

## Parasitoids (Insecta: Hymenoptera) of the Caterpillar Pests Infecting the Vegetable Crops of the Valley Region of Manipur

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**ABSTRACT:** Manipur is situated at the extreme east of India between the latitude 23°7' -25°4' N and longitude 93°5' -94°5' E and its surface elevation ranges from 750m to 2300m ASL. It covers a total area of about 22,327km<sup>2</sup>, comprising of both the valley and hilly terrain, within which the former occupies at the centre and hills encircle the valley. The insect survey was undertaken in the valley which has four districts namely Bishnupur, Imphal East & West and Thoubal. The ambient temperature of the valley ranges from a minimum of 3-21°C and maximum of 22-32°C with the RH ranging from 48-82% at different months, with an average rainfall of 150cm per year. Vegetable crops such as cauliflower, cabbage, mustard, pea, potato, french bean, brinjal and bhendi are commonly cultivated here. Field survey and collection of the lepidopteran pests infesting the above crops were carried out for two years (2013 & 2014). The study revealed the occurrence of 15 species of parasitoids attacking 12 different host insects (pest). Of the 15 parasitoids, 14 belonged to the parasitic Hymenoptera and 1 under the order Diptera. Among them braconids, ichneumonids, chalcids and bethylids were represented by 8, 3, 2 and 1 species respectively. The percentage parasitism varied with parasitic species and it ranged from 10 to 60% and most of the parasitoids showed their period of occurrence from February to September with peak activity in March and August. Information pertaining to each parasitoid has been discussed in this paper along with the respective host insect in the context of pest management.

*Key words:* Parasitoids, Pest, Biocontrol, Manipur, vegetable crops, Hymenoptera

### INTRODUCTION

Insect Pest Management (IPM) recommends a number of strategies, of which insect control using biological agents forms an important aspect, which constitutes predators, parasitoids and pathogens. Among them, parasitoids are preferred by virtue of their self perpetuating propensity and cost effectiveness in the long run. Insect parasitoids are one of the abundant groups, probably comprising nearly 10% of all the metazoans [1] and they predominantly come under the order Hymenoptera and a few belongs to the family Tachinidae of the order Diptera. They can be conserved, preserved and multiplied under laboratory condition for the purpose of field release against target pest [2]. Several species of parasitoids have been recorded from different parts of India, especially attacking the

pests of economically important crops and they play a dominant role in suppressing the pest population. Therefore, biocontrol method had been recommended by FAO as early as 1975, so as to incorporate the same under pest management system in view of its eco-friendly approach [3]. As such details relating to parasitoids of caterpillar pests of Manipur are scanty. One such related recent report pertaining to parasitoids was that of caterpillar pests of paddy in Manipur [4], whereas the remaining papers were on parasitoids of sucking pests like aphids [5]. In view of their importance in biological control, an attempt has been made here to make an inventory of parasitoids that attack caterpillar pests infecting the vegetable crops of the valley areas of Manipur along with their percentage parasitism and periodicity of occurrence.

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## MATERIALS & METHODS

Field survey was carried out during 2013-2014 at various vegetable growing valley districts of Manipur namely viz., Imphal East, Imphal West, Thoubal and Bishnupur. To know their incidence pattern an area of 50 m<sup>2</sup> of the field was randomly examined at the sampling site selected individually for each crop. For the caterpillar pests attacking cruciferous crops viz., cabbage and cauliflower, insect samples were collected at random from 50 plants at the interval of 15 days. Total number of larvae per colony or per infested leaf was noted during each sampling. Later, the infected larvae collected from the field were individually reared in the lab till they developed into adult parasitoids. The parasitoids that emerged from each pest species were provided with 10% honey solution on a cotton swab and cultured till death separately. Subsequently, the dead specimens were preserved as per conventional methods [6] and percentage parasitism was calculated after determining the identity of the parasitoids.

## RESULTS & DISCUSSION

Field survey and collection of caterpillar pests from the vegetable crops such as cabbage, cauliflower, pulses, french bean, lady's finger, brinjal and potato revealed the occurrence of 15 parasitic species infecting 12 different insect hosts. The list of insect pests and their respective parasitoids is provided in table-1. Of the 15 parasitoids, 14 belonged to the parasitic Hymenoptera and 1 under the order Diptera. Among the Hymenopterans, braconids, ichneumonids, chalcids and bethylids were represented by 8, 3, 2 and 1 species respectively. The cruciferous crops in the valley region showed the presence of *Pieris brassicae*, *P.canidia*, *P. daplidice*, *Plutella xylostella*, *Spodoptera litura*, *Thysanopulsia orichalcea* and *Crociodolomia binotalis*. Among these, *Pieris brassicae* and *Plutella xylostella* showed dominant status in terms of abundance and the rest being categorised as minor pest. The above two caterpillar species multiply at a faster rate on cruciferous crops; thereby they assume significant proportion in terms of density. Availability of caterpillar pest is further influenced by less consumption and usage pattern of pesticide in these terrains in comparison to other intensive cultivation cropping states. As a result, under the natural condition, *P. brassicae* has been parasitized by *Cotesia glomerata*, *Campoletis* sp., *Brachymeria lasus* and *B.bengalensis*. Of these *C. glomerata* was observed as a major parasitic species

with the percentage of parasitism varying from 10-62%, whereas the other parasitoids showed appreciably less abundance. *C.glomerata* and *Campoletis* sp. are categorised as larval parasitoid, while *B.lasus* and *B.bengalensis* as pupal parasitoid since they attack respectively larval and pupal stages of the host. *C.glomerata* was also found to be the primary parasite of *Pieris canidia* and *P. daplidice* with 55% and 52% parasitism respectively. Similar observation was also noted by Rataul and Sood *et al.* [7;8] wherein *C.glomerata* was found active (50-60% parasitism) in the field regulation of *P.brassicae* in Punjab and Himachal Pradesh.

The second important vegetable pest in Manipur is the Diamond back moth, *Plutella xylostella*. In the present study, *P. xylostella* was parasitized by *Cotesia plutellae* (larval parasitoid) and *Diadegma fenestralis* (pupal parasitoid). Both the species were almost equal in their efficiency in controlling the pest - *P.xylostella*, as they showed the parasitic level of 25% and 30% respectively. Nirmala Devi and Desh Raj studied the field collected larvae of *P.xylostella* parasitized by *Diadegma fenestralis* in Himachal Pradesh and observed the rate of parasitism ranging from 73.33 - 86.67% [9]. Yet another species namely *Cotesia plutellae* was also responsible for the mortality to the extent of 22.5 % on *P.xylostella* under the climatic conditions of Punjab [10]. On the other hand, the Bihar hairy caterpillar, *Spilarctia obliqua* was affected by a braconid - *Meteorus dichomeridis* with 52% parasitism during May to August in the valley region of Manipur. Veenet Kumar also reported the occurrence of *M.dichomeridis* parasitizing the larvae of *S.obliqua* with 75.67% in Mysore [11]. Similarly, a number of parasitoids infecting *S. obliqua* have been highlighted in a study undertaken at the northern region of our country especially on the vegetable crops [12]. Such variation in the rate of natural regulation could be attributed to the host density of the pest. *Helicoverpa armigera* collected from pea plant was parasitized by the ichneumonid, *Campoletis chlorideae* and the percentage parasitism ranged from 10 to 32%. Observations made in the present study unambiguously revealed that the period of activity of parasitoid is invariably from February to September under the agro-climatic conditions of Manipur which being coincided with the cultivation of vegetable crops and also the abundance of the pest species concerned.

The study inferred that, among the 15 parasitoids listed here, *C. glomerata*, *D. fenestralis* and *G. creatonoti* infecting the respective hosts viz., *P.*

**Table 1**  
**Insect hosts and their parasitoids collected from the vegetable crops of Manipur.**

Insect host	Crop plant	Insect parasitoids	Percentage parasitism	Period of activity
1. <i>Pieris brassicae</i> (L.) (Pieridae)	Cabbage, Cauliflower	<i>Cotesia glomerata</i> L. (Braconidae)	10-62	Feb.-April
		<i>Camptopletis</i> sp. (Ichneumonidae)	15	March-April
		<i>Brachymeria lasus</i> (Walker) (Chalcididae)	20	March-April
		<i>Brachymeria bengalensis</i> (Cameron) (Chalcididae)	15	March-April
2. <i>Pieris canidia</i> (Sparrman) (Pieridae)	Cabbage, Cauliflower	<i>Cotesia glomerata</i> L. (Braconidae)	55	Feb.-March
		<i>Camptopletis</i> sp. (Ichneumonidae)	10	March
		<i>Brachymeria lasus</i> (Walker) (Chalcididae)	12	March
		<i>Brachymeria bengalensis</i> (Cameron)(Chalcididae)	10	March
3. <i>Pieris daplidice</i> (Rober) (Pieridae)	Cabbage, Cauliflower	<i>Cotesia glomerata</i> L. (Braconidae)	52	Jan.-March
4. <i>Plutella xylostella</i> L. (Plutellidae)	Cauliflower	<i>Cotesia plutellae</i> Kurd Braconidae	25	Feb.-April
5. <i>Spilarctia obliqua</i> (Walker) (Arctiidae)	French bean	<i>Meteorus dichomeridis</i> Wilkinson (Braconidae)	52	May-Aug.
		<i>Carcelia</i> sp. (Tachinidae)	10	May-Aug.
6. <i>Thysanopulsia orichalcea</i> (Fab.) (Noctuidae)	Cauliflower	<i>Glyptapanteles creatonoti</i> Viereck (Braconidae)	40	Feb.- May
7. <i>Helicoverpa armigera</i> Hubner (Noctuidae)	Pea	<i>Camptopletis chlorideae</i> Uchida (Ichneumonidae)	10-32	Feb.-March
8. <i>Spodoptera litura</i> (Fabricius) (Noctuidae)	Cauliflower	<i>Glyptapanteles creatonoti</i> Viereck (Braconidae)	35	March-May
9. <i>Sylepta derogata</i> (Fabricius) (Pyralidae)	Lady's finger	<i>Apanteles stantoni</i> (Ashmed) and <i>Apanteles</i> sp. (Braconidae)	45	Aug.-Sept.
		<i>Goniozus</i> sp. (Bethyridae)	30	Aug.-Sept.
			18	Aug.-Sept.
10. <i>Crociodolomia binotalis</i> Zeller (Pyraustidae)	Cabbage, Mustard	<i>Glyptapanteles creatonoti</i> Viereck (Braconidae)	45	April-June
11. <i>Agrotis ipsilon</i> (Hufnagal) (Noctuidae)	Potato	<i>Cotesia ruficus</i> Haliday (Braconidae)	10-30	March-May
12. <i>Leucinodes orbonalis</i> Guenee (Pyralidae)	Brinjal	<i>Bracon brevicornis</i> Wesm. (Braconidae)	20	March-June

*brassicae*, *P. xylostella* and *C. binotalis* in the cabbage/ cauliflower fields, *M. dichomeridis* and *C. chlorideae* parasitizing the Bihar hairy caterpillar, *S. obliqua* and the gram pod borer, *H. armigera* damaging the beans and pea plant respectively were found to be very effective in the natural regulation of the pest. Therefore, the above five parasitic species can be exploited in future for the field management of pest species.

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