STUDY ON THE SCANNING ELECTRON MICROSCOPY OF *NESOLYX THYMUS* A HYPERPARASITOIDS OF UZI FLY IN MUGA CULTURE

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ABSTRACT: Muga silkworm, *Antheraea assamensis* Helfer (Lepidoptera: Saturniidae), yields golden yellow silk, is unique to Brahmaputra river valley of Assam. Among different pests reported on muga silkworm, uzi fly *Exorista bombycis* is one of the serious endo-parasitoid particularly during Nov-April causing 20-90% loss in silkworm growing areas and post winter (Dec-Mar). Chemical pesticides are harmful to this insect along with the environment ,there for biological control need to adopt in muga culture. *Nesolyx thymus*, a hyperparasitoids of uzi fly are using as a biological agent to control uzi infestation in muga culture. This hyperparasitoids are attack the immature pupae to lay eggs on the surface and develop inside to complete there life cycle. The insect killed the uzi pupa and emerge out as adult flies. In this study, Scanning electron microscope (SEM) was done to shows how development occure inside the pupae.

KEY WORDS: Uzi, hyper-parasitoids, SEM, muga culture.

Almost all arthropod herbivores have natural enemies that can be used in what is known as ‘biological control. The level of interactions can provide an essential foundation for designing effective biological control by Lewis et al. (1997), and for improving the efficacy and understanding the suppression of herbivore populations in biological control. Ecological interactions between two species are often (indirectly) mediated by a third species of the same or another trophic level (Bronstein and Barbosa 2002).Fluctuations in predator or parasitoid populations and the level of herbivore suppression, not only tritrophic interactions, but also the impact of higher-level natural enemies. Predatory and parasitic insects are attacked by their own suite of predators, parasitoids and pathogens (Rosenheim, 1998), which constitute the fourth trophic level.

Hyperparasitoids are also called secondary insect parasitoids as they develop at the expense of insect primary parasitoids (Sullivan & Völkl, 1999). In other words, a hyperparasitoid attacks another insect that is itself parasitic on a host insect, which is often an herbivore. Like parasitoids, larvae of endophagous hyperparasitoids feed inside the host, whereas ectophagous species feed externally. Koinobiont hyperparasitoid species allow their host to continue development after oviposition. *N. thymus* is under koinobiont, pupal hyperparasitoid of uzi fly *Exorista bombysis* which continued development after oviposition and emerge from the host as adults.

Scanning electron microscopic study was conducted to see the mode of development of *Nesolyx thymus*, inside the pupa.

MATERIALS AND METHODS

Insect colonies

A continuous colony of house flies was maintained under standardized laboratory conditions in 25 ± 1°C, 75 ± 10% relative humidity. Sugar, water and milk powder (energy source) were provided as food as described by Mommaerts et al. (2006a).

Biological control agents

The *Nesolyx thymus* species originated from Mysor biocontrol laboratory under central silk board which used to control uzi infestation in *B.mori* and maintained by infested with house flies pupae to control uzi infestation in muga culture.

For Scanning Electron Microscopy (SEM)

For SEM studies both adult (male and female) and parasitized pupae after 24 hrs, 48 hrs, 72 hrs, 96 hrs,120 hrs and 144 hrs were fixed in 3% glutaraldehyde in 0.1 M sodium cacodylate buffer at pH-7.6 for four hour at room temputure.Parasitized pupae are just pins by nidle to penetrad solution to well fixed. After fixation the tissue fragments were washed three times in 0.1M sodium cacodylate buffer, pH 7.2, containing 5mM $CaCl_2$, and post fixed in a solution containing 1% osmium tetroxide and 0.8% potassium ferricyanide in 0.1M cacodylate buffer. Then dehydrated in a graed of acetone series, freeze dried with tert-butyl alcohol,mounted on a stub using double coated adhesive tape, sputter coated with gold and observed for surface morphology with JSM-6360 (Jeol) Scanning Electron Microscope operated at 20KV.

RESULTS

Development time: The egg to adult development time ranged from 13-16 day in summer and 25-29 day in winter. There are four nymphet stages in N.thymus which complete inside the pupa. The nymph duration was found in first- 2 days second -3 days third -4days and four 6- days respectively.

Longevity: There were significant differences in longevity between summer and winter seasons. In summer seasons it was 10-13 days and in winter 6-9.

Fecundity, immature mortality and sex ratio: Fecundity of N.thymus is 200-250 per female and emerge out from per housefly pupae was 35-50 pre-oviposition period (time from emergence to first oviposition) was 13-15 days in summer and 20-28 day in winter, oviposition period (period during which females laid eggs) 3-7 day ,but preferable upto 4 days are most preferable for parasitization.and post-oviposition period (time after last oviposition until death) was 2-3 days. The secondary sex ratio (proportion of males) was 1:5 male and female ratio determined at adult emergence.

Adult body size: The whole body length, head width and wing length, were significantly different females were significantly larger than males. The whole body size of female was found 2.2± 0.03 mm and male 1.3±0.12 mm. Head width of female0.4 ± 0.1mm and male0.25 ± 0.2mm .The for wing length of female was 0.9±0.2mm and hind wing 1.5 ±0.3mm and male for wing 0.7±0.2mm and hind wing1.1±0.5mm in length.

DISCUSSION

In parasitoids, development mode (koinobiont or idiobiont) has been emphasized as a major potential determinant of life histories (Godfray, 1994;

Quicke, 1997; Mayhew & Blackburn, 1999; Strand, 2000; Harvey & Strand, 2002). The dichotomous hypothesis states that natural selection operates on the life history strategies of these two categories of parasitoids to magnify their differences (Godfray, 1994). Koinobiont endoparasitoids allow their host to continue development. Therefore they are able to attack small hosts that have less efficient defenses against parasitism. Moreover, younger hosts are generally more abundant than the later stages (Price, 1974). *N. thymus* hyperparasitoid of uzi fly also need younger pupa for parasitization and development inside the host then later stages.

After parasitisation the development of the host is usually stopped therefore, the development time of parasitoids is predicted to be generally less than that shown by hyperparasitoids. This species was not tested in muga culture, which might have influenced the results. Scanning electron microscopy done for the first time to observe biology, pattern of development.

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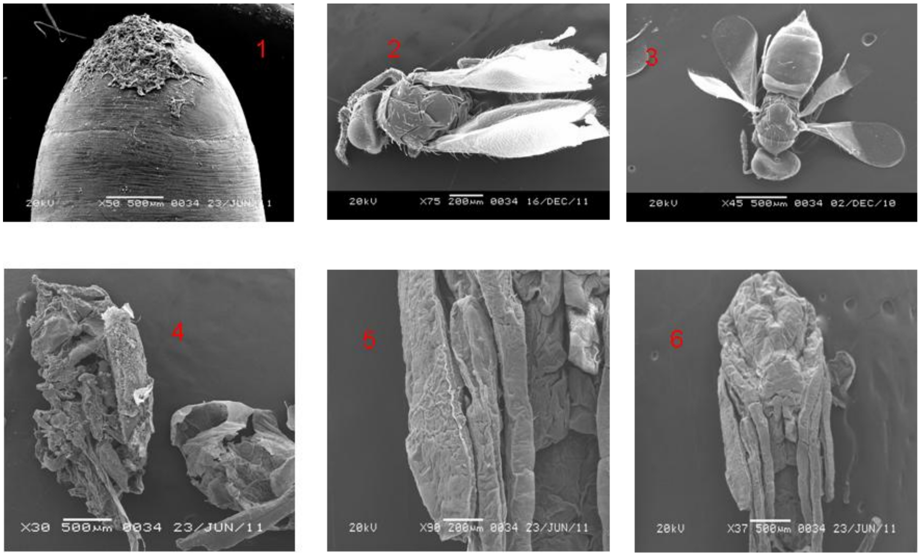

Figure A. Scanning electron microscopy of *N. thymus;* 1. Parasitied pupa of house fly, 2. Adult male, 3. Adult female, 4. *N. thymus* nymph inside the house fly pupa, 5. Development of organs, 6. Fourth instar nymph.

Figure B. Scanning electron microscopy of *N.thymus;* 7. Compound eye, 8. Antenna with head, 9. Wings with clearly visible hair.