	2.895	E

From the results as summarized in Table 1, it is observed that ETOGROWTH™-T235 is effective against Yellow Stripped Flea Beetle (*Phyllotreta striolata Fabricius*). Compared to the Control, all treatments of ETOGROWTH™-T235 at 1:100~600 are significantly high. From the the Relative Growth Rate, with higher concentration, the mortality of the Yellow Stripped Flea Beetle (*Phyllotreta striolata Fabricius*) also increased, indicating the efficacious effect of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle (*Phyllotreta striolata Fabricius*). However, the mortality rate over time for each individual treatment is not very significant, suggesting the mode of action of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle is not through contact toxicity.

Table 2 : Antifeedant Effect of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle Larvae (*Phyllotreta striolata Fabricius*).

Treatment	Selective Feeding Deterrent Index (%)	Duncan's Multiple Test (1%)	Non-Selective Feeding Deterrent Index (%)	Duncan's Multiple Test (1 %)
1:100	93.54 ± 0.62	A	85.79 ± 1.40	A
1:200	85.59 ± 0.97	A	75.13 ± 2.57	AB
1:300	79.21 ± 1.53	A	64.37 ± 2.40	B
1:400	77.76 ± 1.51	A	57.46 ± 1.88	C
1:500	59.41 ± 2.20	B	30.44 ± 1.78	D
1:600	35.66 ± 3.24	C	26.52 ± 1.51	D

Antifeedant effect of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle Larvae (*Phyllotreta striolata Fabricius*) is very significant as reflected in the results obtained from both the Selective Feeding Deterrent Index and Non-Selective Feeding Deterrent Index, (F=50.430**). The result indicated that the antifeedant effect of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle (*Phyllotreta striolata Fabricius*) is one of the main mechanism in controlling the population of larvae.

Table 3 : Repellent Effect of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle Larvae (*Phyllotreta striolata Fabricius*).

No of Hrs Treatment	Repellency under lab condition	Duncan's Multiple Test (1 %)	Decreased in population in field trials (%)			Repellency (%)
			1 day	5 days	15 days	
1:100	91.42 ± 0.55	A	11	100	74.2	80.9
1:200	89.39 ± 0.64	A	100	77.8	70.2	77.5
1:300	82.13 ± 1.17	B	100	55.6	50.8	69.9
1:400	73.45 ± 1.36	C	85.7	77.8	46.4	67.0
1:500	31.74 ± 0.74	D	71.4	55.6	20.5	53.0
1:600	22.36 ± 1.78	E	42.9	55.6	18.5	33.3

Repellency under lab condition and the decreased in population in field trials over time were evaluated to calculate the percentage of repellency. The percentage of repellency increased with increased in the concentration. Also from the decreased in population in field trials from Day 1 to Day 15, for the various treatments, the differences were very significant, reflecting the repellent effect of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle (*Phyllotreta striolata Fabricius*) is very significant. By comparing the repellency of the different treatment with the control, the percentage of repellency of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle (*Phyllotreta striolata Fabricius*) at 1:100, 1:200, 1:300, 1:400, 1:500 and 1:600 is 80.9 %, 77.5 %, 69.9 %, 67.0 %, 53.0 % and 33.3 % respectively.

Table 4 : Stomach Posison Toxicity of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle Larvae (*Phyllotreta striolata Fabricius*).

No of Hrs Treatment	Ingestion / Day (0.01 x cm ² /Leaf)	Ingestion Under Different Duration (0.01 x cm ² /Leaf)			Ingestion / Total Ingestion %	Toxicity
	Average	24 hrs	48 hrs	72 hrs		
1:100	5.46	3.67	9.10	16.37	8.73	0.3639
1:200	6.06	4.86	11.07	18.19	9.70	0.4044
1:300	6.61	6.11	11.15	19.82	10.57	0.4406
1:400	7.72	6.83	14.12	23.16	12.35	0.5149
1:500	10.42	8.06	18.53	31.27	16.67	0.6952
1:600	11.26	8.14	21.09	33.78	18.01	0.7510
Control	14.99	14.75	29.70	44.98	23.98	-

From the results obtained, with increasing concentration, the feeding deterrent also increased. For Treatment at 1:100~300, the average ingestion did not varied much, however when compared to the Control, the different is very significant, indicating the toxicity of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle Larvae (*Phyllotreta striolata Fabricius*) is very significant, (F=29.47, 23.21). The toxicity effect of ETOGROWTH™-T235 significantly reduced the population to a great extent.

Table 5: Efficacy of ETOGROWTH™-T235 on Yellow Stripped Flea Beetle Larvae (*Phyllotreta striolata Fabricius*) and effect of crop protection..

Treatment	Total Ingestion (A)	Infested Plant (%)	Area of Ingestion cm ² / Leaf	Protection (%)	Infested Plant (%)	Area of Ingestion cm ² / Leaf	Protection (%)	Infested Plant (%)	Area of Ingestion cm ² / Leaf	Protection (%)
1:100	30.93	5.74	0.254	43.52	33.33	0.746	83.58	71.67	1.24	87.24
1:200	40.44	5.56	0.386	38.27	60.40	0.934	75.43	83.33	1.37	89.22
1:300	59.04	18.09	0.640	32.14	81.52	0.814	69.15	76.67	1.40	84.41
1:400	75.69	15.04	0.756	36.25	71.72	1.080	74.93	85.00	1.55	76.58
1:500	145.30	10.90	0.760	22.43	88.33	0.894	76.81	95.12	1.84	63.32
1:600	223.05	14.79	0.942	18.25	89.28	1.470	7.66	100.00	2.96	50.10
Control	445.00	43.36	1.280	-	100.00	2.320	-	Totally Damaged		

By comparing the different treatments with the Control, the total ingestion (or infestation / percentage of damages) for the different treatments, 1:100, 1:200, 1:300, 1:400, 1:500 and 1:600 was 6.95 %, 9.09 %, 13.27 %, 17.01 %, 32.58 %, 50.11 %, with Control as 100%. By determining the Total Ingestion (A), the differences under different treatment which is a clear indication of the total effect of antifeedant, repellent, toxicity, etc.

The degree of protection was also very significant under different treatment. In terms of Percentage of Infested Plant, Area of Ingestion (cm²/ Leaf), treatment with 1:100 is very significant as compared to the Control. In the case of Protection (%), the results of 1:100 is comparable with 1:200, 1:300 is comparable with 1:400 and 1:500 comparable with 1:600, they can thus be divided into 3 recommended ranges.

Conclusion:

ETOGROWTH™-T235 presented strong antifeedant properties to Yellow Stripped Flea Beetle Larvae (*Phyllotreta striolata Fabricius*). In addition, ETOGROWTH™-T235 also possesses some repellency effect on Yellow Stripped Flea Beetle Larvae (*Phyllotreta striolata Fabricius*).

In summary, ETOGROWTH™-T235 possesses four model of actions, namely contact toxicity, stomach toxicity, antifeedant activities and repellency effect. Antifeedant activities is the strongest one, followed by contact toxicity. The strong antifeedant combination with repellency effect lead to the weak stomach poison toxicity.

To conclude, it is recommended to spray ETOGROWTH™-T235 at 1:300~400 consecutively for 2 sprays to control the Yellow Stripped Flea Beetle (*Phyllotreta Striolata Fabricius*) and at the same time, the crop protection can also be achieved.