DISTRIBUTION OF ENDOSYMBIOTES AMONG THE INSECT FAUNA OF ANNAMALAINAGAR

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It is known for over a century that many insects carry microbes as symbiotic partners[1]. Several studies indicate that these microbes are indispensable for the nutritional requirements of the host insect[1–4]. The study of symbiosis in insect is therefore important to understand the complicated insect physiology and to work out a possible pest control strategy. However, all insects are not symbiote-bearers. In the massive survey on endo-symbiosis by Buchner it was reported that only 10% of the living species of insects regularly have intracellular microorganisms

Table 1 *Insects bearing microbial symbiotes*

Insect host	Type of symbiote	Location in insect
Cofana spectra, Distant (Rice white leafhopper)	i. 'a' Symbiote ii. Bacterium	Both are located in separate mycetomes in abdomen.
Cofana unimaculata, Signoret (leafhopper on grasses)	i. 'a' Symbiote ii. Yeast	In paired mycetome. In abdominal fatbody.
Nephotettix virescens, Distant (Rice Green leafhopper)	i. 'a' Symbiote ii. Bacterium	Both are located together in paired mycetomes in abdomen.
Leofa ? unicolor (a Cicadellid on grasses)	i. Yeast	In abdominal fatbody.
Exitianus indicus, Distant (a Cicadellid on grasses)	i. 'a' Symbiote	Paired mycetomes in abdomen.
Amritodus atkinsoni, L. (Mango leafhopper)	i. Bacterium	Paired mycetomes in abdomen.
Idioscopus clypealis, L. (Mango leafhopper)	i. Bacterium	Paired mycetomes in abdomen.
Nilaparvata lugens, Stal (Brown planthopper)	i. Yeast-like organism	Mycetocytes in abdominal fat tissues.
Sogatella furcifera, Horvath (White backed planthopper)	i. Yeast-like organism	Mycetocytes in abdominal fat tissues.
Nisia nervosa, Motsch. (White striated planthopper)	i. Yeast-like organism	Mycetocytes in abdominal fat tissues.
Sardia rostrata, Melichar (a delphacid on grasses)	i. Yeast-like organism	Mycetocytes in abdominal fat tissues.
Nisia grandiceps, Kirkaldy (a Meenopline)	i. Yeast-like organism	Mycetocytes in abdominal fat tissues.
Perkinsiella sp. (Planthopper on Sugarcane)	i. Yeast-like organism	Mycetocytes in abdominal fat tissues.
An unclassified fulgorid on Water grass, *Brachiaria mutica*.	i. Yeast-like organism	Mycetocytes in abdominal fat tissues.
Leptocorisa acuta (Rice earhead bug)	i. Bacterium	In crypt of hindgut.
Anigrus sp. (Meenoplidae)	— Symbiosis absent—?*	

* Detailed investigation was not possible due to lack of specimen.

or microorganism-like particles[5]. It is also interesting to note that an insect which is otherwise a regular symbiote-bearer loses its symbiote under a different geographical condition due to unfavourable climate[6].

Hence a survey was conducted around Annamalainagar to identify insects in which microbial symbiosis exists. The insects were either collected from the fields or from light traps. Live insects were dissected in 0.8% saline. Smears were prepared with mycetomes, alimentary canal, ovary, testes, fat-body, haemolymph etc and stained with Giemsa or cotton blue. Slides were examined under light microscope for the presence of microbes. The type of symbiote was classified as yeasts or bacteria or 'a' symbiote, as the case may be, based on the available descriptions[1,7,8]. The insects examined, the type of symbiotes in them and their location are given in table 1.

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UPPER EXTREME OF TEMPERATURES LIMITING THE DEVELOPMENT OF *TETRASTICHUS PYRILLAE* CRAWFORD WITHIN ITS HOST EGGS

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AMONG the natural enemies of the sugarcane leaf hopper (*Pyrilla perpusilla* Walker), the egg parasitoid, *Tetrastichus pyrillae* Crawford (Eulophidae: Hymenoptera) occupies an important place[1–6]. In a laboratory study the present authors found that the fertility of this parasitoid was the maximum when the rearing temperature was kept around 25°C. In the present study, attempts have been made to explore the upper extreme of temperature, hitherto obscure, for the embryonic or post-embryonic development of *T. pyrillae.*

Pure cultures of both the host and the parasitoid were maintained in the laboratory. Freshly emerged parasitoid adults were isolated and released at the rate of 20 pairs per rearing glass tube (10 × 3.75 cm). Five such tubes were prepared and kept at 25 ± 1.5°C in a BOD incubator. The adults in each rearing tube were fed on 10% sucrose in water. About 100 freshly laid host eggs glued on the egg card were subjected to parasitization by the parasitoid females. This method was repeated simultaneously for all the five rearing tubes. The egg cards were replaced every 24 hr until all the females died. The egg cards were then transferred to test temperatures viz. 27.5, 30, 32.5 and 35 ± 1.5°C after 1, 2, 4, 6 and 8 days of parasitization from tubes 1–5, respectively.

In all cases, the number of eggs displaying symptoms of parasitization, duration of life cycle and the number of male and female parasitoids emerged was recorded and the data are summarized in table 1.

The average number of parasitized eggs/female revealed that the host eggs, when transferred from 25 to 35 ± 1.5°C after 1–2 days of parasitization, did not produce any symptom, indicating that the parasitoid died in its embryonic stage. In host eggs shifted to 35 ± 1.5°C after 4 days of parasitization symptoms in the form of black minute spots of microscopic size could develop. In 6–8-day-old parasitized host eggs, the symptoms of parasitization appeared quite clearly but from such host eggs no