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Suitability of host plants for the development of polyphagous defoliator, *Eupterote undata* (Lepidoptera: Eupterotidae)

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Abstract

Eupterote undata (Lepidoptera: Eupterotidae) is a polyphagous defoliator. The effect of four preferred host plants of forestry importance viz., *Paulownia fortunei*, *Populus deltoides*, *Tectona grandis* and *Toona ciliata* on the larval development of *E. undata* was studied. There was a significant difference in the consumption of leaf quantity, duration of larval stages and weight gained by larval instars of *E. undata* when reared on different host plants. Total consumption of leaf of *T. ciliata* was maximum (10989.37 mg) by a larva of *E. undata* during its total larval period when leaves were provided separately. It was followed by 10075.83 mg of *T. grandis*, 8301.87 mg of *P. deltoides* and 6260.37 mg of *P. fortunei*. *E. undata* showed shortest larval period of 114.97 days when larvae fed on *P. fortunei* and longest development period (151.66 days) on *T. ciliata*. Among the four host plants studied, maximum total weight (1768.08 mg) was gained by the larvae fed on *P. fortunei* and minimum (980.54 mg) by the larvae fed on *T. ciliata*. Larvae gained 1229.31 mg weight when fed on *P. deltoides* and 1071.15 mg on *T. grandis*.

Keywords: *Eupterote undata*; polyphagous defoliator development; suitability; host plants.

Introduction

Eupterote undata (Lepidoptera: Eupterotidae) is a widely distributed polyphagous defoliator causing considerable defoliation to broad range of plants including *Bombax malabaricum*, *Careya arborea*, *Cedrela toona*, *Dalbergia volubilis*, *Erythrina indica*, *Gamelina arborea*, *Paulownia fortunei*, *Populus deltoides*, *Shorea robusta*, *Tecoma grandiflora*, *Tectona grandis*, *Terminalia* spp., *Toona ciliata* and *Vitex negundo* (Beeson, 1941). *E. undata* was recorded as a defoliator on cardamom by Tamilselvan and Singh (1993). It has been reported by Sheikh and Kalita (1995) on *Gamelina arborea*. Ahmad and Faisal (2004a,b) reported severe damage to *Paulownia fortunei* and *Populus deltoides* by the larvae of *E. undata*. *P. fortunei* was found to be the most preferred host of *E. undata* among the four important host plants (Faisal *et al.*, 2010). The present study was undertaken to investigate the suitability of different host plants for the development of *E. undata*.

Materials and Methods

Studies on development of *Eupterote undata* on different host plants were carried out in the

laboratory. The experiment was started with newly hatched first instar larvae (0-12 hr old) which were obtained from nucleus culture. The larvae were weighed and placed in separate petridishes (10 cm diameter). Leaves of main host plants including *Paulownia fortunei*, *Populus deltoides*, *Tectona grandis* and *Toona ciliata* were washed with water, air dried and cut into two equal halves. Weight of both halves of leaf was taken. One half was provided as food to the larva while other half was kept in another petri dish in the same manner for the determining the moisture loss as per the method described by Evans (1939). Before placing the larvae in the petridishes for feeding, the initial weight of larvae was taken. From this experiment, food consumed by one larva, larval weights were calculated after every 24 hours. Such experiment was conducted with different host plants as considered above and each experiment was replicated ten times. The moulting was recorded for each instar. All experiments were conducted at a temperature of $25 \pm 1^\circ\text{C}$ with $75 \pm 5\%$ relative humidity. From the above experiment, following parameters were calculated.

$$\begin{aligned} \text{Weight of food consumed} &= \text{Initial weight of leaf} - \text{Weight of leaf left after feeding} \\ \text{Larval weight gain} &= \text{Final weight of larva} - \text{Initial weight of larva} \end{aligned}$$

Results and Discussion

The larvae of *E. undata* undergo seven moults or eight larval instars on all the studied host plants. *E. undata* showed shortest larval period of 114.97 days when larvae fed on *P. fortunei* and longest development period (151.66 days) on *T. ciliata* (Table 1). Total consumption of leaf quantity (weight) of *Toona ciliata* was maximum (10989.37 mg) by a larva of *E. undata* during its total larval period when leaves were provided separately. It was followed by 10075.83 mg of *Tectona grandis*, 8301.87 mg of *Populus deltoides* and 6260.37 mg *Paulownia fortunei* respectively (Table 2). During first instar, larva consumed maximum leaves (275.75 mg) of *T. ciliata* while 269.35 mg, 195.91 mg and 125.08 mg leaves of *T. grandis*, *P. deltoides*, and *P. fortunei* respectively was consumed. Same trend of leaves consumption was observed in other larval instars (Table 2). Leaf consumption by the larva of *E. undata* on different host plants was significantly different from each other at 0.1% level of significance. Difference in food consumption may be due to difference nutritional value of food plants as has been observed by Sankarperumal and Bhaskaran (1989) in case of *Spodoptera litura* larva which consumed nutritionally concentrated carbohydrate and protein rich *Ricinus communis* leaf less than low nutritious *Helianthus annuus* leaf.

Average weight gained by the larva of a particular instar was significantly higher in comparison to their preceding instars (Table 3). Hiratsuka (1920) has also reported that all the lepidopteron consume more food during last two or three instars. Among the four host plants studied, maximum weight (1768.08 mg) was gained by the larvae fed on *P. fortunei* and minimum (980.54 mg) by the larvae fed on *T. ciliata*. Larvae gained weight 1229.31 mg and 1071.15 mg when fed on *P. deltoides* and *T. grandis* respectively (Table 3).

Weight gained by the larva from first to eighth instar larvae was 3.16 mg, 8.78 mg, 20.85 mg, 54.58 mg, 172.26 mg, 368.95 mg, 495.35 mg and 644.15 mg when fed on *P. fortunei* while minimum weight of first to eighth instar larvae was 1.73 mg, 2.44 mg, 9.75 mg, 29.30 mg, 104.22 mg, 162.92 mg, 279.24 mg and 390.94 mg when fed on *T. ciliata* (Table 3). There was significant difference in weight gain of the larva of *E. undata* at 0.1%. The poor nutritional quality of host plants may adversely affect the larval growth and development of herbivorous insects and thereby need to feed more to develop and reach adult stage (Clancy

and Price, 1987). Above observations indicate the preference of *P. fortunei* as the most suitable host plant for the development of *E. undata*.

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References

- Ahmad M, Faisal M, 2004a. *Eupterote undata* (Lepidoptera: Eupterotidae): A new pest of *Paulownia*. Annals of Forestry, 12(1): 147-148.
- Ahmad M, Faisal M, 2004b. First record of *Eupterote undata* (Lepidoptera: Eupterotidae) infesting *Populus deltoides*. Annals of Forestry, 12(2): 285-286.
- Beeson CFC, 1941. The ecology and control of the forest insects of India and the neighbouring countries. Vasant Press, Dehradun (repr. edn., Manager of Publications, Govt. of India), pp 431-432 .
- Clancy KM, Price PW, 1987. Rapid herbivore growth enhances enemy attack: sublethal plant defences remain a paradox. Ecology, 68: 733-736.
- Evans AC, 1939. The utilization of food by certain lepidopterous larvae. Transactions of the Royal Entomological Society London, 89: 13-22.
- Faisal M, Ahmad M, Pahwa E, 2010. Feeding preference of polyphagous defoliator *Eupterote undata* (Lepidoptera: Eupterotidae). Annals of Entomology, 28(1): 41-43.
- Hiratsuka E, 1920. Researches on nutrition of silkworm. Bulletin of Sericultural Experiment Station Japan, 1: 257-315.
- Sankarperumal G, Bhaskaran S, 1989. Effect of food quality on food utilization by *Spodoptera litura* Fabricus (Lepidoptera: Noctuidae). Nutritional Ecology of Insect and Environment, 190-194.
- Sheikh MS, Kalita J, 1995. A preliminary work on *Eupterote undata* (Lepidoptera: Eupterotidae), a defoliator of *Gmelina arborea* Roxb. in Assam. Insect Environment, 1(3): 12-13.
- Tamilselvan M, Singh J, 1993. Studies on the biology of *Eupterote undata* Blanchard - a defoliator on cardamom. Journal of Plantation Crops, 21: 231-233.

Table 1. Duration of different larval stages of *Eupterote undata* fed on different host plants.

Larval Instars	<i>Paulownia fortunei</i>	<i>Populus deltoides</i>	<i>Tectona grandis</i>	<i>Toona ciliata</i>
Ist	4.33±0.43	6.00±0.57	7.00±0.57	8.00±0.57
IInd	6.66±0.43	8.66±0.43	9.00±0.57	9.33±0.71
IIIrd	9.66 ±0.43	11.00±0.57	12.00±0.57	13.00±0.57
IVth	12.33±0.43	12.00±0.57	14.66±0.43	15.00±0.57
Vth	13.00±0.57	15.00±0.57	18.00±0.57	20.66±0.71
VIth	16.00±0.81	19.66±0.83	22.66±0.57	25.33±0.71
VIIth	24.33±0.71	24.00±0.93	27.00±0.43	28.00±0.57
VIIIth	28.66±0.71	27.00±0.57	29.00±0.43	32.33±0.43
Total larval Period (days)	114.97±1.00	123.33±1.08	139.33±0.81	151.66±0.71

Table 2. Consumption of leaves (by weight) by the larvae of *Eupterote undata* fed on different host plants.

Larval Instars	Average weight of leaves (mg) of different host plants consumed by the larval instars			
	<i>Paulownia fortunei</i>	<i>Populus deltoides</i>	<i>Tectona grandis</i>	<i>Toona ciliata</i>
Ist	125.08±1.51	195.91±2.22	269.35±2.74	275.75±2.38
IInd	199.63±2.01	255.66±2.67	386.55±1.98	381.20±2.37
IIIrd	316.28±4.69	454.26±3.26	583.04±3.51	551.24±3.76
IVth	434.30±2.72	580.60±1.53	743.81±3.50	983.50±2.10
Vth	635.83±3.57	898.31±4.77	1312.36±4.75	1534.71±3.68
VIth	1052.80±3.34	1573.58±5.01	1920.54±6.56	2028.75±4.44
VIIth	1453.18±2.76	1864.61±5.12	2208.89±4.84	2428.75±8.19
VIIIth	2043.27±5.16	2478.94±3.02	2651.29±5.27	2805.47±5.86
Average consumption during larval period	6260.37±5.30***	8301.87±6.88***	10075.83±7.07***	10989.37±7.31***

*** Significant at P = .001, C.D. = 29.48

Table 3. Increase in body weight (mg) of larvae of *Eupterote undata* fed on different host plants.

Larval Instars	Average increase in body weight (mg) of larval instars of <i>E. undata</i>			
	<i>Paulownia fortunei</i>	<i>Populus deltoides</i>	<i>Tectona grandis</i>	<i>Toona ciliata</i>
Ist	3.16±0.28	2.21±0.28	1.81±0.22	1.73±0.15
IIInd	8.78±0.67	4.31±0.68	3.88±0.79	2.44±0.64
IIIrd	20.85±0.44	14.31±0.65	11.33±0.67	9.75±0.53
IVth	54.58±0.99	39.83±1.57	34.30±2.16	29.30±2.18
Vth	172.26±2.34	138.72±1.93	119.33±0.90	104.22±1.77
VIth	368.95±5.97	212.22±2.86	176.19±2.89	162.92±2.55
VIIth	495.35±7.37	333.18±4.16	298.14±3.74	279.24±4.08
VIIIth	644.15±5.64	484.53±5.02	426.17±5.47	390.94±4.47
Average weight increase during larval period	1768.08±3.24***	1229.31±2.55***	1071.15±2.42***	980.54± 2.34***

*** Significant at P = .001, C.D. = 5.47