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Biological Effects of Parasitism by *Epiricania melanoleuca* (Fletcher) on *Pyrilla perpusilla* (Walker)

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ABSTRACT

Biological effects of parasitism by *Epiricania melanoleuca* (Fletcher) on the nymphal and adult stages of *Pyrilla perpusilla* (Walker) have been investigated under laboratory conditions. Parasitoid-inflicted injuries caused high mortality (95.9%) in the first instar nymphs within two days of parasitisation. Appreciable nymphal mortality (70%) also occurred in the parasitised second, third, fourth and fifth instars in the form of weak nymphs, nymphal-adult intermediates and weak adults though after a prolonged nymphal duration in the later three instars. Fecundity of the parasitised adults was reduced by 22 per cent but their longevity was enhanced significantly.

Key Words : *Epiricania melanoleuca, Pyrilla perpusilla,* biological effects, parasitism

Population of the sugarcane leafhopper, *Pyrilla perpusilla* (Walker), a sporadic pest of sugarcane, is suppressed by the natural enemies during the inter-outbreak period (Brar, 1978). *Epiricania (Epipyrops) melanoleuca* (Fletcher), an ectoparasitoid of nymphal and adult stages of pyrilla, acts as a key mortality factor of pyrilla population during monsoon period in Punjab (Brar and Bains, 1979). Due to the rapid rate of increase and longer period of activity of this parasitoid, it has shown its potential as an effective biocontrol agent through artificial augmentation (Misra and Pawar, 1981). Though the numerical trend in populations of the host and the parasitoid has been studied under natural conditions by many entomologists, the information on the deleterious effects produced by the epipyropid on the host is still scanty and controversial. Keeping in view the need for proper understanding of the biological relationship between the host and the parasitoid, the present study was undertaken.

MATERIALS AND METHODS

Laboratory culture of pyrilla was maintained by rearing it on sugarcane leaves in the rearing sets following the technique developed by Dhaliwal and Bains (1983). Effect of parasitism by *E. melanoleuca* on the survival and development of various nymphal instars of pyrilla was determined under laboratory conditions from August through October, 1986. Nymphs of each of the five instars were taken from the culture and were released into rearing sets @ 10 individuals per set. The insects were parasitised artificially by keeping the glass vials containing lab-reared, newly-hatched larvae of the parasitoid, into the rearing sets. The nymphs showing signs of parasitism were separated out and reared to record their development period and adult emergence. Unparasitised nymphs from the culture were also reared separately as control.

To determine the anomalies in the parasitised adults of pyrilla, the newly emerged adults were parasitized by the procedure as described in case of nymphs. Eighteen pairs of each of the parasitised and healthy adults were released in rearing sets @ one pair per set to compare their longevity and fecundity. The number of eggs laid by the females were counted daily and removed from the sets. The data were compared by applying 't' test.

RESULTS AND DISCUSSION

The data related to the parasitism effects produced by *E. melanoleuca* on nymphal and adult stages of *P. perpusilla* are presented in Tables 1 and 2 respectively.

Exposure of first instar nymphs for parasitisation resulted in 95.9 per cent mortality within two days before the appearance of any signs of parasitism. The remaining ones exhibited parasitism after 11-13 days. Such nymphs, however, could not tolerate the parasitoid feeding and died after an average nymphal life of 20 days. High mortality in early nymphal instars has been reported to be due to injuries caused by the parasitoid (Mukerji and Venkatraman, 1948). The mean developmental period of nymphs parasitised in the third, fourth and fifth instars was prolonged significantly, the maximum prolongation (42.6 days) being in the fourth instar.

Mortality among the first four nymphal instars due to parasitism indicated that all the individuals died as weak nymphs, nymphal-adult intermediates and weak adults (lived upto 7 days). The present findings, however, are not in line with those of Bindra and Brar (1978) who reported emergence of normal adults from the parasitised penultimate instar nymphs. In case of parasitised last instar nymphs, 50 per cent adults were produced out of which only 20 per cent were normal. Though longevity of such adults (males and females) was the same as that of the ones emerged from unparasitised nymphs, the fecundity of these adults was comparatively low (96 eggs/female).

Data recorded on the parasitised adults indicated that males (39.33 days) and females (46.78 days) survived for a significantly longer period than their unparasitised counterparts (Table 2). Similar prolongation was also observed in the pre-oviposition period of the parasitised females. The egg laying capacity of the parasitised females (125.17 eggs/female) was, however, reduced by 22.05 % as compared to that (157.11 eggs/female) of the unparasitised ones. The present findings support the observations of Gupta (1940) and Brar and Bains (1979) who reported reduction in fecundity in female pyrilla parasitised by *E. melanoleuca*. However, the earlier reports indicating no effects of parasitism on fecundity (Mukerji and Venkatraman, 1948) and reduc-

Table 1. Effects of parasitism by *E. melanoleuca* on various nymphal instars of *P. perpusilla*

Host stage	Number of nymphs tested	Mean longevity of nymphs (days)	Calculated 't' value	Mortality (%) as			Survival (%) as normal adults	Mean longevity of normal adults (days)	
				Nymphs	Intermediate forms	Weak adults		Male	Female
I-instar (1)*	73**	20.0 ± 1.00	-	100.00	0.00	0.00	0.00		
II-instar (5)	34	32.3 ± 4.82	1.205	88.23	5.88	5.88	0.00		
III-instar (13)	20	37.1 ± 5.41	5.868***	70.00	25.00	5.00	0.00		
IV-instar (21)	20	42.6 ± 7.76	8.063***	35.00	45.00	20.00	0.00		
V-instar (28)	20	37.7 ±14.38	2.500***	40.00	10.00	30.00	20.00	32	30
Control (Unparasitised)	31	31.3 ± 0.89	-	0.00	0.00	0.00	100.00	31	34

* Figures in parentheses indicate the age (days) of insects at the time of parasitisation
** Seventy nymphs died within two days before showing signs of parasitism
*** Significant (P = 0.05)

Table 2. Effects of parasitism by *E. melanoleuca* on adult stage of *P. perpusilla*

Type of adults	Longevity (days)		Pre-oviposition period (days)	Fecundity per female	Reduction in fecundity due to parasitism (%)
	Male	Female			
Parasitised	39.33 ± 7.33 (30-54)	46.78 ± 9.18 (36-70)	31.44 ± 3.66 (26-41)	125.17 ± 25.60 (81-175)	22.05 ± 15.53 (20 - 41.18)
Un-parasitised	32.11 ± 6.88 (20-50)	34.22 ± 10.14 (23-70)	16.39 ± 4.07 (11-25)	157.11± 23.70 (105-190)	—
Calculated 't' value (P=0.05)	4.06*	6.65*	9.78*	3.54*	—

Figures in parentheses indicate range

tion in longevity of parasitised adults (Brar and Bains, 1979) of pyrilla are at variance with the results of the present study.

Most of the parasitised nymphs died before contributing to the next generation through adults. Though parasitoid-induced prolongation in the longevity of pyrilla (nymphs and adults) may lead to feeding by the individuals on sugarcane for additional number of days, yet the feeding rate of parasitised individual may be below normal. The reduced fecundity of parasitised adults of postmonsoon period may be helpful in reducing the overwintering egg population of pyrilla under natural conditions. As the third instar nymphs are preferred by *E. melanoleuca* for parasitisation (Dhaliwal, 1982) which are capable of tolerating the parasitoid feeding, timing of artificial releases of *E. melanoleuca* may be decided accordingly.

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