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INFLUENCE OF FOOD PLANTS ON THE CONSUMPTION OF FOLIAGE AND PUPAL CHARACTERS OF *PERICALLIA RICINI* Fab. (ARCTIIDAE: LEPIDOPTERA)

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Information on the relative preference of food plants for feeding, oviposition or shelter is valuable to understand the pattern of carry over of the pest in a locality. In the present experiment, the polyphagous arctiid caterpillar, *Pericallia ricini* was offered eight different food plants and the effect of the food plants on the pupal period, weight of pupae, sex ratio and per cent formation of pupae and adults were studied. The consumption of foliage by larvae of different instars and different sexes were also assessed.

Materials and Methods

Larvae of *P. ricini* were reared in the laboratory and allowed to emerge out and copulate. Disease free second generation of larvae from the laboratory culture were utilised for the feeding trials. They were grown on the different food plants, treating ten larvae feeding on one food plant as one treatment.

The following were the food plants offered:

Common name	*Scientific name*	*Variety/cultivar*
Colocasia	*Colocasia antiquorum* L	Trichur local
Cotton	*Gossypium hirsutum* L	Varalakshmi
Sweet potato	*Ipomoea batatas* L	Vellanikkara local
Pumpkin	*Cucurbita moschata* L	C01
Castor	*Ricinus communis* L	SA2
Brinja!	*Solanum melongena* L	SM6
Banana	*Musa paradisiaca* L	Palayamkodan
Sesamum	*Sesamum indicum* L	Kayamkulam 1

The pupal period was determined by noting the dates of pupation and adult emergence. The pupal weight was determined on the third day of pupation, after removing the hairy covering of the pupae. The emergence of adults from the pupae and the percentage of pupation were also analysed.

Consumption of foliage by male and female larvae was determined by recording the quantity of food eaten by each larvae on the basis of their sex as determined subsequently after adult emergence, Instar-wise consumption of food materials upto each moult was also determined.

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Sex ratio

The effect of the food plants on the sex ratios of the emergent adults was found to be significant. But in this case, since mortality of larvae differed between treatments, the total nnmber of adults formed was not the same and the results lacked uniformity. Hence the actual number of adults that emerged, which was less than 30, was computed to the level of 30 adults. The data given are those obtained after such transformation.

Results and Discussion

Influence of the different food plants on the pupae

The data on the influence of food plants on the pupal period and weight of pupae are furnished in Table 1.

Pupal period

The pupal period did not vary significantly among the pupae developing on the different food plants. Hence it seems that the influence of the food plants on the pupal duration is very little. The results obtained by El-Kifl *et al.* (1973) were of similar nature. Pandey and Srivastava (1967) found that larvae with higher growth indices do not necessarily yield pupae having shorter pupal durations. The present study also is in agreement with this finding.

Weight of pupae

The heaviest pupae developed from larvae which fed on cotton. Considering the relative growth rate and weight gain per larva, it was seen that there were other food plants which performed better as food for the larvae (Table 6). It may be expected that the heaviest pupae may be from insects fed on brinjal where there was the maximum weight gain or in the case of insects fed on colocasia where the relative growth rate is the maximum. This did not occur because the expenses for pupation are met differently by different foods. Even though larvae fed on brinjal or colocasia are the heaviest, when they pupate, much of their metabolic reserves are utilised for pupation. On the contrary, on larvae fed on cotton, the nutrient balance is such that only very little of the body reserves are utilised for pupation. Hence the heaviest pupae are obtained from insects feeding on cotton. Banana-fed larvae produced the lightest pupae, more so because of the least weight gain per larvae observed on insects feeding on this plant,

Pupa! and adult emergence

The number of pupae developing from larvae fed on a diet was one of the major criteria for evaluating a food material. Further calculation of the adult formation from larval and pupal stages may throw light on the nature of inhibitory effect or nutritional requirements for a definite stage of the insect (Bhattacharya and Pant, 1976). Larval mortality caused a decreased percentage of pupation in the larvae fed with colocasia, pumpkin, castor, brinjal and banana. The results indicate the nutritional imbalance and insufficiency of nutrients for the

completion of life cycle of *P. ricini* on pumpkin, banana and brinjal. The lower percentage of pupal formation on colocasia and castor is not statistically significant.

Consumption of foliage by larvae in the different instars

The data on consumption of food plants by III, IV and V instar larvae of *P. ricini* is furnished in Table 3.

Consumption is seen to increase with age of the larvae. This is only expected, since when the larvae grow and gain weight, the metabolic requirements and the maintenance energy are bound to increase, and to compensate for it a higher consumption of food is necessary. There are earlier references also showing

Table 1

Effect of different foods on the pupal period and weight of pupae of *P. ricini*

Host Plant	Pupal period (days)	Pupal weight (g)
Colocasia	21.56	0.50
Cotton	13.83	0.53
Sweet potato	17.47	0.35
Pumpkin	11.83	0.44
Castor	14.70	0,40
Brinjal	16.31	0.49
Banana	14.08	0 25
Sesamum	12.21	0.31
CD (0.01)	NS —	0.088**

** Significant at one par cent level of significance

Table 2

Per cent of pupae and adults of *Pericatlia ricini* formed from larvae fed on different foods

Host Plant	Pupae formed (%)	Adults emerged (%)
Colocasia	95.83	95.83
Cotton	100.00	100,00
Sweet potato	100.00	100.00
Pumpkin	66.67	29.17
Castor	95.83	95.83
Brinjal	79.17	62.50
Banana	58.33	50.00
Sesamum	100 00	100.00
CD (0.01)	8.185**	0.0433**

** Significant at one per cent level of significance

that more food is consumed during the last two or three instars. *Bombyx mori* and *Protoparce sexta,* both lepidopterous leaf feeders, ate about 97 per cent of their total food during the last two instars (Hiratsuka, 1920; Wolcott, 1937).

Food consumption by male and female larvae.

The difference in consumption of leaves of food plants by the two sexes of the test insect can be understood from Table 4.

Females were observed to consume more food than the corresponding males. Probably, this is for accumulation of greater amounts of nutrients necessary for the production and development of eggs, Davey (1954) similarly reported that total food intake during the nymphal stage is greater in the female than in the male of *Schistocerca gregaria.*

Table 3

Consumption of food plants by III, IV and V instar larvae of *Pericallia ricini* (g/larva)

Host plant	III	IV	V
Colocssia	0,56	1.32	4,44
Cotton	0.97	1.85	5.55
Sweet potato	0.75	4.05	5.44
Pumpkin	1,00	4.82	5.74
Castor	2.48	4.19	5.30
Brinjal	1.47	4.49	6.25
Banana	2.08	3.85	5.88
Sesamum	0.76	2.60	4.50
CD (0.01)	0.7745**	0.0624**	0.0274**

** Significant at one percent level of significance

Table 4

Consumption of foliage (g wet weight per larva) by male and female larvae of *P. ricini* during the experimental period

Host plant	Male larva	Female larva
Colocasia	3.12	3.20
Cotton	4.03	4,35
Sweet potato	4.97	5.26
Pumpkin	5.00	6.54
Castor	5.61	6.36
Brinjal	5.78	6.43
Banana	4.54	7.27
Sesamum	3.51	3.78
CD (0.01)	0.0173**	~ 0.0173**

**Significant at one per cent level of significance

Table 5

Sex ratio of moths of *P. ricini* emerged at the end of the experimental period

Host plant	Female : Male	Sex ratio
Colocasia	17 : 13	1 : 0,76
Cotton	16 : 14	1 : 0.88
Sweet potato	10 : 20	1 : 2.00
Pumpkin	13 : 17	1 : 1.31
Castor	16 : 14	1 : 0.88
Brinjal	18 : 12	1 : 0.67
Banana	11 : 19	1 : 1.73
Sesamum	10 : 20	1 : 2.00

Table 6

Relative growth rate on dry weight basis (mg/mg/day) and total weight gain per larva fg fresh weight) of *P. ricini*

Host Plant	Relative growth rate	Weight gain
Colocasia	0.23	0.98
Cotton	0,15	0.94
Sweet potato	0.12	0.95
Pumpkin	0.14	0.99
Castor	0.12	0,77
Brinjal	0.17	1.06
Banana	0,08	0,66
Sesamum	0.14	0.67
CD (0.01)	0.034**	0.092**

**Significant at one per cent level of significance

Sex ratio

Sex ratio of 1:1 or a slightly greater number of females to males is considered as the best (Bhattacharya and Pant, 1976). The different food plants may favour development of one sex and suppress the other. The optimum sex ratio near 1:1 was found in insects which were fed on cotton and castor. The worst value of twice the number of males to females was recorded among adults from sesamum and sweet potato (Table 5). Even when a particular food plant favours larval growth to the best extent and favours utilisation to the maximum, if it fails to produce adults having a good sex ratio, the survival of the insect species is endangered. Through ecological adaptation, insects overcome this and egg laying is done mostly on those plants alone which support normal development in all the stages. The heavy and consistent infestation of *Pericallia ricini on* cotton and castor might probably be due to this reason.

Summary

The influence of different food plants on the growth of the arctiid caterpillar *Pericallia ricini* is discussed. Due to differences in the quality of the nutrients and the nutrient balance in the different food plants, the pupal periods of caterpillars feeding on the varied food plants differed significantly. The pupal weights and the mortality of larvae and pupae differed between the insects feeding on the different food plants. An increased consumption of food by larvae of the later instars and by females than males was also observed.

സംഗ്രഹം

പെരികാലിയ റിസിനി എന്ന ശലഭത്തിന്റെ വളർച്ചയുടെ പല ഘട്ടങ്ങളെ ഭക്ഷ്യയോഗ്യമായ പലതരം ചെടികളും എങ്ങിനെ സ്വാധീനിക്കുന്നു എന്ന വസ്തുതയെ പഠന വിധേയമാക്കുകയുണ്ടായി. ഈ ചെടികളുടെ ഇലകളിൽ അടങ്ങിയിരിക്കുന്ന പോഷക വസ്തുക്കളുടെ അളവിലും തോതിലുമുള്ള വ്യത്യാസങ്ങൾക്ക് വിധേയമായി ഈ ശലഭത്തിന്റെ പ്യൂപ്പയുടെ കാലദൈർഘ്യം വ്യത്യാസപ്പെടുന്നതായി കാണപ്പെട്ടു. വ്യത്യസ്ത ചെടികളിൽ വളരുന്ന പുഴുക്കളുടെയും പ്യൂപ്പയുടെയും മരണനിരക്കും പ്യൂപ്പയുടെ തൂക്കവും വ്യത്യസ്തങ്ങളാണെന്ന് കണ്ടു. ആൺ ശലഭങ്ങളുടെ പുഴുക്കളേക്കാൾ പെൺ ശലഭങ്ങളുടെ പുഴുക്കളാണ് കൂടുതൽ ഇലകൾ തിന്നുതീർക്കുന്നതെന്നും വ്യക്തമായി.

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