



## EVALUATION OF CERTAIN NATURAL PRODUCTS AGAINST LARVAE OF CITRUS BUTTERFLY *Papilio demoleus* Lin.

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### ABSTRACT

A field study was conducted to know the efficacy of various natural insecticides against larval population of citrus butterfly *P. demoleus* during 2011-12 at AICRP on Citrus, Tirupati. Among various natural insecticides Bt at both concentrations (0.005% and 0.025%) offered hundred percent mortality against citrus butterfly and retained its residual action upto ten days. The order of efficacy of rest of the treatments was NSKE (81.08%) azadirachtin (76.03%), neem soap (69.87%), pongamia oil (66.17%), pongamia soap (56.61%) and garlic extract (41.10%).

**KEY WORDS:** Citrus, Citrus butterfly, Natural products

### INTRODUCTION

The genus “citrus” is unique in its diversity of forms and no other fruit can parallel to it. They are highly regarded for their nutritive value and economic significance. India is one of the principle citrus producing country in the world, having an area of 162 lakh ha with annual production of 12.31 lakh tonnes with productivity of 7.6 metric tonnes per ha. In India, Andhra Pradesh is prominent for citrus cultivation occupies a majestic position with an area of 42.7 lakh ha. having an annual production of 5.76 lakh tonnes of fruits with productivity of 13.5 metric tonnes per ha (Indian Horticulture database-2013).

Through out the world 823 species of different insect and mite pests were known to be associated with citrus (Ebeling, 1959). Out of these 165 species are important in India causing an estimated loss of 30 percent in yield (Pruthi and Mani, 1945). Among them, the citrus caterpillar *P. demoleus* can feed voraciously and cause extensive damage in the larval stage particularly to nursery plants and cause great loss to seedlings and young saplings leaving behind midribs only. Severe infestation resulted in entire defoliation of the tree (Butani and Jotwani, 1975). Though chemical control of insects offers quick results, indiscriminate use of insecticides lead to adverse effects, besides increasing the cost involved in plant protection with a view to reduce the negative effects of the chemical pesticides, certain natural insecticides were evaluated against *P. demoleus* under field conditions.

### MATERIAL AND METHODS

To evaluate the efficacy of different natural insecticides against citrus butterfly, *P. demoleus* a field experiment was conducted at citrus improvement project on one and half year old Sathgudi sweet orange nursery plants during the year 2011-12. The experiment was conducted with nine treatments of natural insecticides in randomized block design with three replications in plot size 2 x 6 m for each treatment. An untreated check was maintained for comparative study. Each treatment was sprayed with three liters of spray solution using knap sack sprayer. The treatments imposed in the experiment were NSKE (5%), Azadirachtin (0.001%), neem soap (10 g lit<sup>-1</sup>), pongamia oil (0.5 g lit<sup>-1</sup>), Pongamia soap (10g lit<sup>-1</sup>), garlic extract (20 g lit<sup>-1</sup>), Bt (0.0025%) and (0.005%).

Larval population was recorded one day before spraying and at 1, 3, 5, 7, 10 and 14 days after spraying as post treatment counts. The larval mortality of butterfly was calculated for all the treatments and the data was subjected to statistical analysis.

Percent mortality was calculated by using the following formula

$$\text{Percent mortality} = \frac{\text{Number of larvae dead}}{\text{Initial larval count}}$$

The percentages thus obtained were transformed into angular values and analyzed statistically.

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Table 1. Effect of Natural Insecticides on Larval Population of Citrus Butterfly on Sathgudi Sweet Orange (Curative Control) during 2011 and 2012

S. No.	Treatment	Concentration / dose (%)	Pre count population	Per cent larval mortality (Days after spraying)*									
				1	3	5	7	10	14				
1.	Neem seed kernal extract (NSKE)	5	24.66	25.66 (30.40)	55.41 (48.10)	81.08 (63.51)	95.92 (78.32)	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.	Azadirachtin	0.0001	22.33	22.29 (28.18)	46.25 (42.82)	76.03 (60.67)	90.92 (72.44)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
3.	Neem soap	10 g lit <sup>-1</sup>	24.33	16.47 (23.97)	42.47 (40.69)	69.87 (56.37)	83.51 (66.03)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
4.	Pongamia oil	0.5	23.00	10.35 (18.72)	26.83 (31.18)	56.61 (48.79)	61.14 (54.39)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
5.	Pongamia soap	10 g lit <sup>-1</sup>	22.66	13.27 (21.39)	33.81 (35.55)	66.17 (54.45)	70.60 (57.17)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
6.	Garlic extract	20 g lit <sup>-1</sup>	23.00	8.88 (17.36)	23.61 (29.06)	41.10 (39.87)	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)
7.	<i>Bacillus thuringiensis</i>	0.0025 (2.09 × 10 <sup>7</sup> )	21.33	46.80 (43.17)	85.88 (67.86)	100 (0.00)	100 (0.00)	0.00 (0.00)	100 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
8.	<i>Bacillus thuringiensis</i>	0.005 (4.23 × 10 <sup>7</sup> )	23.00	61.46 (51.65)	90.71 (72.24)	100 (0.00)	100 (0.00)	0.00 (0.00)	100 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
9.	Untreated check		21.66	-	-	-	-	-	-	-	-	-	-
	CD at 5%		10.08	5.86	4.62	7.81	1.12	-	-	-	-	-	-

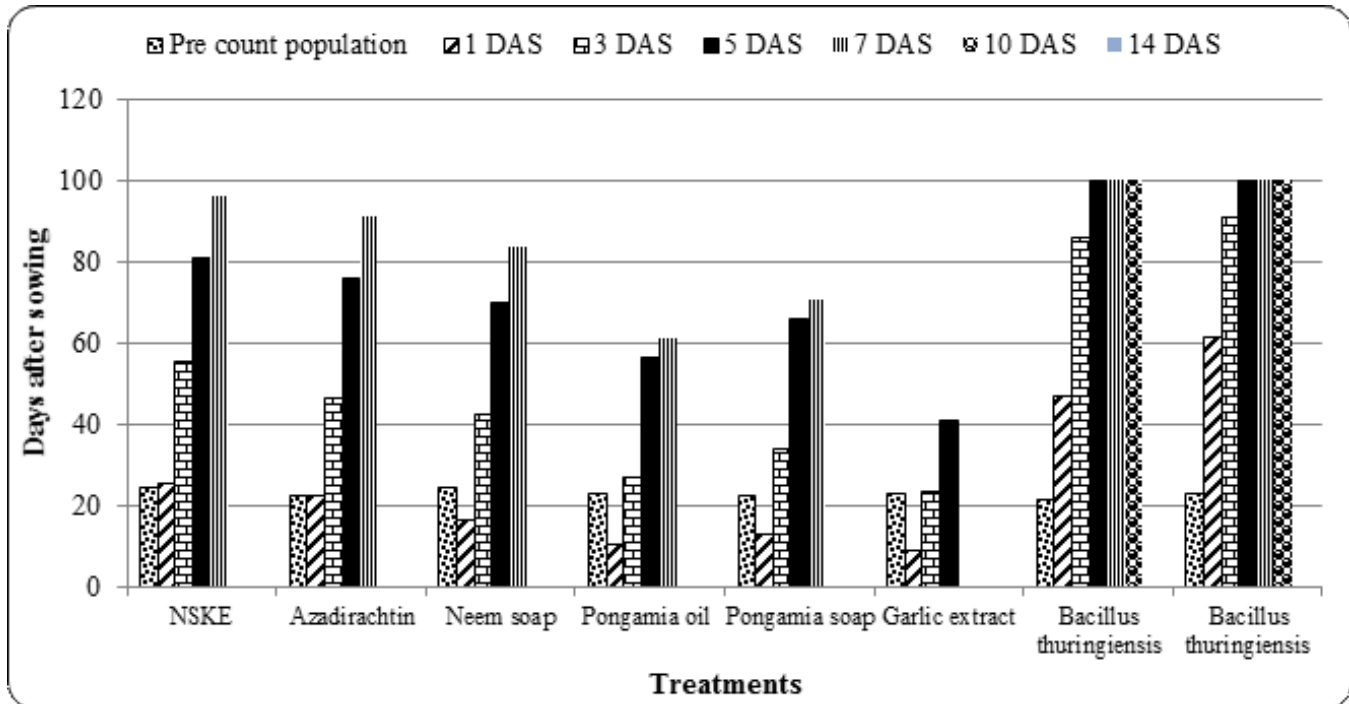


Fig. 1. Effect of Natural Insecticides on Larval Population of Citrus Butterfly on Sathgudi Sweet Orange

## RESULTS AND DISCUSSION

The efficacy of insecticides was evolved by imposing the treatments after noticing butterfly larval damage. The data from Table 1 and Fig. 1 revealed that all the insecticidal treatments were significantly superior to untreated check. At one day after spraying, the maximum population reduction was obtained in Bt 0.005 per cent (61.46%) followed by Bt 0.0025 per cent (46.80%). On third and fifth day also efficacy of all the insecticides was enhanced among which Bt at both concentrations offered hundred per cent mortality. Among botanicals NSKE (95.92%) was effective treatment followed by azadirachtin (90.92), neem soap (83.51%), pongamia soap (70.6%) and pongamia oil (61.14%). On all the days, garlic extract was found to be least effective treatment with only 41.10 per cent larval mortality. Except Bt, all other treatments lost their efficacy on seventh day, whereas Bt (0.005% and 0.0025%) retained their residual action upto ten days. However on fourteenth day all the treatments lost their efficacy by recording new population of the pest. The superiority of *Bacillus thuringiensis* in the control of citrus butterfly *P. demoleus* in the present study was in agreement with the findings of Resham *et al.* (1986) and Johnson *et al.*, (1995). The effectiveness of neem products in controlling citrus butterfly was also reported by Chauke *et al.*, (1999).

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