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BIOLOGICAL STUDIES ON *TRICHOGRAMMATOIDEA ARMIGERA* NAGARAJA (*), A NEW DIMORPHIC EGG PARASITE OF *HELIOTHIS ARMIGERA* (HÜBNER) IN INDIA (**)

BY

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A new species of *Trichogrammatoidea* which is being described by H. NAGARAJA as *T. armigera*, has been reared from eggs of *Heliothis armigera* on *Polianthes tuberosa* and from those of an unidentified Lepidopteron on *Cajanus cajan*. In the laboratory the parasite was successfully bred on *Corcyra cephalonica*, *Achaea janata*, *Gnorimoschema operculella* and *Plutella xylostella*; it did not show any perceptible preference for any of these hosts. It also parasitised eggs of *Spodoptera litura*, but although development proceeded to the adult stage, adults failed to emerge, suggesting unsuitability of this host.

The males of *T. armigera* are found to exhibit dimorphism — one form being alate and the other typically apterous. The apterous males were almost exclusively produced only by fertilised females and in the progeny of virgin females these forms were extremely rare (1 apterous male : 1,500 winged males). Among the progeny of a single mated female, an apterous male developed invariably in association with a female, but this rule did not apply when a single *Corcyra* egg was parasitised by more than one parental female. However, in no case did an apterous male alone emerge from a single host egg.

The biology of *T. armigera* has been studied at 25° ± 1°C. and R.H. 75 %, using *C. cephalonica* eggs. The parasite completed its life-cycle in 7-9 days — the egg, larval and pupal periods occupying, 1, 2-3 and 4-5 days, respectively. When fed honey, the average longevity of females was 7 (max. 11) days, of alate males 6 (max. 10) days and of apterous males 1 (max. 2) day. The maximum fecundity was 118 while the average was about 63. From 2-26 (average 9) eggs were parasitised per day. The sex-ratio was 62 % females : 38 % males (35 % alate and 3 % apterous). An alate male during its lifetime inseminated upto 10 (Av. 9) females while an apterous one inseminated up to 4 (Av. 3) females.

Heliothis armigera (HÜBNER) (*Lep.* : *Noctuidae*) is becoming an increasingly serious pest of tomato (*Lycopersicon esculentum*), lab-lab

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(*Dolichos lablab*) and several other economic plants. Egg-parasites of this pest hitherto recorded in India are : *Trichogramma australicum* GIRAULT (*Hym.* : *Trichogrammatidae*), *T. achaeae* NAGARAJA & NAGARKATTI and *Telenomus* sp. (*Hym.* : *Scelionidae*) (MANJUNATH *et al*, 1970). In his search for additional egg-parasites of *H. armigera* the author reared a new species of *Trichogrammatoidea* (*Hym.* : *Trichogrammatidae*), which is being described by his colleague Mr. H. NAGARAJA as *T. armigera*. Its field parasitism and biology have been studied and are described in this paper.

Field parasitism

During May-June 1970 *H. armigera* was found infesting the tuber-rose *Polianthes tuberosa* (*Amaryllidaceae*) in and around Devanahalli and Patrenahalli in Bangalore (Mysore State). This is the first record of *H. armigera* on *P. tuberosa*. Eggs were found on leaves and flowers, which were collected and held individually in glass vials for emergence of parasites. *Trichogrammaaustr alicum*, *T. achaeae* and *Trichogrammatoidea armigera* were reared from these eggs. Particulars of the collections and percentage parasitism by *T. armigera* are given in table 1. Parasitism by the other two species is also included for comparison.

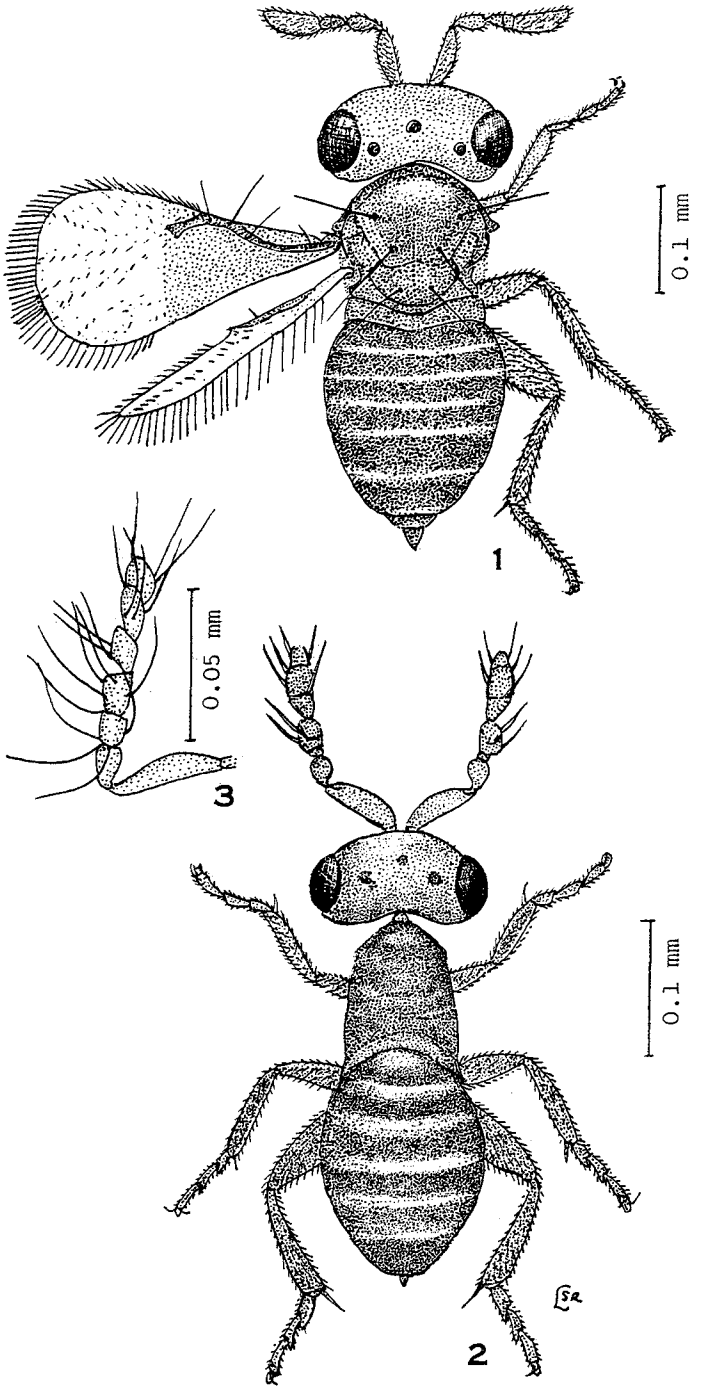
TABLE 1

Egg-parasitism of H. armigera *on* P. tuberosa

Date of collection (1970)	Locality	No. of eggs collected	Percentage parasitism by			Total % parasitism
			T. *australicum*	T. *achaeae*	T. *armigera*	
May 11	Devanahalli	140	79.3	1.4	0	80.7
— 19	Patrenahalli	300	44.0	1.0	0	45.0
— 28	Devanahalli	200	44.0	0	10.0	54.0
June 2	Patrenahalli	220	22.3	0	11.8	34.1
— 5	Devanahalli	250	12.0	0	2.0	14.0
— 10	—	65	6.2	0	3.1	9.3

As seen from table I, total parasitism ranged from 9.3 to 80.7%, *T. australicum* being the most important (up to 79.3%), followed by

FIGS 1-3. *Trichogrammatoidea armigera:* 1, adult female; 2, adult apterous male; 3, antenna of winged male.


0.1 mm
1
0.05 mm
3
0.1 mm
2

T. armigera (up to 11. 8%)and *T. achaeae* (up to 1.4%). *Heliothis* eggs became scarce by the second week of June and were not available thereafter.

Biology of *Trichogrammatoidea armigera*

Initially, a laboratory culture of *T. armigera* was built up on *H. armigera* eggs and subsequently on eggs of the rice-moth *Corcyra cephalonica* STNT. (*Lep.* : *Pyralidae*). The following studies were made at 25° ± 1° C and R.H. 75%, using *C. cephalonica* eggs.

DIMORPHISM AMONG MALES

Males of *T. armigera* are found to occur in two forms — alate and apterous. Alate males, which have plumose antennae (fig. 3) can be distinguished from females (fig. 1), which have prominently clubbed antennae without long hairs. Apterous males (fig. 2) are much smaller than the alate ones and have stouter leg segments; their antennae have slightly enlarged club segments and shorter and stouter hairs. The relative size of females, alate males and apterous males length from head to abdomen, in mm, is given below:

	Minimum	Maximum	Average (for 20 specimens)
Females	0.33	0.54	0.48
Alate males	0.32	0.53	0.47
Apterous males	0.18	0.38	0.23

The larva of apterous male can be distinguished from that of female or alate male on the basis of its smaller size on the second day.

Both forms of males were obtained from eggs of *H. armigera* collected in the field and also from those of *C. cephalonica* parasitised in the laboratory. From both host species winged forms of the parasite emerged in preponderant numbers.

MATING

Both sexes are ready to mate soon after emergence. Males, especially the apterous ones, usually move on or near the parasitised host eggs, often probing them with their antennae, probably in anticipation of emergence of females, with which they would mate immediately. Mating usually lasted for about 60 seconds, but varied from 30 to 120 seconds. Females are usually uninuptial, but were sometimes mated by several males with no perceptible influence on their fecundity, etc. If a single female is introduced into a tube containing several males, all the males become excited and crowd on the female for mating; in such instances, the female often dies.

INSEMINATION CAPACITY OF ALATE AND APTEROUS MALES

1. The insemination capacity of alate males was studied as follows:

A large number of parasitised eggs were isolated individually into small vials. On emergence of adults, the single alate male or a female emerged was used for study while those in which both sexes emerged were rejected, as mating might have already occurred.

A freshly-emerged healthy male was introduced into a vial (5 × 1.25 cm) containing 10 freshly-emerged virgin females. After 24 hours, these females were removed and the male was supplied with 10 more virgin females for mating. This procedure was continued until the male died. The females that had been allowed to mate were isolated individually into vials and each was provided with 30 to 40 eggs for parasitisation.

Being an arrhenotokous species, only those females which produced female (besides male) progeny were obviously mated, while those which produced only males were not.

2. The insemination capacity of apterous males was also determined as above, but in this case, as an apterous male emerged invariably in association with a female (see table 5), only 9 more virgin females were supplied to this male on the first day. On subsequent days, the procedure was the same as above.

The results of the above experiments are given in table 2.

TABLE 2

Number of females inseminated by alate and apterous males of T. armigera

Sl. No. of male	No. of days males lived		No. of females provided		No. of females inseminated	
	A	B	A	B	A	B
1	5	2	50	20	8	4
2	3	1	30	10	10	3
3	5	2	50	20	9	2
4	6	1	60	10	10	4
5	3	1	30	10	8	2

A = Alate male B = Apterous male

Thus an alate male inseminated during its life up to 10 (average 9) females and an apterous one up to 4 (average 3)females. Although alate males lived for 3 to 6 days, they inseminated only on the first

two days; more females were inseminated on the first day and only 1 or 2 on the second day. With apterous males, insemination occurred only on the first day.

OVIPOSITION

A female, whether mated or not, is ready to oviposit soon after emergence. Before ovipositing, it thoroughly examines the entire host egg with its antennae — perhaps to test its suitability for parasitisation. A female usually lays only one and sometimes two eggs in each *Corcyra* egg and avoids those that are already parasitised. When the host eggs are in limited supply, several parasites oviposited in the same host egg. However, not more than 3 normal individuals developed in each egg.

Dissections revealed that the parasite lays only one egg per insertion, oviposition lasting 1 or 2 minutes and rarely more. The parasite was observed at times to feed on the liquid exuding from the host (especially *Heliothis*) egg after oviposition. Oviposition occurred daily and continued usually until the day prior to the death of the parasite.

IMMATURE STAGES

Egg (fig. 4): The parasite egg lies free within the host egg. Freshly laid eggs are white, translucent and fusiform. The granular cytoplasmic material is uniformly distributed except at the polar ends where there is high concentration. The micropyle is situated subapically at the broader end. The egg swells slightly and becomes oval before hatching (fig. 5).

Larva: First instar (fig. 6): On eclosion the larva is oval. The body wall is membranous. The mouth opening is faint but the mandibles are discernible. The larva grows very rapidly, becoming elongate within an hour or two. Mandibles become clearer and so also the segmentation at the anterior end, which is visible only when the larva wriggles. The larva appears white and opaque except for the anterior and posterior ends which are translucent. The chorion is seen attached to the posterior end.

Second instar (fig. 7): Bean- or oval-shaped. Tentorium with very much reduced sclerites except for the presence of a pair of slightly curved, pointed mandibles. In other respects, same as the first instar.

Third instar (fig. 8): Oblong. Head is distinct. Tentorium with very distinct mandibles. Body contents are a little transparent, filling the entire body except a small portion at the anterior end.

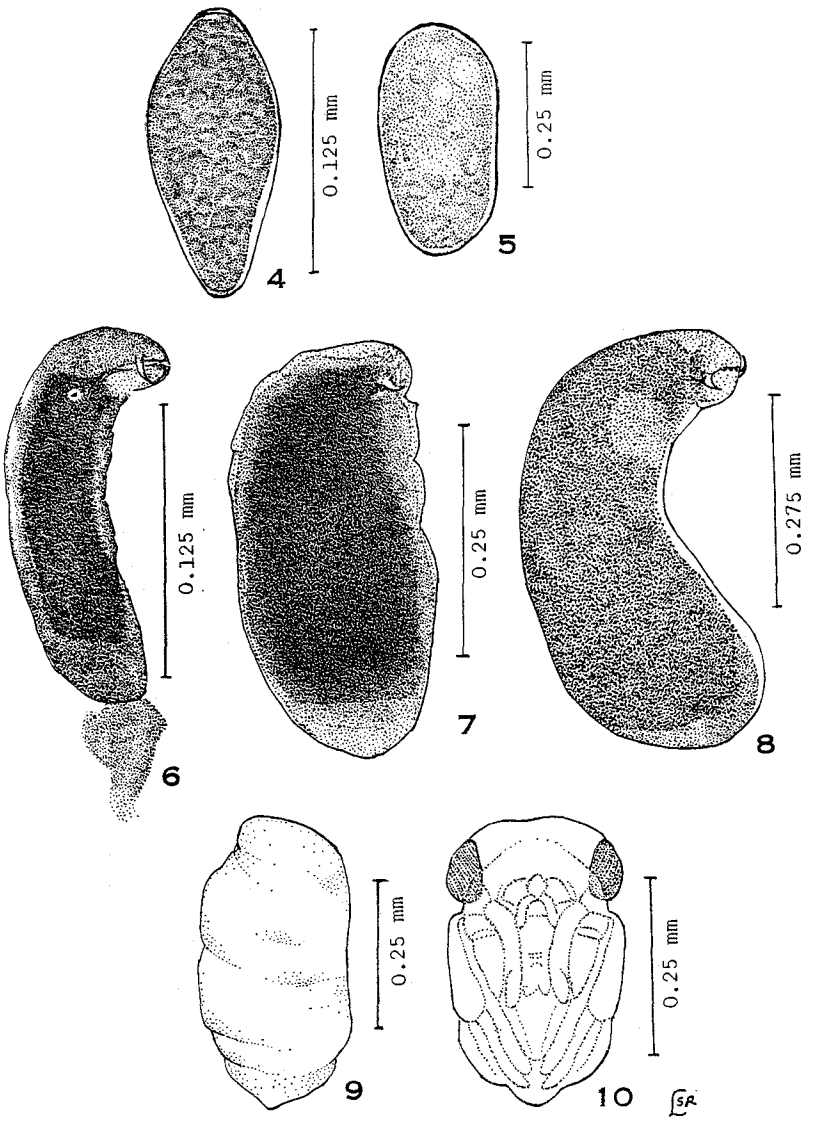


FIG. 4-10. Immature stages of *Trichogrammatoidea armigera:* 4, freshly laid egg; 5, egg after 24 hours; 6, first instar larva; 7, second instar larva; 8, third instar larva; 9, prepupa; 10, pupa.

A knob-like elevation is present at the anterior end, above the mandibles.

Prepupa (fig. 9): Irregularly oval with a slightly broader anterior end. Body wall is membranous with faint segmentation. Visceral mass and fat bodies are visible in the centre.

Pupa (fig. 10): Translucent and cream-coloured. Cuticle is thin and transparent. Abdominal segments are not distinct dorsally, but are faintly visible ventrally. Wing pads and other appendages are clearly defined. Eyes and ocelli are red.

The size and duration of different stages are given in table 3.

TABLE 3

Size and duration of different stages of T. armigera *(at 25° C and R.H. 75%)*

Stage	Size (in mm)		Duration (in days)
	Length	Width	
Egg	0.14 — 0.17 (0.15)*	0.05 — 0.07 (0.06)	1
Larva			
I instar	0.17 — 0.21 (0.18)	0.06 — 0.08 (0.07)	2
II —	0.41 — 0.51 (0.46)	0.20 — 0.29 (0.24)	
III —	0.49 — 0.55 (0.52)	0.26 — 0.32 (0.29)	
Prepupa	0.41 — 0.52 (0.50)	0.24 — 0.32 (0.29)	5
Pupa	0.41 — 0.51 (0.41)	0.24 — 0.29 (0.26)	
Period from egg to adult emergence			8

(*) Figures in parenthesis average for 10 specimens

LONGEVITY, DAILY RATE OF OVIPOSITION/PARASITISATION, FECUNDITY AND SEX-RATIO

The following method was used to study these aspects:

Thirty (this number was found to be adequate after preliminary experiments) fresh eggs of *Corcyra* were glued (using gum arabic solution) to a strip of thick paper and introduced into a 5×1.25 cm glass tube. A single, freshly emerged female mated with a winged male was introduced into such tube, providing a speck of honey as food. Eggs were thus exposed for 24 hours and then removed to fresh tubes for emergence of parasites. Fresh eggs, as above, were offered daily for further parasitisation until the parasite died.

The parasitised eggs turn light brown on the 3rd day and uniformly black on the 4th day while the unparasitised ones do not change their colour. The latter were removed or crushed with a pin to prevent the hatching *Corcyra* larvae from destroying the parasitised eggs. Observations on the longevity, fecundity and sex ratio were recorded and the data are presented in table 4. The data on daily rate of oviposition are illustrated in fig. 11.

TABLE 4

T. armigera : *Longevity, fecundity and sex ratio*

Sl. No. of females	Longevity in days	No. of eggs parasitised	No. of adults emerged (Fecundity)				% Sex ratio	
			Females	Males				
				winged	wingless	Total	Females : Males	
1	9	68	36	33	2	71	51 : 49	
2	4	34	23	11	2	36	64 : 36	
3	7	68	32	36	4	72	44 : 56	
4	11	105	73	32	1	106	69 : 31	
5	4	35	21	14	3	38	55 : 45	
6	7	56	38	18	2	58	65 : 35	
7	5	33	23	10	1	34	68 : 32	
8	8	50	30	21	2	53	57 : 43	
9	5	45	31	14	2	47	76 : 24	
10	9	50	33	20	2	55	60 : 40	
11	11	115	82	34	2	118	69 : 31	
12	7	50	30	22	2	54	56 : 44	
Average	7	59	38	22	2	62	61 : 39 (36 winged; 3 wingless)	

The maximum longevity of an ovipositing female was 11 days, the average being about 7 days. The maximum and average longevity of winged and wingless males were 10 and 6, and 2 and 1 day respectively.

Fecundity, based on the number of adults emerged from parasitised eggs, was a maximum of 118 and 62 on an average.

Commencing from the day of emergence, oviposition normally occurred daily and in most cases ceased one day prior to the death of the parasite. Up to 26 eggs were laid per day. Although there is a tendency to lay more eggs in the first few days, it was not so in all cases and was erratic. The average daily rate of oviposition and also the maximum and minimum number of eggs laid on each day are graphically represented in fig. 11.

Three of the 30 female parasites observed, although mated, did not oviposit at all. They appeared otherwise quite healthy, but were short-lived (1 to 2 days).

Up to 26 (on average 9 *Corcyra* or *Heliothis*) eggs were parasitised each day. The maximum number of eggs parasitised by a female during its life was 115, the average being 59.

Females were preponderant, the sex-ratio being about 61% females : 39% males (36% alate and 3% apterous).

It was observed that the adults resulting from each day's oviposition comprised both sexes.

Experiments similar to those designed for table 4 were conducted using females mated with apterous males. The results obtained were comparable in all respects with the data presented in table 4. So these data are not repeated. It is significant that the male (besides female) progeny of these females comprised both alate and apterous forms in the same ratio as of the progeny of females mated with alate forms.

Virgin females were also similarly studied. The fecundity, longevity and daily rates of oviposition/parasitisation of these females were similar to those of the mated ones except that the progeny were exclusively males. A significant feature was that, among these males, the winged forms were always in overwhelming majority and the apterous ones were extremely rare (1 apterous male : 1,500 winged males).

Nature of parasitism and the sex of individuals developing from a single *Corcyra* egg

It has already been mentioned that a female lays only one and rarely two eggs in each host. With a view to recording the number

of parasites developing in each host and their sex, the following procedure was followed: Mated females were confined individually in vials (2.5 × 0.6 cm) and 30-40 *Corcyra* eggs were offered to them daily. The parasitised eggs were then isolated into vials for emergence of parasites. The data are presented in table 5.

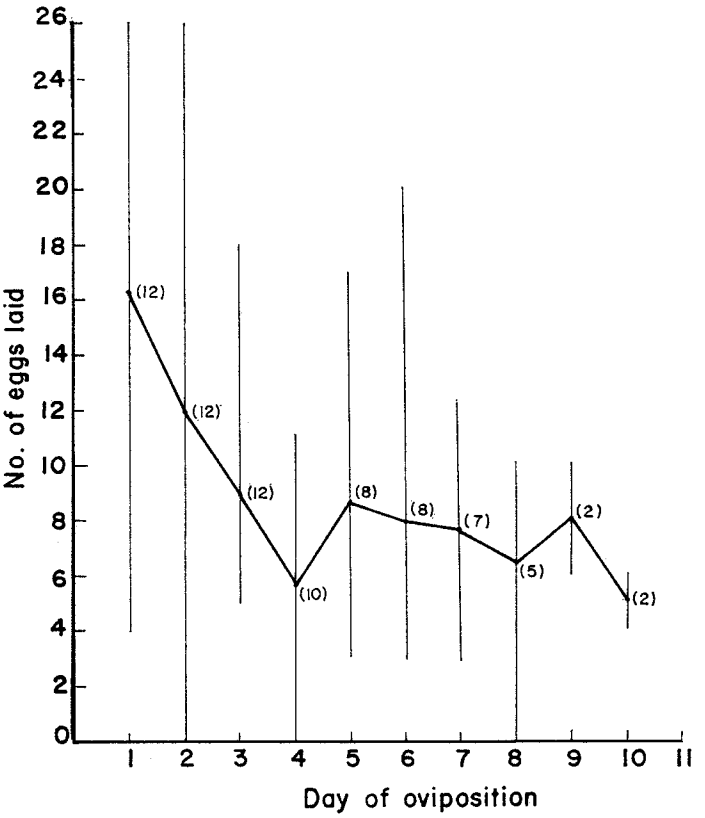


FIG. 11. Average daily rate of oviposition by *Trichogrammatoidea armigera*. (Vertical lines indicate the maximum and minimum number of eggs laid. The figures in parenthesis indicate the number of females alive on each day of oviposition out of the 12 selected for study).

An examination of emergence data for 1,355 parasitised eggs in table 5 shows that among the progeny of a single mated female:

1. Mostly (88.1%) only one parasite individual developed in each host and sometimes two; in the latter case, the parasites were either both males (0.6%) or a female and a male [either a winged male (1.6 %) or an apterous one (9.7%)].

2. In no case did (a) two or more females or (b) an alate and an apterous male, or (c) an apterous male alone emerge from a single egg.

3. An apterous male emerged invariably in association with a female and such females were mostly mated.

It may be pointed out again that the above pattern of emergence was a rule only with adults belonging to the same family (i. e., adults resulting from eggs parasitised by a single female). In cases when an egg was parasitised by more than one female, the above mentioned conditions did not apply, except that an apterous male alone was not produced from a single egg; in these cases up to 3 normal adults (rarely even 4) emerged from each and these comprised various combinations like 2 females and an alate male; 2 alate males and a female; one individual each of a female, an alate and an apterous male; an alate and 2 apterous males, etc. This deviation from the above mentioned " emergence pattern " must be a result of competition among the larvae developing in a single egg and the final emergents reflected only the survivors.

Alternate hosts

T. armigera was once recorded also on eggs of an unidentified lepidopteron on *Cajanus cajan* collected from Mandya, about 60 miles from Bangalore.

In the laboratory it was successfully bred on the following alternate, lepidopterous hosts (besides *C. cephalonica*): *Achaea janata* (Linnaeus) (*Noctuidae*); *Gnorimoschema operculella* (Zeller) (*Gelechiidae*); *Plutella xylostella* (Linnaeus) (*Plutellidae*).

It also parasitised the eggs of *Spodoptera litura* (F.) (*Noctuidae*), but in this case, although the parasite developed to the adult stage, it failed to emerge; apparently the adult parasites are unable to break through the chorion of this host.

Host-preference

Eggs of *A. janata*, *C. cephalonica*, *G. operculella* and *H. armigera* were used to study whether *T. armigera* shows preference for any particular host. The procedure was:

Graph paper was pasted on a thick card and then cut into 6.2 × 1.2 cm strips. 20 eggs each of the above mentioned hosts were glued to the centre of each square in the manner illustrated below:

TABLE 5

Nature of parasitism and sex of individuals developing from a single Corcyra *egg*

Batch No. (*)	No. of parasitised eggs observed (**)	No. of parasitised eggs yielding only (***)				
		single winged male	two winged males	single female	winged male + female	apterous male + female
I	94	24	3	15	6	46
II	46	14	5	16	3	8
III	22	5	0	12	1	4
IV	392	152	0	225	2	13
V	267	85	0	168	4	10
VI	36	9	0	26	0	1
VII	64	17	0	46	1	0
VIII	92	22	0	67	1	2
IX	121	34	0	74	0	13
X	221	77	0	106	3	35
Total :	1,355	439	8	755	21	132
Percentage :		32.4	0.6	55.7	1.6	9.7

(*) Parasites used in each batch belonged to a separate generation.

(**) Each egg was exposed only to a single female for parasitisation. No superparasitism was allowed.

(***) Winged and an apterous male, two or more females, or an apterous male alone never emerged from a single egg.

Note : The sex-ratio in this table has no significance because each batch comprised eggs parasitised by an unknown number of females.

1	2	3	4
3	4	1	2
4	3	2	1
2	1	4	3

(sequence repeated)

1 = *A. janata*
2 = *C. cephalonica*
3 = *H. armigera*
4 = *G. operculella*

This arrangement gave uniform distribution (i. e., in the above diagram adding four numbers in any straight direction gives 10) of all species of eggs. This " egg sheet " was then introduced into a 7.5 × 2.5 cm glass vial and a freshly emerged, mated female was introduced. A streak of honey served as food for the parasite. Eggs were thus exposed for only 24 hours.

Only those eggs that turned black within 3-4 days were apparently parasitised and the others were not. Altogether 10 parasites were studied and the data are presented in table 6.

TABLE 6

Host-preference studies with T. armigera

Hosts exposed*	Parasite Nos. 1	2	3	4	5	6	7	8	9	10	Total (and percentage) eggs of each host parasitised
	No. of eggs parasitised										
Achaea janata	4	5	2	3	3	1	2	4	4	3	31 (15.5)
Corcyra cephalonica	2	6	1	2	3	11	5	2	3	6	41 (20.5)
Gnorimoschema operculella	12	5	5	0	4	4	4	4	1	5	44 (22.0)
Heliothis armigera	2	2	1	8	1	1	3	2	9	4	33 (16.5)
Total eggs parasitised by each parasite	20	18	9	13	11	17	14	12	17	18	

* No. of eggs of each host exposed to each parasite = 20

Statistical analysis of the above data indicated that the differences in the number of eggs of different hosts parasitised was not significant.

Discussion

Only one other species of *Trichogrammatoidea* has been reported from India so far, namely *T. nana* ZEHNT., which was originally introduced from Burma against the teak defoliators *Hapalia machaeralis* WLK. and *Hyblaea puera* CRAM. (BEESON & CHATTERJEE, 1939) and has since become established on several lepidopterous pests. The present record of a new species, *T. armigera*, is therefore an addition to our knowledge of this group of egg-parasites.

T. armigera was reared from field-collected *Heliothis* eggs for only a brief period during May-June 1970, when the egg-laying period of *Heliothis* was coming to an end. Of the total egg-parasitism of 9.3 to 80.7%, *T. armigera* alone was responsible for 2 to 11.8%. However, until this species is studied for at least one full season i. e., from the beginning to the end of the egg-laying period of *Heliothis*, its true value as a bio-control agent cannot be assessed. Nevertheless, it would be worthwhile introducing this species into other countries against *Heliothis* spp.

The occurrence of dimorphism in the males of *T. armigera* has certain very interesting features. The apterous males are small, weak and short-lived as compared with alate forms. But their production cannot be attributed to under-nourishment because a single *Corcyra* or *Heliothis* egg can support the development of up to 3 normal parasites, but apterous ones, among the progeny of a mated female, were invariably associated with a female. Moreover, the two forms of males differ consistently and fundamentally in several characters.

SALT (1937) worked with another dimorphic Trichogrammatid namely *Trichogramma semblidis* (AURIVILLIUS) and established that the occurrence of male dimorphism in this species is largely determined by the host males reared on *Sialis lutaria* LINNAEUS (*Neuroptera: Sialidae*) are nearly always apterous while those from three species of Lepidoptera i. e., *Ephestia kuehniella* ZELL. (*Phycitidae*), *Sitotroga cerealella* OL. (*Gelechiidae*) and *Barathra brassicae* L. (*Phalaenidae*) are alate. However, he obtained two exceptional males from *Sialis* eggs. Of the 757 males reared on this host 755 were apterous and 2 were winged. Regarding this he stated: " No explanation can be offered. But the disagreement of only two cases out of 757, while it invites further investigation, must not prevent the drawing of a reasonable conclusion. " With *T. armigera* the hosts used were all Lepidoptera, but the two forms of males were regularly produced by each of them, although alate males always predominated (35 alate : 3 apterous). The hosts, therefore, does not appear to determine the production of any one type of male in this species.

SCHMIEDER (1933) made some interesting studies on the polymorphism in *Melittobia chalybii* SAY (*Hym.: Chalcidoidea*), a parasite of *Trypoxylon politus* SAY (*Hym.: Trypoxylonidae*). Both sexes of this parasite occur in two forms — the type-form and the short-lived or second form. His observation on the life-history was : " A female of the type-form enters the nest of a host wasp (*T. politus*) and remains upon the host larva within the cocoon, feeding and ovipositing for about 70 days, until it dies. The first few (12 to 20) eggs laid develop in about 14 days into a generation of males and females of the second-form. These do not leave the host cocoon and the females deposit their eggs upon the same host upon which their mother continues to oviposit. All eggs, those of the mother and those of her offspring of the second-form, now develop in about 90 days into chalcids of the type-form. After mating, the females alone gnaw their way to the exterior. " His conclusion is: " The first larvae ingest mainly the blood of the host while the later ones must feed to a larger extent upon the remaining tissues and that this trophic difference determines the production of one or the other form of adult from a single type of egg. " Whether any such trophic difference is responsible for apterism in *T. armigera* is not known, but the facts that from eggs of *Corcyra* subjected to superparasitism the development of 2 or 3 normal adults was common, and that the apterous males (besides females) were almost exclusively produced only by fertilized females while in the progeny of virgin females these forms were extremely rare (1 apterous male : 1,500 winged males) seem to preclude such a possibility.

Another curious phenomenon, hitherto unrecorded in parasitic Hymenoptera to my knowledge, is that in *T. armigera* an apterous male — among the progeny of a single mated female — is invariably associated with a female.

In the light of these observations, the production of apterous males in *T. armigera* can probably be explained as follows: During cell-division, occasionally it seems that one of the cleavage nuclei or polar bodies becomes separated off along with a little cytoplasm from the parent cell and develops independently; this phenomenon apparently occurs more in fertilised eggs than in unfertilised eggs. It would be interesting to see whether possible chromosomal deficiencies are responsible for the apterous character, the short life and reduced vigour of these males.

RÉSUMÉ

Recherches biologiques sur *Trichogrammatoidea armigera* NAGARAJA, nouveau, dimorphique, parasite d'œufs de *Heliothis armigera* (HÜBNER) en Inde.

Une nouvelle espèce de *Trichogrammatoidea* décrite par H. NAGARAJA sous le nom de *T. armigera* a été obtenue d'œufs de *Heliothis armigera* sur *Polianthes tuberosa* ainsi que d'œufs d'un Lépidoptère non identifié sur *Cajanus cajan*. Au laboratoire, le parasite a été élevé sur *Corcyra cephalonica*, *Achaea janata*, *Gnorimoschema operculella* et *Plutella xylostella*; il n'a manifesté aucune préférence pour aucun de ces hôtes. Il a parasité également les œufs de *Spodoptera litura*, mais les adultes n'ont pas réussi à sortir; ce qui fait penser que cet hôte ne convient pas.

Les mâles de *T. armigera* présentent un dimorphisme : une forme est ailée et l'autre aptère. Cette dernière est presqu'exclusivement issue des femelles fécondées. Dans la descendance d'une femelle accouplée, un mâle aptère se développe invariablement en association avec une femelle, mais cette règle ne s'observe pas lorsqu'un œuf de *Corcyra* est parasité par plus d'une femelle. Cependant, en aucun cas, un mâle aptère ne sort d'un seul œuf parasité.

La biologie de *T. armigera* a été étudiée à 25° ± 1°C et 75 % H.R. en utilisant des œufs de *C. cephalonica*. Le cycle du parasite s'effectue en 7 à 9 jours, les stades : œufs, larve, nymphe, durant respectivement 1, 2 à 3 et 4 à 5 jours. Alimentés sur miel la longévité moyenne des femelles est de 7 jours (max. 11), des mâles ailés de 6 jours (max. 10) et celle des mâles aptères de 1 jour (max. 2). La fécondité moyenne est de 63 avec un maximum de 118 œufs. De 2 à 26 œufs de l'hôte (en moyenne 9) sont parasités par jour. Le rapport des sexes est de 62 % de femelles et 38 % de mâles (35 % d'ailés et 3 % d'aptères). Un mâle ailé insémine en moyenne 9 femelles, tandis qu'un mâle aptère en insémine 3.

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