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Biological control of cotton pest *Sylepta derogata* by using plant extracts Econeem, *Acorus calamus* and *Piper longum*

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Abstract

Laboratory studies were carried out to evaluate the efficacy of some locally available botanicals against cotton pest *Sylepta derogata*. The cotton plant is native to India and the pest is polyphagous insect. Plants extracts obtained from *Azadirachta indica, Acorus calamus* and *Piper longum* using standard methods. Among all these botanicals, extracts were prepared and dilutions were obtained at 5%, 10%, 15%, 20% and 25% concentrations with the addition of distilled water. Several plants and plant products have long been used as insecticides, repellents, antifeedants, sterilants and ovicides in insect control. Use of plant extracts is one of the possible methods of pollution free technology in insect control. Among the treated botanicals, Azadirachta indica was effective significantly and high percentage mortality 91.41% was observed in at 25% level. *Acorus calamus* treatment caused moderate mortality level when compared these two treatments *Piper longum* showed low mortality rate 90.20%.

Key words: *Sylepta derogata, Acorus calamus, Piper longum, Azadirachta indica, pest control*

Introduction

India is one among the mega species diversity country in the world which consists of wide variety of fauna and flora. The cotton plant is native to tropical and subtropical regions around the world, including the Americas, Africa, and India. Cotton leaf-roller S*ylepta derogata Fab* is a sporadic pest of cotton in India (Sohi, 1964) and belong to the family Pyralididae. The pest is a polyphagous insect and attacks agricultural crops and Malvaceous plants. The damage caused by the caterpillars whose

feeds on the leaves and young buds. The larva rolls the leaf and feeds on the green tissue in the early stage and eats up a large portion of the leaf as it grows. Fruits as well as roots of the Indian long pepper (*Piper longum.L*) and *Acorus calamus* or sweet flag are attributed with numerous medicinal properties and are used for diseases of respiratory tract viz., cough, bronchitis, asthma etc. The neem tree (*Azadirachta indica A.juss*), Katpoora viruchum for centuries in the Indian subcontinent belongs to the family Meliaceae. A neem tree is native to India and is grown in various countries throughout the world including India, Burma, Sri Lanka and Australia. Antifeedant effect of *Azadirachta indica* on *Helicoverpa armigera* was studied by Babu *et al*., (2000) and they observed the neem extract had increased feeding deterrancy, delayed pupation and finally the death of the larvae. The different parts of the neem tree are used for production of grains from stored pest and a woolen cloth was an ancient practice in India. Neem oil is a broad spectrum botanical insecticide, miticide and fungicide which derived on the seeds of the neem tree. Neem products are associated with many agricultural and medicinal uses.

Materials and Methods

Biology of *Sylepta derogata*

Biology of *S.derogata Fab*. is studied by various workers like Fadare and Amusa (2003). The biology and field ecology of *Sylepta derogata* in Uttarpradesh were carried out by Lal *et al*., (1951). For experiments, freshly moulted *Sylepta derogata* larvae were collected from the nearby cotton fields of Coimbatore. In my study period of March to October (2003), the adult lays 200 eggs on the under surface of the cotton leaves. The eggs are minute, scale like and brown or pale white in colour. The eggs hatch into larvae in about 4-6 days, after hatching, they begins to roll the leaves and live inside the rolls feeding on the leaf tissue. The total larval period lasts 15-20 days. The period of pupation is about 6-12 days. After copulation, the female lays eggs and the male dies. There are 3-4 generations in a year and the life cycle completed within 25-30 days.

Collection of the pest

For experiments, freshly moulted *Sylepta derogata* larvae of the second instar were collected during the months of March – October (2003) from the nearby the cotton fields of Coimbatore. In order to avoid genetic and size variations, larvae were collected from the same locality and host plant for each experimental series.

Preparation of plant extract

The extract of *piper longum* was prepared by the method of Ikan (1970). 10g of powdered pepper was mixed with 150 ml of 95% ethanol and kept for 3 hours. The extract was filtered and concentrated by adding 10ml of 10% alcoholic KOH. *Acorus calamus* extract was prepared by the plant extraction method of Harbone 1973. *The Acorus calamus* powder 10 g. was mixed with 100 ml of 10% acetic acid and kept for 4 hours. This was concentrated to one third of its volume by evaporation at room temperature. The Ammonium hydroxide (conc) was added drop by drop to precipitate the extract centrifuged and washed with 2ml of 1% NH_4OH. The Botanical insecticide Econeem was brought from local pesticide shop.

Evaluation of efficacy of different botanicals against *S. derogata*

After measuring the initial weight of the larvae, they were introduced into separate plastic containers. The different concentrations of plant extracts of *Acorus calamus*, *Piper longum and* Econeem (5%, 10%, 15%, 20%, 25%) were prepared and 20 larvae of are used for each experiment and after 24 hours and 48 hours the numbers of death larvae were noted. The percentage of mortality was calculated by using the following formula.

$$\text{Percentage Mortality} = \frac{\text{Number of dead larvae}}{\text{Number of larvae introduced}} \times 100$$

Result and Discussion

Saxena *et al.,* (1981) reported that the emergence of the first instar larvae of *Cnaphalocrosis medinalis* could be largerly prevented by dipping its eggs into neem oil. In Econeem treatment the high degree of first instar larval mortality was observed at (25%) level of 24 hrs. 91.41%. After 24 hrs treatment, the fifth instar larvae showed the mortality rate at (25%) level 59.81% and 72.82%. Toxicity of Econeem, *Acorus calamus* and *Piper longum* enhanced to arrest the spinneret and lead to arrest the silken thread formation. Morphological deformities were observed at low dosages in all the three treatments. High percentage mortality 91.41% was observed in Econeem at 25% level. *Acorus calamus* treatment caused moderate mortality level and when compared these two treatments *Piper longum* showed low mortality rate 90.20%.

Table 1: Efficacy of Econeem on the I, II, III, IV and V instar larva of *S. derogata*

Conc	Larva	% larval mortality														
		First Instar			Second Instar			Third Instar			Fourth Instar			Fifth Instar		
		24hr	48hr	mean	24hr	48hr	mean	24hr	48hr	mean	24hr	48hr	mean	24hr	48hr	mean
5%	20	61.90	62.97	62.43	37.64	52.49	45.06	31.97	37.64	34.80	36.69	46.43	41.56	31.97	37.64	34.80
10%	20	68.39	72.82	70.60	57.67	61.90	59.78	37.64	52.49	45.06	37.64	52.49	45.06	36.69	48.45	42.57
15%	20	75.09	78.48	76.78	61.90	72.82	67.36	52.49	62.97	57.73	46.43	57.67	52.05	46.43	57.67	52.05
20%	20	78.48	83.66	81.07	66.23	75.09	70.66	59.81	68.39	64.10	59.81	71.83	65.82	57.67	68.19	62.93
25%	20	91.41	91.41	91.41	85.44	90.20	87.82	68.39	72.83	70.60	68.19	78.48	73.33	59.81	72.82	66.31

Table 2: Efficacy of *Acorus calamus* on the I, II, III, IV and V instar larva of *S. derogata*

Conc	Larva	% larval mortality														
		First Instar			Second Instar			Third Instar			Fourth Instar			Fifth Instar		
		24hr	48hr	mean	24hr	48hr	mean	24hr	48hr	mean	24hr	48hr	mean	24hr	48hr	mean
5%	20	36.69	52.49	44.59	29.20	73.64	33.42	28.27	36.69	32.48	23.73	35.75	29.74	17.70	36.69	21.17
10%	20	48.48	78.48	63.48	37.64	52.49	45.06	31.97	37.64	34.80	31.97	37.64	34.80	28.27	37.64	32.48
15%	20	50.57	70.79	60.68	46.43	55.61	51.02	36.69	52.49	44.59	37.64	52.49	45.06	31.97	57.67	34.80
20%	20	60.88	85.44	73.16	57.67	68.19	62.93	46.43	62.97	54.70	46.43	57.67	52.05	46.43	64.06	52.05
25%	20	66.33	89.06	78.26	68.19	78.48	73.33	52.49	71.83	62.16	57.67	71.83	64.75	57.67	68.39	60.86

Table 3: Efficacy of *Piper longum* on the I, II, III, IV and V instar larva of *S. derogata*

Conc	Larva	% larval mortality														
		First Instar			Second Instar			Third Instar			Fourth Instar			Fifth Instar		
		24hr	48hr	mean	24hr	48hr	mean	24hr	48hr	mean	24hr	48hr	mean	24hr	48hr	mean
5%	20	36.69	46.43	41.56	31.97	48.45	40.21	35.75	36.69	36.22	28.27	37.64	32.95	24.65	31.97	28.31
10%	20	31.91	57.67	44.82	46.43	61.90	54.16	31.97	37.64	34.80	35.75	48.45	42.10	28.27	48.45	32.95
15%	20	46.43	62.97	54.70	57.67	68.19	62.93	46.43	57.67	52.05	46.43	57.67	52.05	31.97	57.67	40.21
20%	20	68.39	69.54	68.96	75.09	78.48	76.78	52.49	68.39	60.44	57.67.	68.19	62.93	37.64	68.39	47.65
25%	20	78.48	90.20	83.77	78.48	90.20	84.34	57.67	72.83	65.24	68.19	72.82	70.50	52.49	71.83	60.44

Conclusion

In the present investigation, the administration of Econeem, *Acorus calamus* and *Piper longum* promoted the larval morphological deformities high percentage of larval mortality in different larval stages at different doses at varies duration. When compared to other two plant extracts, the Econeem is more effective and the *Acorus calamus* extract is equally important to that of Econeem, the *Piper longum* extract also exhibited its potential to control the larva and altered the biochemical constituents, therefore from the above findings it is inferred that Econeem and *Acorus calamus*, *Piper longum* extracts may be used in the pest control management instead of hazardous chemical pesticides.

References

Babu.R. Murugan.K., Kavitha.R and Sivaramakrishnan.S 2000 Synergistic effects of extract from *Azadiracta indica*, *Pongamia pinnata* and *Vitex negunda* on feeding, survival and fecundity of *Helicoverpa armigera Hub* (Lepidoptera: Noctuidae). Indian J. Environ. & Toxicity. 10(1): 42-44

Fadare* T.A. and Amusa.N.A 2003 Comparative efficacy of microbial and chemical insecticides on four major Lepidopterous pets of cotton and their (insect) natural enemies. African J. Bio-Technology. 2(2): 425-428

Harborne J.B.1974 Phytochemical Methods PP:185 Chapman and Hall Ltd. Fakenham Norfolk

Lal.K.B. and Singh Chhotey 1951 The biology and field ecology of the cotton leaf roller *sylepta derogata* in Uttarpradesh. ICGR. 5(3): 137-147

Sohi.G.S 1964 Pests of cotton. Entomology in India. Entomological Society of India New Delhi. pp 111-148