Changes of haemolymph protein profile in the larva of *Pericallia ricini* (Fabricius) parasitised by the Braconid Wasp, *Apanteles taragamae* Viereck (Hymenoptera: Braconidae)

N Raja, S Janarthanan & S Ignacimuthu*
Entomology Research Institute, Loyola College, Chennai 600 034, India

Received 21 September 1999; revised 24 December 1999

Parasitism by the braconid wasp, *A. taragamae* caused alterations in the haemolymph polypeptides of woolly bear larvae of *P. ricini*. Analysis of haemolymph proteins by SDS-PAGE and densitometry showed that the quantities of haemolymph proteins were reduced dramatically in the parasitised larvae. Simultaneously, parasitism induced large amount of 95 kDa polypeptides in the haemolymph of the parasitised larvae. Also, a remarkable induction of 43 and 45 kDa polypeptides which are not detectable in non-parasitised larvae appeared in the parasitised larva.

Most of the species of Hymenoptera are parasitoids, which are free-living as adults and parasitic as larvae1. These parasitoids have very effectively been used as biocontrol agents in Integrated Pest Management programme. The functional relationship between insect parasitoids and their hosts is well documented2-4. Insect parasitoids often induce drastic changes in the physiology and behaviour of their hosts5. These include transitory immunosuppression, induction of novel haemolymph proteins, alterations in the level of endogenous proteins and metabolites, developmental arrest, etc5.

In the present observation changes in the haemolymph proteins of the woolly bear larvae of *Pericallia ricini* (Fabricius) parasitised by the braconid wasp, *Apanteles taragamae* (Viereck) have been reported for the first time. The pest *P. ricini* is a major defoliator of castor (*Ricinus communis*) and reported as minor pest of pumpkin, gingelly, moringa, sesbania and field bean6.

Larvae of *P. ricini* were collected from the field and subsequently reared in the laboratory. During rearing the emergence of the larval parasitoid *A. taragamae* from the third larval instar of *P. ricini* was recorded as larval endoparasitoid. Immediately after this observation the haemolymph samples were drawn from the parasitised larvae by wounding the prothoraxic legs and draining the haemolymph into an ice cold microcentrifuge tube rinsed with phenylthiourea solution on ice. Later, it was centrifuged at 3000 g for 10 min and the clear haemolymph sample without any tissue debris and haemocytes was collected. Equal quantity of haemolymph samples was loaded in SDS-PAGE7, allowing to make relative quantitative comparisons between parasitised and non-parasitised larvae. The gel was stained with coomassie brilliant blue R-250. Molecular weight standards were run to assess the molecular weight of various haemolymph proteins. The relative amounts of haemolymph proteins detected with gel electrophoresis were quantified using an LKB-Ultrascan laser densitometer.

During rearing of *P. ricini* larvae it was interesting to observe that the final instar larval endoparasitoid emerged from the third instar larval host. The final instar of the larval parasitoid immediately after emergence from the host spins the pupal cocoon. Haemolymph samples from these hosts were immediately collected for the study of parasitization induced changes on various proteins.

As seen in the SDS-PAGE gel (Fig. 1) the *P. ricini* third instar larval protein profile showed several polypeptides that were correlated by densitometer scans (Fig. 3). The densitometer scan as well as protein profile in the gel illustrate several qualitative and quantitative changes that occur during parasitism; a few additional peaks were detectable only in the parasitised larvae indicating the presence of novel proteins that are non-detectable in non-parasitised larvae. Most other proteins appeared relatively less
due to parasitism. The parasitised larva of *P. ricini* by the larva of *A. taragamae* is depicted in Fig. 2.

A large peak (designated by an arrowhead in Fig. 4) that migrated at 95 kDa was found to be an additional novel protein that was absent in the non-parasitised larva. In addition, two polypeptides of molecular weight 43 and 45 kDa (also pointed by an arrowhead in Fig. 4) were also found in parasitised larvae. These polypeptides were non-detectable in non-parasitised larvae.

The effect of parasitism on the host insect can be viewed as parasite adaptations to ensure successful parasitism and to create a host environment suited to meet the needs of the parasitoids. During parasitism, the rapid increase in the growth of the parasite causes severe nutritional stress as nutrients are diverted to sustain parasite growth. Moreover, the host gradually stops feeding and the host food consumption and growth ceases before the parasite's pupation. The results of the present study also showed the
NOTES

395

slowdown in movement and feeding of the host (unpublished data). A slowdown in host protein synthesis may be expected to occur as a consequence of the retardation of host metabolism following the lack of feeding by the host. The present study confirmed the production of novel proteins (95 kDa) that were not detectable in non-parasitised larvae. Polypeptides of similar molecular weight due to braconid parasitism have been reported earlier in several other insect hosts. Reports of different species of endoparasites such as *Glyptapanteles obliquae* (Wilkinson) and *Apanteles glomeratus* (Linnaeus) have been reported earlier in *P. ricini*. The present kind of parasitism by *A. taragamae* in *P. ricini* has differed from the reported parasitoids and such parasitization induced haemolymph protein changes has been reported for the first time.

References