

Table 1 Growth of *Scenedesmus bijugatus* at constant illumination (2.7 K Lux) and varied temperature

Time (day)	Colony count at 33–35°C		Colony counts at 36–40°C	
	% colonies	% unicells	% colonies	% unicells
Initial reading	100	—	100	—
5	100	—	100	—
10	100	—	100	—
15	100	—	19	81
20	100	—	19	81
25	83	17	19	81
30	63	37	3	97
35	42	58	—	100

produced unicells population. We grew *S. bijugatus* in Juller's solution¹, (pH = 7.8), which contained neither ammonium salt nor organic substance. Steenbergen² synchronized the cultures of *S. quadricauda* by light and dark cycles and found that unicell formation was light dependent morphogenesis, as it occurred in the second half of photoperiod. Besides light, temperature influences the production of unicells. Table 1 shows that unicell formation occurred earlier at 36–40°C than at 33–35°C. The percentage of unicells was 81% and 17% respectively, while the intensity of light was constant.

Trainor *et al*³, studied the morphological variation in the species of *Scenedesmus* and found that colonies of *Scenedesmus* reproduced by 4-cell colony formation. However, the 4-cells of one division may fail to join and four unicells result. These unicells may reproduce themselves or may form 4-celled colony. For the last two years these unicells are maintained in the laboratory, which have ceased to form 4-celled colony.

The unicell cultures have been subjected to various factors along with the original culture of *S. bijugatus*. They are more resistant to antibiotics like penicillin, streptomycin and mitomycin C and tolerated UV-radiation for long duration. Penicillin concentration 3×10^6 units/100 ml was lethal to *S. bijugatus* but unicells revived at this concentration after 4 weeks. Streptomycin 0.5 mg/100 ml was lethal to *S. bijugatus* while unicells tolerated as high as 1 mg/100 ml. Mitomycin C at 9 mg/100 ml was lethal but unicells cultures were healthy at 10 mg/100 ml.

Cultures of *S. bijugatus* and unicells were exposed to UV, wavelength of 2537 Å, at a distance of 5 cm for 30–180 sec with a gap of 30 sec. Unicell population

withstood radiation for 150 sec whereas *S. bijugatus* turned white at the end of 90 sec.

The authors thank Prof. D. Singh for facilities. The financial assistance provided by C.S.I.R. to the first author is gratefully acknowledged.

20 August 1984, Revised 21 December 1984

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RECORD OF TWO NEW HYPERPARASITES OF *APANTELES TARAGAMAE* VIER. (BRACONIDAE: HYMENOPTERA), A LARVAL PARASITE OF THE BLACK-HEADED CATERPILLAR PEST OF COCONUT

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OPISINA ARENOSELLA Walker (= *Nephantis serinopa*), the black-headed caterpillar pest of coconut is attacked by several parasites and predators, some of which in turn serve as hosts for certain hyperparasites. Therefore, the efficiency of the natural enemies of *O. arenosella* as powerful biological control agents in the field, is considerably reduced. Thus Rao *et al*¹ and Dharmaraju² reported a *Pluotropis* sp (Eulophidae) from the cocoons of *Bracon brevicornis*, collected from the states of Kerala and Mysore. Recently Temerak³ recorded *Pediobius bruchicida* as attacking the cocoons of *B. brevicornis* which was reported as a primary parasite of *Sesamia cretica* Led., a pest of sugarcane, sorghum and maize. *Apanteles taragamae*, another common larval parasite of *O. arenosella* is known to be attacked by four hyperparasites¹, viz *Aphanogomus manilae* (= *Calliceras manilae* Ashm.);

Eurytoma albotibialis Ashm.; *Perilampus microgastris* Ferr.; and *Brachymeria nephantidis* Gahan.

In the present work, the authors report two more hyperparasites attacking the developmental stages of *A. taragamae*. A short account on the biology of one of them is also given.

1. *Pediobius imbreus* (Walker) (family: Eulophidae)

This species originally collected from the cocoons of *Apanteles taragamae* was also found parasitising the cocoons of *Bracon brevicornis* in the field. In the laboratory they can be reared on the pupae of *B. brevicornis*. When reared under the laboratory conditions (Temp. 28.7 ± 2.7 ; R.H. 57.3 ± 5.4) with 50% diluted honey, this hyperparasite lived for more than 40 days. Mating takes place on the same day of emergence and is accomplished in 43 seconds ($n = 21$). However, mating is not essential for oviposition. It is found that the female starts to oviposit on the same day of emergence and is completed within about 30 seconds ($n = 53$). The life cycle from egg to adult is completed within 17 days ($n = 19$). Only one hyperparasite developed from a host pupa.

Adult females readily feed on the host body fluid. When a female *Pediobius* visits one clutch of the pupae of *B. brevicornis*, it oviposits in most of them and the remaining ones are mostly damaged due to the injury caused by its host feeding behaviour. Some of the injured pupae develop into small-sized individuals which cannot successfully paralyse the actively moving pest larva.

(2) *Eurytoma braconidis* Ferriere (family: Eurytomidae)

This hyperparasite was also obtained from the cocoons of *A. taragamae*, collected from the fields in Malabar. Only one hyperparasite was found to emerge from a host cocoon.

The authors thank Dr Z. Bouček and Dr B. R. Subba Rao of the Commonwealth Institute of Entomology, London for the identification of the hyperparasites, and also to Dr K. J. Joseph, Professor and Head of the Department of Zoology, University of Calicut, for facilities. One of them (SMG) is thankful to the University of Calicut for a fellowship.

27 September 1983; Revised 3 December 1984

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EFFECT OF THE JUVENOID HYDROPRENE ON OVIPOSITION AND HATCHABILITY IN THE SWEET POTATO WEEVIL, *CYLAS FORMICARIUS* F. (COLEOPTERA = CURCULIONIDAE)

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THE action of juvenoids brings about the disruption of a variety of processes such as larval development, metamorphosis, reproduction and embryonic development in insects^{1,2}. In the sweet potato weevil, *Cylas formicarius* F., the juvenoid hydroprene caused several deformities in the ovaries³. In the present communication, the action of the juvenoid on the oviposition and hatchability in this weevil which is a serious pest of sweet potatoes has been investigated and reported.

The insect was mass cultured in the laboratory³. Pupae were segregated from the infested tubers and were kept in 4 inch petridishes containing moist cotton and a filter paper above it. Adults were separated as soon as they emerged. Different age groups of adult females were treated with 0.1 $\mu\text{g}/\text{sp}$ of the juvenoid hydroprene. Untreated males of the same age were added to these females for mating purpose. The oviposition and hatchability rates were studied. The parallel controls were maintained throughout.

The results of the experiments are presented in table 1. Oviposition and hatchability rates were age-dependent. The oviposition rate was low initially and it increased with the time and later it decreased irrespective of the treated stage. The hatchability was almost negligible in the first week but increased with time and finally it was found to be cent percent. The grubs that hatched out of the eggs laid in the first week by the 1-day old females died immediately. But the grubs that hatched out of the eggs laid after first week survived and fed normally.

Decreased fecundity in the treated insects was caused by the defects evoked in the ovaries. Such decreased fecundity was also observed earlier⁴⁻⁶.