

# Biology of *Apanteles Baoris* Wilkinson (Hymenoptera: Braconide) A Larval Parasitoid of *Chapra Maathas* Fab

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**Abstract:** *Apanteles baoris* Wilkinson is potential biocontrol agent of *Chapramathias* Fab. a paddy pest in Kolhapur. It attacks about 86% caterpillars of *C. mathias*. In the present paper life cycle, longevity, Sex ratio and behavioral aspects viz; mating and oviposition have been studied in detail. The life cycle of the parasitoid egg to adult emergence have been completed within 17 days. Egg hatching period was 3 days, larval period was 8-9 days and pupal period was 5-6 days. Mating takes place within one hour of their emergence from cocoons. Mating occurred at morning hours. Oviposition is completed within 3 seconds. In a single host the parasitoid can lay on an average 55 eggs of which progeny production obtained was 46 (average). Sex ratio of adult parasitoids was found favoring females. The results are useful for mass rearing of the above parasitoids.

**Keywords:** *Apanteles Baoris*, *Chapra Mathias*, Biocontrol Agent, etc.

## I. INTRODUCTION

Biology forms basic information for the workers involved in biological control program. It helps in formulation of mass rearing of biocontrol agents. Braconids are potential biocontrol agents of several kinds of insect pests. Studies related to biology in parasitic braconids have been attempted by several workers [Fulton, 1940; Broodryk, 1969; Kajita and Drake, 1969; Cardona and Oatman, 1971; Sato, 1975; Sathe, 1986, 1988, 1991; etc.]. However, very little attention is paid on the biology of this important group of biocontrol agent of insect pests from India. Keeping in view all above facts, the present work was carried out.

## II. MATERIALS AND METHODS

The larvae / cocoons of the hosts and parasitoids were collected from paddy fields to maintain the laboratory culture. 40 early second instar of *C. mathias* larvae were exposed to five mated females of *A. baoris* in an oviposited unit. Parasitoid eggs and larvae were collected after 12 hr interval, dissecting parasitized host larvae in normal saline solution. The larval stages were treated with 50% chloroform and 50% ethanol and mounted in Hoyer's medium on microslides after staining with acetocarmine. Instars were identified by observing size of head capsule and mandibles (Short, 1952, 1953.)

## III. RESULTS

### 1) Life cycle of *A. baoris*: (Plate I, Figs. 1 - 9)

The durations of different stages of life cycle of *A. baoris* are shown in table 1.

**Table 1:** Developmental period and longevity of *A. baoris*

Sr. No.	Egg Period (days)	Larval Period (days)	Pupal Period (days)	Adult emerged on (day)	Adult longevity with 50 % honey solution (days)	Sex
1	2	8	5	15	7	♂

2	2.5	9	4.5	16	6.5	♂
3	2.5	9	5.5	17	9	♀
4	2	8	5	15	8.5	♀
5	3	10	5	18	9	♀
6	2.5	9	4.5	16	7	♂
7	2.5	9.5	5	17	8	♀
8	2	10	6	18	9	♀
9	2	8	5	15	6.5	♂
10	2.5	9	4.5	16	8	♀
11	2	8	6	16	7.5	♂
12	2	8	5	15	8	♀
13	3	9	5	17	9	♀
14	2	10	6	18	8.5	♀
15	2.5	8.5	5	16	7	♂
16	2.5	9	4.5	16	7	♂
17	2	10	6	18	9	♀
18	3	10	5	18	9	♀
19	2	8	5	15	8	♀
20	2.5	10	4.5	17	7.5	♂
<b>Avg.</b>	<b>2.35</b>	<b>9</b>	<b>5.1</b>	<b>16.45</b>	<b>7.95</b>	

#### Egg (Figure 1):

The newly deposited eggs were white, thin walled and typically hymenopteriform. The eggs were randomly deposited in the body cavity of the host larva. About 40 - 60 eggs were deposited per host. The egg found greatly increased in the size after oviposition. The length and width of 25 eggs averaged 0.10 mm (range 0.09 to 0.15 mm) and 0.03 mm (range 0.025 to 0.036 mm) respectively. Its cephalic end has broadened. The egg hatching period was 3 days.

**Instars:** The parasitoid showed 3 instars. First two were vesiculated and last was hymenopteriform

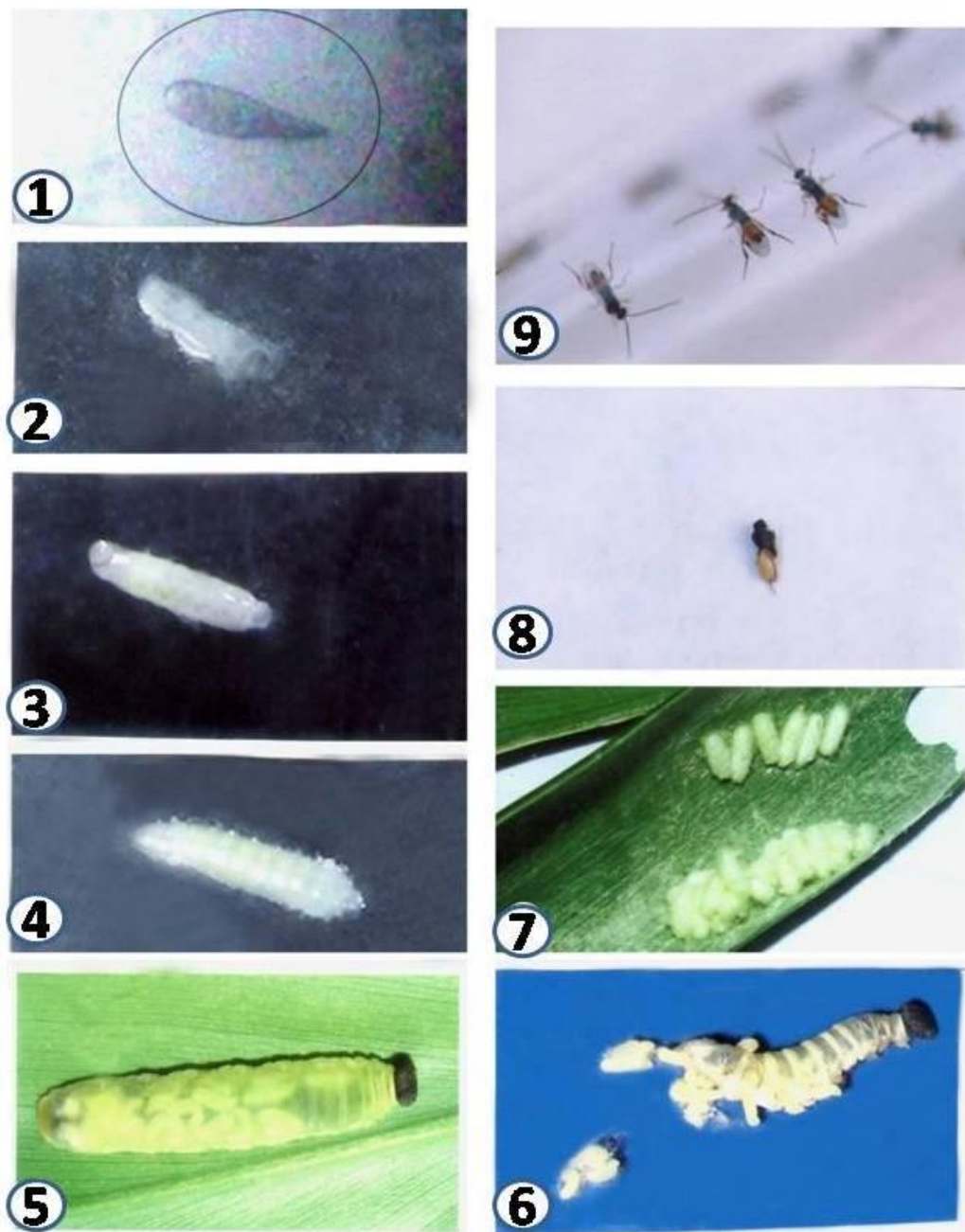
#### 1st instar (Figure. 2):

The 1st instar showed a translucent body, a broad head, 3 thoracic, 7 abdominal segments and a caudal vesicle. After 3 days body became opaquer and the head narrower. The body length of 25 individuals averaged 1.28 mm (range 1.19 - 1.35 mm) and width was 0.22 mm (range 0.18 - 0.26 mm). The head capsules of 25 individuals averaged 0.082 mm in length (range 0.078 - 0.086 mm) and 0.069 mm (range 0.067 - 0.072 mm) in width. In 25 individuals, mandibles averaged 0.034 mm (range 0.031 - 0.037 mm) and 0.011mm (range 0.007 - 0.016 mm) in length and width respectively. The vesicle was transparent and somewhat rounded in shape. The first instar lasted for 4 days.

#### II instar (Figure 3):

The body of second instar was cylindrical, straight and white. The integument of larvae was very thin. The larva showed a narrow head, 13 well defined segments and a prominent vesicle. No spiracle could be seen in second instars but tracheal system shows single lateral longitudinal trunk (Fig. 4). The average length and width of the body measured in 25 individuals were 2.65 mm (range 2.60 - 2.72 mm) and 0.42 mm (range 0.34 - 0.49 mm) respectively. The head

capsule length and width of 25 individuals averaged 0.33 mm (range 0.24 – 0.37 mm) and 0.19 mm (range 0.14 – 0.23 mm) respectively. The length of 25 mandibles averaged 0.082 mm (range 0.077 – 0.089 mm) and width 0.037 mm (range 0.026 – 0.039 mm). The vesicle was transparent and rounded. The vesicle showed a single layer of columnar epithelial cells. This stage lasted for 3 days.



**Plate -1 : Figs 1-9 : Life stages of *A. baoris***

**Fig. 1: Egg, Fig. 2 : First instar larva, Fig. 3 : Second instar larva, Fig. 4: Third instar larva, Fig. 5 : Infected 5<sup>th</sup> instar of *U. folius*, Fig. 6: Emergence of 3<sup>rd</sup> instar of *A. baoris*, Fig. 7 : Cocoons, Fig. 8 : Pupa, Fig. 9 : Adults**

### III<sup>rd</sup> instar (Fig. 5):

This instar was opaque white. The body segments were clearly seen. The larva showed the head and 13 well defined segments and tapered slightly towards both ends. Early last instar was with an anal vesicle but it is absent in mature form. The tracheal system well developed. Two longitudinal trunks and one transverse commissure were prominent and 8 pairs of spiracles were prominently seen (Fig. 35b). The average length and width of the body measured in 25 individuals were 4.05 mm (range 3.90 – 4.12 mm) and 1.53 mm (range 1.46 – 1.60 mm) respectively. The head capsule length and width of 20 individuals averaged 0.910 mm (range 0.824 – 0.936 mm) and 0.693 mm (range 0.681 – 0.702 mm) respectively. The mandible length and width observed in 25 individuals averaged 0.13 mm (range 0.096 – 1.07 mm) and 0.069 mm (range 0.046 – 0.084 mm) respectively. In later instar vesicle was absent. The mouth parts were heavily sclerotized and well developed. Mature parasitoid larvae emerged from the host (Fig. 6, 7), killing it and spinning a silvery white cocoon. This stage lasted for 2 days.

The head of the third instar larva was well developed into dorsal epicranial part and ventral buccal region. The epicranial part consists of a frons with two lateral rudimentary antennal sockets and a clypeus (Fig. 8). The mandibles are dark brown coloured and sclerotized. Each mandible was bifid with a broad basal end and narrow pointed end. A strongly curved hypostoma with a ventrally directed hypostomal spur was behind each maxilla. The maxillary palp was oval and prominent. The labium was encircled by the labial sclerite. The lateral sclerite was supported by a lateral stipital sclerite on each side. The labium was with two oval labial palpi, a silk press and opening of silk duct.

### Cocoon (Figure. 9):

After emergence, the last instar of parasitoid formed silvery white densely spun, cylindrical cocoon which was rounded at both ends. The average length of 25 cocoons was 4.19 mm (range 3.97 – 4.42 mm) and width was 1.75 mm (range 1.59 – 1.93 mm). This parasitoid is gregarious.

### Pupa (Figure 10):

The pupa was exarate or free type. It is creamy white, initially except for the black in eyes and the brown ocelli, but it blackened progressively towards completion of the stage. The pupal stage stayed for 5 days.

### Adult (Figure 11):

Adults were black with head and thorax; abdomen was blackish brown. It was about 3 – 4 mm in body length and 6 – 6.5 mm in wing expansion. The female (Fig. 11) was with small ovipositor. Males were smaller than the females.

## IV. DISCUSSION

Broodryk (1969) observed 3 instars in *Chelonus (microchelonus) curvimaculatus* Cameron. The first instar occupies the greatest part of the larval life and the other two instars have taken relatively short period. The same situation occurred in *C. diurnii*. Fulton (1940) reported 3 instars in *Apanteles (= Cotesia) congregatus* (Say). In *Apanteles (Pseuelopmantes)* Muesebeck and *C. diurnii* the total developmental period from egg to adult was similar (about 18 days) but, the pupal period was relatively longer in former case (Cordona and Oatman, 1971). Sato (1978) reported 14.6 days for emergence of adults of *Apanteles (= Cotesia) glumeratus* (L) from egg at 25°C while *Apanteles (= Cotesia) flavipes* required 18.2 days for its complete development at the same temperature (Kajita and Drake, 1969). Sathe (1986) studied biology of *C. diurnii* Rao and Nikam, a larval parasitoid of *Exelastisatomosa* under laboratory conditions (24 °C, 55-60% R.H.). He reported that the parasitoid completes its development from egg to adults within 18 days: Egg stage was lasted for 3 days, larval stage for 10 days and pupal stage for 5 days. While the present parasitoid, under laboratory conditions (24 °C, 55-60% R.H.), completed its development within 17 days. The parasitoid is rearable.

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**REFERENCES**

- [1] Broodryk., S. W., 1969. The biology of *Chilonus* (*Microchilonus*) *curvimaculatus* Cameron (Hymenoptera: Braconidae) J. ent. Soc. South Afr., 32: 169-189.
- [2] Cardona, C. and Oatman, E. R. 1971. Biology of *Apanteles dignus* (Hymenoptera: Braconidae), a primary parasite of the Tomato pin worm. Ann. ent. Soc. Am., 60: 996-1007.
- [3] Fulton, B.B. 1940. The horn worm parasite, *Apanteles congregatus* (Say) and the hyperparasite *Hypopteromalustobacum* (Fitch) Ann. ent. Soc. Am, 33: 231-244.
- [4] Kajita. W. Drake, E.F. 1989. Biology of *Apanteles chilonus* and *A. flavipes* (Hymenoptera: Braconidae), parasites of *Chilosuppressalis*. Mushi. 42: 163-179.
- [5] Sathe, T.V. 1986. Biology of *Cotesia diurnii* Rao and Nikam (Hymenoptera: Braconidae), a larval parasitoid of *Exelastis atomosa* Walsingham. Oikoassy, 3 (2), 31-33.
- [6] Sathe T.V., N.B. Gosawi and D.V. Devgire, 1986. Parasite complex associated with *Chapramathias* Fab., a paddy pest in Kolhapur. Geobios new reports, 5: 59-60.
- [7] Sathe, T.V. 1988. The Biology of *Cotesia orientalis* Chalikwar & Nikam (Hymenoptera: Braconidae), a larval parasitoid of plume moth in India. J. Zool. Res., 1(1): 23-37.
- [8] Sathe, T.V. 1991. The Biology of *Apanteles asawari* Sathe (Hymenoptera: Braconidae), a larval parasitoid of *Spodopteralitura* (Fab.). Oikoassy, 8(1): 15-18.
- [9] Sato, Y. 1975. Rearing *Apanteles glomeratus* L. on the larvae of *Pieris repa crucivora* Biosduval fed on an artificial diet. Kontyu (Tokyo), 43: 242-249.
- [10] Short J.R., T. 1952. The morphology of the head of larval Hymenoptera with special reference to the head of Ichneumonidae, including a classification of the final instar of Braconidae. Trans. Roy. Entom. Soc. London, 103: 27-84.
- [11] Short J.R. T. 1953. A grouping of larval characters of some species of the genus *Apanteles* (Hymenoptera: Braconidae). Intomol. Res. Bull., 44: 327-33.