COTESIA GLOMERATUS - A POTENTIAL BIOCONTROL AGENT FOR LARGE WHITE BUTTERFLY, *PIERIS BRASSICAE* IN INDIAN PUNJAB

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Introduction

Unlike most of the other oilseed producing countries, India grows a wide range of crops: rapeseed-mustard, groundnut, soybean, sunflower, sesamum, safflower, niger, castor, linseed, coconut, oil palm and a number of forest trees which yield oil. India holds an important position in the world's vegetable oil economy with oilseed Brassicas as second predominant group of oilseed crops after groundnut. Like many other oilseed crops, these energy rich crops in this country are grown under energy deprived conditions with limited inputs mostly by marginal farmers. In addition, a number of abiotic and biotic stresses add up in preventing the realization of full yield potential of these crops. Among the biotic constraints, insect-pests are the major ones that cause substantial yield losses. Although mustard aphid, *Lipaphis erysimi* (Kaltenbach) (Homoptera: Aphididae) continues to pose serious threat to oilseed *Brassica* and is a major production constraint, the large white butterfly, *Pieris brassicae* (Linnaeus) (Lepidoptera: Pieridae) is also emerging as an important pest. *P. brassicae* is an oligophagous pest with wide host range and is known to infest 83 species of food plants belonging to Cruciferae, Tropaeolaceae, Capparaceae, Resedaceae and Papilionaceae (Feltwell, 1982). It has a Palearctic distribution from North Africa across Europe and Asia to the Himalayan Mountains (Higgins and Riley, 1970). In Indian Punjab, this species was earlier restricted to vegetable Brassicas only, however, for the past few years continuous occurrence is being reported on oilseed Brassicas. The pest is a voracious feeder and inflicts heavy damage to the leaves and inflorescence. In heavily infested fields all the plant parts including pods are eaten up leaving only the twigs. At present, the management of this pest is largely based on the use of synthetic insecticidal chemicals, which have their own adverse effects such as development of insecticide resistance in the insect-pest, resurgence, pesticide residues in oil and cake besides environmental pollution. This necessitates the development of alternate control strategies such as to exploit natural control or argumentatively release natural enemies as a part of integrated pest management programmes. Studies that identify natural enemies that coincide spatially and temporally with pest populations, and therefore have potential to control them, can suggest ways to minimize insecticide applications by targeting them more efficiently, thereby helping to conserve the natural enemies (Murchie *et al.* , 1997; Holland *et al.* , 1999). The present study was conducted keeping this objective in mind.

Materials and Methods

The study was carried out during 2007-08, 2008-09 and 2009-10 crop seasons at the Oilseeds Research Farm of Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana-141 004. *Brassica juncea* cv. PBR 91 was sown in plot size of 10 x 8 m which was kept unsprayed throughout the crop season. Regular surveillance of the field at weekly interval was done for the presence of eggs and/larvae of *P. brassicae* starting from 1st Standard Meteorological Week (SMW). As and when the egg masses and larvae were observed in the field, these were brought to the laboratory. These were kept in the glass jar till hatching/pupation to record emergence of parasitoid, if any. Field observations were also made to record for any predator feeding on eggs or larvae.

Results and Discussion

During the three years study period no egg parasitoid was observed. However, larval parasitization ranging from 6 to as high as 86 per cent was observed during different SMWs (Fig. 1). In 2007-08 crop season, the larval parasitization ranged from 6-86 per cent during 9th-13th SMW. Maximum larval parasitization (86.0 %) was observed during 10th SMW. In 2008-09, it ranged from 44-66 per cent during 9th-13th SMW. The maximum parasitization (66.0%) was observed during 11th SMW. However, in 2009-10, larvae were observed late in the season from 11th-13th SMW and

consequently the larval parasitization. It ranged from 36 per cent in 11th SMW to as high as 70 per cent in 12th SMW. The mean larval parasitization during 2007-08, 2008-09 and 2009-10 crop season was 37.2, 53.0 and 52.7 per cent, respectively. Only a single larval parasitoid, *Cotesia glomeratus* (Hymenoptera: Braconidae) could be recovered from parasitized larvae. Of the 600 larvae collected, 46.3 were parasitized. Kristensen (1994) in Denmark recorded larval parasitization of this pest as high as 82 per cent.

P. brassicae generally starts infesting oilseeds *Brassicas* from 4th SMW, though its infestation was observed late in the three years study period. Thereafter, the population remains upto the crop maturity. Field observations have recorded larval population as high as 106.6 larvae/plant on *Brassica carinata* cv. PC 5 (data not given). Such a high incidence resulted in plants practically devoid of leaves, flowers and developing pods with only twigs left intact. In the event of lack of food even the twigs were scratched by larvae on some of plants. Parasitization was recorded after 8th SMW till the population lasted on crop. Though, predators like *Coccinella septempunctata, Chrysoperla carnea* and *Episyrphus balteatus* were present in the field, none of the predators was found to feed on eggs and larvae of *P. brassicae,* as large populations of *L. erysimi* were available to them.

The development of Integrated Pest Management (IPM) strategies in oilseed *Brassica* require a better understanding of interactions among pests and their natural enemies. (Alford *et al.,* 2003). An understanding of relationship between pests and their natural enemies in an agroecosystem is key to development of strategies to enhance conservation biological conrol in oilseed *Brassicas* (Williams, 2004, 2006). Conservation biocontrol has been defined as the 'modification of the environment or existing practices to protect and enhance specific natural enemies or other organisms to reduce the effects of pests' (Eilenberg *et al.*, 2001). Although, *P. brassicae* is causing substantial damage to the crop, but, a considerably high level of larval parasitization by *C. glomeratus* occurs under unsprayed field conditions. This native parasitoid can prove be an important component of area wide pest management programmes especially in the conservation biological control of *P. brassicae*.

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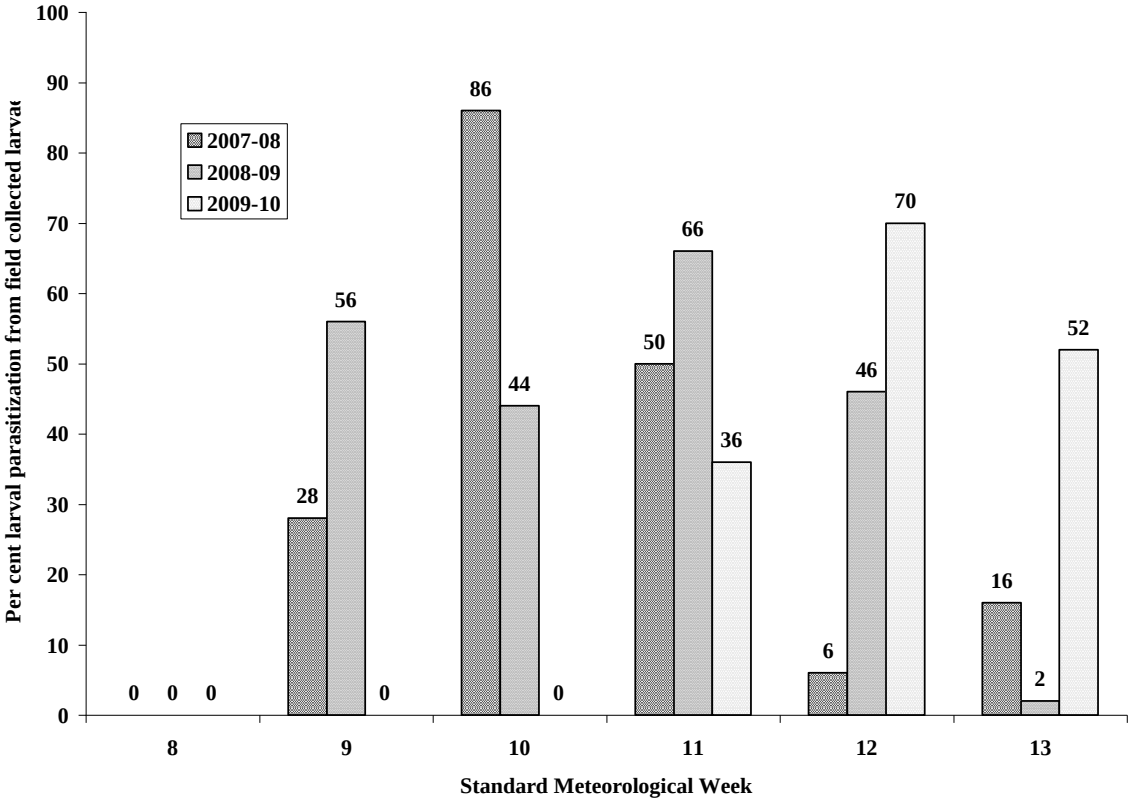

Fig. 1. Larval parasitization of *Pieris brassicae* during different years