Raipur in Madhya Pradesh[2]. *Fusarium equiseti* (Ida) pathogenic to *M. hibisci* was reported from Bangalore[3]. Recently, *Eucoilidea* sp. (Eucoilidae) and *Eurytoma* sp. (Eurytomidae) were recorded as parasites of *M. hibisci* from Jabalpur[4]. Although *M. hibisci* was recorded for the first time from Tamil Nadu and is considered to be a sporadic pest of okra, not much work on the natural enemies of this pest has been carried out. This communication reports observations on the distribution pattern of *M. hibisci* as well as the parasites associated with it.

The study was carried out in one acre of unsprayed okra field. Observations were recorded at 15-day intervals commencing from 30 days after sowing. The following observations were made during the study: (i) The number of leaves infested per plant was recorded ($n=200$). Drying and drooping of leaves were the characteristic symptoms of damage. (ii) The number of infested plants in the field and percentage infestation were recorded ($n=2000$). (iii) Puparia found in each affected leaf were counted by splitting the petiole of the dried leaf ($n=250$). (iv) Maggots developing in the green leaves of the upper, middle and lower leaf layers ($n=25$ for each layer) were also counted. (v) The percentage parasitism was estimated after collecting the puparia from the petiole and placing them in glass tubes until the parasites emerged ($n=750$).

The mean percentage of infested leaves during the first observation (30 days after sowing) was 2.04. It increased to 9.88 and 11.86 at the second (45 DAS) and third observations (60 DAS) respectively. Similarly the percentage of infested plants increased from 11.21 at 30 DAS to 20.84 at 45 DAS and 25.63 at 60 DAS. The average number of puparia in each leaf was 3.21 (±SEm 1.76). Green leaves that did not show any external signs of infestation were also examined for the presence of *M. hibisci* maggots. The average numbers of maggots were 2.16 (±SEm 1.57), 1.20 (±SEm 1.72) and 0.24 (±SEm 0.64) in the lower, middle and upper layers respectively. This indicated that the infested leaf need not necessarily exhibit drying symptoms and it is quite likely that at any given time all the leaves in a plant are infested.

Five different species of hymenopteran parasites of *M. hibisci* were also identified. These were *Macroneura pedatoria* (Ferriere) (Eupelmidae), *Eupelmus* sp. nr. *urozonus* Dalman (Eupelmidae), *Eurytomocharis keralensis* Mukerjee (Eurytomidae), *Pteromalus* sp. (Pteromalidae) and *Bracon* sp. (Braconidae). Except *Bracon* sp. all the other parasites emerged from the puparia of the host. *E. keralensis* was the predominant parasite. The parasites of *M. hibisci* recorded in the present study are being reported for the first time from India. Observations on parasitism by *E. keralensis* revealed that 6.12, 24.0 and 54.13% of *M. hibisci* puparia were parasitized at 30, 45 and 60 DAS respectively. Subsequent sampling (75 DAS) revealed that the populations of both pest and parasite had decreased to negligible levels.

The present study revealed that though *M. hibisci* was present in large numbers as a pest of okra in initial stages, in course of time its parasites, particularly *E. keralensis*, were successful in reducing its numbers. In such a situation, control measures using chemicals can be avoided as the pest is under good natural biological control.

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RECORD OF *BLEPYRUS INSULARIS* (CAM.) ON *FERRISIA VIRGATA* (CKLL.) IN INDIA

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THE striped mealybug *Ferrisia virgata* (Ckll.) is a polyphagous pest infesting many ornamental, fruit and field crops[1,2]. The mealybug species is known to cause severe damage to twigs, leaves and fruits of guava, *Psidium guajava* L[3]. Many predators and a few parasitoids have been recorded in India on *F. virgata*[4,5]. A further search for natural enemies of the mealybug in infested guava orchards around Bangalore during 1987 revealed the presence of a new parasitoid, *Blepyrus insularis* (Cam.), on *F. virgata*.

B. insularis (Encyrtidae: Hymenoptera) was active

from August to November, causing a maximum 32% parasitism. It was found to parasitize the earlier nymphal instars (up to 10 days old) of *F. virgata*. The parasitoid completed development in 25–30 days. Only one adult emerged from a parasitized mealybug. It was found to be uniparental. Adults lived for 18–24 days at 25±2°C and 60–70% RH under laboratory conditions. This is the first record of *B. insularis* on *F. virgata* in India. The previous records of *B. insularis* parasitizing *F. virgata* are from the Philippines[6] and Congo[7].

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SPERMATOGENESIS DURING ONTOGENY IN THE BLACK-HEADED CATERPILLAR *OPISINA ARENOSELLA* WALKER (LEPIDOPTERA: XYLORYTINAE)

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DETAILED information on spermatogenesis of insects is often essential for studies on endocrine control of spermatogenesis and in sterilization studies. Hence spermatogenesis during ontogeny of the testis in *Opisina arenosella*, a major pest of coconut palm, was studied and the results are reported here.

O. arenosella, which has eight larval instars, was maintained in the laboratory as described earlier[1]. The testis from different larval instars, prepupa, pupa and adult were fixed and processed by routine histological methods. Phase-contrast microscopy was also used, on teased preparations.

The larval testes of *O. arenosella* are a pair of kidney-shaped organs attached to the body wall on each side of the mid-dorsal line in the 5th abdominal segment. The testis of the I instar consists of only primordial germ cells. In the II instar follicles begin to differentiate and predefinitive spermatogonia are observed. The III instar testis consists of four distinct pyriform follicles. Each testis is enclosed in a peritoneal membrane. Within the testis each follicle is bound externally by a membrane, the capsula lobuli, and internally by another membrane, the tunica interna. The four follicles are covered by another membrane, the membrana communis, which is seen just beneath the peritoneal membrane. The apical cells (9–11 μm diameter) are distinguishable by their poorly stainable cytoplasm. Predefinitive spermatogonia are arranged around the apical cells. The former undergo mitotic division and give rise to definitive spermatogonia. In the IV instar, definitive spermatogonia, through a series of mitotic divisions, give rise to a cluster of cells, which are enclosed in a cellular envelope, the cyst. The cyst contains primary spermatocytes; the V instar shows secondary spermatocytes. Spermatids are visible in the VI instar. As the spermatids elongate, the nuclei of eupyrene spermatids orientate in a band, arranged together at one end of the cyst. Eupyrene spermatozoa first occur as sperm bundles in the penultimate larval instar (figure 1). The testes of both sides fuse to form a single spherical structure during the prepupal period. The apyrene sperm bundles are distinguishable in day-1 pupa (figure 2). Thus in day-1 pupa there are both apyrene and eupyrene sperm bundles. Torsion of the fused testis occurs in, approximately, the day-6 pupa. In the newly emerged adult the major portion of the testis is occupied by sperm bundles. Though the eupyrene sperm bundles are observed in the late larval stages in this insect, the apyrene sperm bundles appear later, only in the early pupal period, as in *Ostrinia nubilalis*[2], *Porthetria dispar*[3] and *Papilio xuthus*[4], but unlike in *Trichoplusia ni*[5] and *Heliothis virescens*[6], where both types of sperm bundles first appear simultaneously only in the early pupal period.

Phase-contrast studies on preparations of teased testis and seminal fluid from vas deferens, seminal vesicles and spermatophore, as well as from copulatory pouch and seminal receptacle of females after mating showed that the eupyrene and apyrene sperm bundles pass from the follicles into the vas deferens and seminal vesicles in the late pupal