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Natural parasitization of *Cotesia* spp. and *Bracon* spp. on *Spodoptera litura* Fab. in castor crop

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Abstract

The larval stage of *Spodoptera litura* Fab. is more prone to parasitism. Larval parasitoids such as braconids belongs to family Braconidae of order Hymenoptera acts as Ecto parasitoids. Braconids have wide host range and successful biocontrol agent recommended for the control of lepidopteran larvae in many crops and stored grains. The present study on parasitization of braconids on *S. litura* was conducted under laboratory conditions. The larva of *S. litura* collected from castor crop from various locations near by Nagpur, Maharashtra, India and reared on castor leaves under laboratory conditions. The larvae were parasitized by two parasitoids namely, *Cotesia* spp. and *Bracon* spp. The study revealed that the field collected larva of *S. litura* when reared on castor leaves showed an average parasitization of 11% and 4.3% by *Cotesia* spp. and *Bracon* spp. respectively.

Keywords: *Cotesia* spp., *Bracon* spp., *Spodoptera litura*, Ecto parasitoids, Biocontrol agent

Introduction

The tobacco caterpillar, *Spodoptera litura* (Fab.) is one of the important polyphagous pests on crops, distributed throughout South and Eastern world, infesting 112 species of plants belonging to 44 families, of which 40 species were reported from India. Besides castor this pest is known to cause heavy losses to tobacco, cabbage, groundnut, tomato and other agricultural crops which proves its tremendous polyphagous nature. The damage is done by larval stage and is often serious. It feed on the foliage gregariously during early stages, while disperse in later stages. These are voracious feeder of the foliage, remaining hidden under soil during the day time. The maximum damage is caused by the larva to young plants, which in severe cases of attack are totally destroyed (Arora *et al.*, 2012) [1].

Biological control is the method of destroying pests by making use of their natural enemies i.e., parasites which are totally beneficial to us. The method is self-perpetuating, ecologically sound, economical and also free from environmental pollution, toxic hazards and other undesirable side effects. However, the drawbacks of indiscriminate use of synthetic pesticides and awareness regarding the quality of environment have again brought the biological control in the forefront as an ecologically sound methods of the pest suppression. The management of natural enemies like parasitoids of pests and the use of selected beneficial organism like antagonists, competitors etc. and of their products to reduce pest population has emerged as the most ecofriendly management for harmful pest populations.

Bracon spp. is most widely used gregarious polyphagous ecto parasitoid which parasitizes many lepidopterous pests of stored products as well as field crops. *Bracon* spp. females first paralyze the last-stage larvae of their host in a "wandering" phase by injecting paralytic venom and ovipositing variable numbers of eggs on or near the surface of paralyzed host (Ghimire and Phillips, 2010) [4]. It attacks many important lepidopterous pests of stored products as well as field crops (Landge *et al.*, 2009 and Dabhi *et al.*, 2011) [5, 3].

Cotesia is a genus of braconid wasps first described by Peter Cameron in 1891 [2]. Some species parasitize caterpillars of species considered as pests. Thus, they are used as biocontrol agents. Currently, there are around 400 described species of the genus *Cotesia* (Shaw and Huddleston 1991) [7]. It is estimated that the entire genus comprises 1500-2000 species worldwide (Mason 1981) [6].

Materials and Methods

To determine the role of naturally occurring larval parasites of *S. litura* in castor crop, a field

survey was carried out during 2020-2021. Larva of *Spodoptera litura* collected from castor crop. Larvae were reared on castor leaves. Fifty larvae of *S. litura* other than experimental area, were collected at fortnightly interval from castor fields and brought to the laboratory. Larvae were maintained in PG Laboratory of entomology section, college of agriculture, Nagpur. Larvae were reared on fresh castor leaves till their death or pupation in growth chambers at $25\pm 1^{\circ}\text{C}$, 60–70% RH and photoperiod of 12:12 (L:D) h. The number of parasitized larvae and the bioagents found from the larvae were recorded and the bioagents sent for identification.

Results and Discussion

To assess the activity of naturally occurring bioagents in castor crop, a periodical survey was conducted during November to December 2020 and the results obtained are presented in Table 1 and Table 2.

During the investigation, *Cotesia* spp. and *Bracon* spp. were found parasiting the larvae of *S. litura*. From the data presented in table 1. it was evident that the larval infection due to parasitization of *Cotesia* spp. was 16, 11 and 6 per cent on 20/11/2020, 05/12/2020 and 20/12/2020, respectively. The maximum parasitization was recorded in the second fortnight

of November. The adult emergence of *Cotesia* spp. was recorded as 13, 10 and 4 per cent

Data presented in Table 2. revealed that the parasitism due to *Bracon* spp. ranged from 3-6 per cent and percentage of adult emergence ranged from 2-4 per cent. The maximum parasitism was in the second fortnight of December. The average larval parasitism due to *Cotesia* spp. was 11 per cent and *Bracon* spp. was 4.3 per cent.

In the present study maximum parasitization recorded by *Cotesia* spp. was 16 percent, which was in line with the findings of Zaz and Kushwaha (1983) [10], who found 14 per cent larval parasitism of *S. litura* due to *Cotesia ruficrus* in cabbage and cauliflower. Yadav *et al.*, 2010a [8] released ten pairs of adult male and female parasitoid, *Cotesia plutellae* on 100 second instar larvae of *S. litura* and they found 20 per cent parasitism in the laboratory. Yadav *et al.*, 2010b [9] reported that, *Apanteles flavipes*, *A. plutellae* and *A. angaleti* were promising parasitoids and their respective parasitization was noticed to the range of 7.5 to 20 per cent. These parasitoids may prove very useful in controlling the population of several obnoxious polyphagous insect pests infesting field crops.



Bracon Spp.



Cotesia Spp.

Table 1: Activity of naturally occurring bioagent *Cotesia* spp. in castor ecosystem

Sr. no.	Period of study	Number of larvae collected	Percentage of parasitization	Percentage of adult emergence
1	20/11/2020	50	16	13
2	05/12/2020	50	11	10
3	20/12/2020	50	6	4
	Average		11	9

Table 2: Activity of naturally occurring bioagent *Bracon* spp. in castor ecosystem

Sr. no.	Period of study	Number of larvae collected	Percentage of parasitization	Percentage of adult emergence
1	20/11/2020	50	4	3
2	05/12/2020	50	6	4
3	20/12/2020	50	3	2
	Average		4.3	3

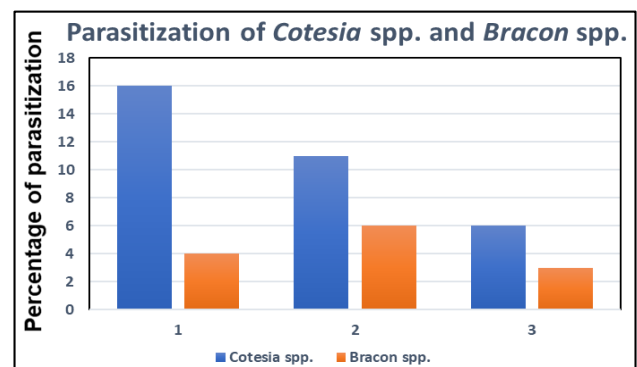


Fig 1: Percentage parasitization of *Cotesia* spp. and *Bracon* spp.

Conclusion

The study revealed that the field collected larvae of *Spodoptera litura* when reared on castor leaves showed

parasitization by *Cotesia* spp. and *Bracon* spp. From this Study it can be concluded that *Cotesia* spp. was found as more effective as it showed maximum parasitization. Further investigation needs to be conducted to identify these parasitoids at species level. These parasitoids can be used in controlling the population of several noxious insect pests infesting crops.

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