

Juvenomimetic & Larvicidal Effects of *Aloe Vera* & *Bryophyllum Pinnatum* Extracts against the Larvae of Confused Flour Beetles



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Abstract

Promising results obtained on the juvenomimetic and larvicidal effects of acetone extracts of two medicinal plants, *Aloe Vera* and *Bryophyllum pinnatum* on 6th instars larvae of confused flour beetle, *Tribolium confusum* indicated a great potential for its exploitation as insecticide. The development of larvae was completely inhibited at 1mg dose of *Aloe Vera* leaf extract, as there was no emergence of adult at this dose. Larvae treated with extracts from *Bryophyllum pinnatum* did not complete their development also due to prolongation of larval period, formation of larval-pupal intermediates & abnormal pupae. Most of the adults emerging from such pupae showed deformed adults & died within a week after emergence without egg laying.

Keywords: Juvenomimetic, Larvicidal, *Aloe Vera*, *Bryophyllum Pinnatum*, *Tribolium Confusion Beetle*, *Tribolium Castaenum* Herbst.

Introduction

Natural products, mainly plants and their derivatives are gaining importance in the recent past for use against noxious insect pests due to reason not only the resistance against conventional synthetic insecticides but also problems like environmental pollution, toxicity, bioaccumulation & biomagnifications especially through different trophic levels in the ecosystem. Some plants and their products have insecticidal, larvicidal and insect growth regulatory effects which are introduced in the pest control strategy (Jamil et. Al. 1988, Chiranjivi & Shudhakar 1996, Omotoso 2004, Sharma et. I. 2008). The use of plant products in treating grains is also becoming popular among farmers in India & abroad, because plants have wide spectrum of actions, safe to apply, have no harmful effects on the mankind and other flora & fauna and they are also easy to process.

Omotoso & Oso (2005) have evaluated the insecticidal and insect productivity reduction capacities of two medicinal plants *Aloe vera* Mill and *Bryophyllum pinnatum* on adult red flour.

However, literatures are not available of these against larvae of this genus *Tribolium confusum* Durval (Coleoptera: Tenebrionidae) commonly called confuse flour beetle, a noxious pest of stored grain of many kinds and in the innumerable products manufactured from grain. Both adults and larvae cause enormous amount of food grains damage in Indian ecological conditions. So acetone extracts of these two plants were evaluated in this present work for their larvicidal and metamorphic or juvenomimetic aberrations against the last (6th) instar larvae of the flour beetles, *Tribolium confusum* Duval.

Material & Methods

Healthy plants of *Aloe vera* and *Bryopyllum pinnatum* grown at the own residential garden at Patna used in all experiments of this present work. Fresh leaves of both plants separately were taken from the rest of the plant, cut into small pieces and were dried 3-4 days in the scorching sun. Slightly sticky masses of these leaves were plant product was Soxhlet extract with acetone. The resultant solution was evaporated to dryness using rotary evaporator at 40°C and the extract was lyophilized to remove traces of water, weighed redissolved in a known volume of acetone.

Food treatment method was applied for bioassay procedures. *Tribolium confusum* culture was made on wheat flour added with brewer's yeast to get freshly moulted larvae of the test insect under laboratory

condition of Department of Botany, Science College, Patna at 30±2°C and 60-70% R.H. Larvicidal and juvenomimetic activities of the extracts were assessed against newly moulted sixth instar larvae of the *T. confusum* by mixing with wheat grains weighing capacity 5g were mixed uniformly with 1ml of test solution containing different (0.25mg, 0.50mg & 1.00mg) of plant extracts and then dried on the paper for about 6 hours. They were then transferred to culture tubes & 10 freshly moulted 6th instar larvae (average length 6.00 ± 0.70mm) were added to each tube. The tubes were placed in beaker which was covered with a thick cloth to exclude light. All experiments were performed in four replications at room temperature 30 ± 2°C & 60-70% R.H. Control groups, consisting of individuals of the same age as the test insect were treated with acetone only. Treated & control larvae/insects were examined at the interval of every 24 hours.

Observations

The result of the observations revealed that acetone leaves extract of *Aloe vera* caused 65% mortality of the 6th instar larvae of the confused flour beetle. *Tribolium confusum* at the lowest dose (0.25mg) of treatment, which reached 100% at the highest dose of 1.00g treatment without any emergence of adult. At the lowest dose half (17.5%) pupae were found dead & half (17.5%) emerged as adults.

Mortality of larvae and pupae at 0.5mg of *Aloe vera* extract dose was 70.00% and 22.50%, respectively and the emergences of adults were only 7.50% (Table-1).

Extracts of *Bryophyllum pinnatum* caused 42.50% mortality of larvae and 22.50% mortality of pupae with 22.50% of adult emergence at the lowest dose (0.25mg) treatment. At intermediate dose (0.50mg) of *Bryophyllum*, 55.00% larvae were found all doses of *Bryophyllum* extracts prolongation of larval period and metamorphic abnormalities like formation of larval-pupal intermediates, abnormal pupae etc. were observed and some larvae become black, exuded the body fluid & ultimately dies without pupation. Symptoms of poisoning manifested during pupation. The adults emerging from shrunken pupae after treatments of both plant extracts showed abnormal exoskeletal features.

Discussion

From the above results, it is evident that plant extracts of *Aloe vera* and *Bryophyllum pinnatum* contain principles with juvenile hormone activity and can also act as larvicide. *Aloe vera* and *Bryophyllum pinnatum* caused 65.00% & 42.50% mortality of larvae, respectively at the lowest dose of extracts. *Aloe vera* extract was the most toxic to larvae as 100% of them died within 6 days at 1mg dose treatment while *Bryophyllum pinnatum* caused only 67.50% mortality. Some very interesting results were obtained with *Bryophyllum pinnatum* extracts on larvae in which prolongation of larval period was recorded in all doses of treatment of the adults emerging following treatment of larval food with 0.25mg & 0.50mg extracts of *Bryophyllum pinnatum*, some retained the complete larval cuticle. The anterior part of the insect's body was like that of a

normal adult but the abdomen was elongated and covered with larval cuticle. The rest of the pupae, resulting from this treatment were smaller in size than the normal ones & did not metamorphose into adults as reported in *Tribolium Castaenum* 5th instar larvae treated with leaves extract of water hyacinth (Kaiser et. Al. 1984).

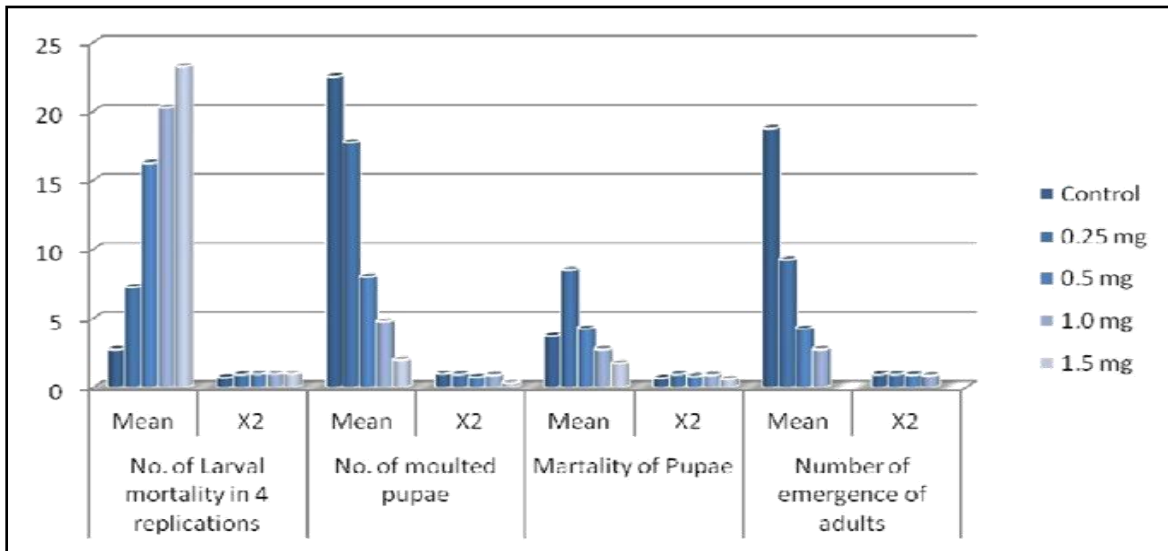
It was significant to note that *Aloe vera* extract was more effective at larval stage while manifestation of poisoning was more profound in pupal stage in case of *Bryophyllum pinnatum* extract with prolongation of larval period & profound morphological abnormalities. Prolongation of larval period may be due to inhibition of moulting process caused by an increased titre of Juvenile Hormone (JH) in the body. This finding gains support from the work on *Corcyra cephalomnica* by *Eichhornia crassipes* leaves extract (Kaiser et. Al. 1988). JH acts directly on the target cells without requiring the mediation of any special organ. JH treated in immature insects fails to ecdyse, die soon after ecdysis or fail to reproduce & develop intermediates between larva & pupa, pupa & adult or your insects are not killed by JH. JH can kill insects, if it acts on the last instar during metamorphosis by including production of intermediates (Tembhare, 1977). Larvicidal action of *Aloe vera* & *Bryophyllum pinnatum* extracts against larvae of *Tribolium castaenum* (Omatoso & Oso, 2005). The chemical composition of the plants used is currently underway to determine the specific compounds actually responsible for the observed biological activities in them.

References

1. Chiranjive C & Sudhakar TR 1998. Effect of indigenous plant materials on the fecundity, adult emergence & development of pulse beetle *C. chinensis* in black gram, Journal of Research, Andhra Pradesh Agriculture University 24 3(4) 57.
2. Jamil. K, Rani U & Thyagarajan G 1984. International pest control July/August 1984, 106-108.
3. Jamil. K, Subhashini. S. & Jyoti KN 1988. New insect growth regulatory compound for the control of Indian Rice moth *Corcyra cephalonica*. 57(18), 1002-1003.
4. Omatoso, OT 2004. Evaluation of some plant powders as toxicants and antifeedants in the control of maize damage by the maize weevil, *Sitophilus zeamais* Motschulsky in storage. Ultra scientist of Physical sciences. 16(2) : 221-230.
5. Omatoso, OT & Oso AA 2005. Insecticidal & insect productivity reduction capacities of *Aloe vera* and *Bryophyllum pinnatum* on *Tribolium castaenum* Herbst. African Journal of Applied zoology & Environmental Biology 7, 95-100.

Table: 1

Dose	Number of Larval mortality in 4 replications		Number of moulted pupae		Mortality of Pupae		Number of emergence of adults	
	Mean (%)	X ² (Sd.E)	Mean (%)	X ² (Sd.E)	Mean (%)	X ² (Sd.E)	Mean (%)	X ² (Sd.E)
Control	2.75 (11%)	0.715 (0.5)	22.5 (90%)	0.978 (0.577)	3.75 (15%)	0.670 (0.5)	18.75 (75%)	0.940 (0.957)
0.25mg	7.25 (20%)	0.931 (0.5)	17.75 (71%)	0.944 (0.5)	8.5 (34%)	0.945 (0.577)	9.25 (37%)	0.945 (0.957)
0.5mg	16.25 (65%)	0.967 (0.957)	8.0 (32%)	0.751 (0.81)	4.25 (33%)	0.798 (0.51)	4.25 (17%)	0.9048 (0.5)
1.0mg	20.25 (81%)	0.976 (0.5)	4.75 (19%)	0.882 (0.5)	2.75 (11%)	0.8824 (0.957)	2.75 (11%)	0.846 (0.5)
1.5mg	23.25 (93%)	0.978 (0.5)	2 (8%)	0.311 (0.8165)	1.75 (7%)	0.6065 (0.5%)	—	—



Graph: 1