

OCCURRENCE OF *TRICHOGRAMMA* SPP. UNDER FIELD CONDITIONS IN ORGANIC AND CHEMICALLY TREATED TOMATO CROP BY USING SENTINEL CARDS, AT RAIPUR, CHHATTISGARH, INDIA

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ABSTRACT

This experiment was carried out with the objective to record the naturally occurring *Trichogramma* species under field condition and also to find the colour preference for egg laying in Chhattisgarh crop field organic and chemically treated tomato crops at IGKV, Raipur, Chhattisgarh during the year 2021-2022. The result from the experiment showed that the mean maximum population of *Trichogramma* in organic and chemical fields were seen during the months of February and March (i.e., 13.5 and 9.38 numbers), and the lowest mean population were recorded during the month of April (1.56 and 1.00 numbers respectively). The most common colour preferred by *T. chilonis* under field conditions was blue, which was observed with mean population of 14.13 numbers in organic field and it was 9.69 numbers on yellow cards in the chemically treated field. The colour which was least preferred was white where mean parasitization were recorded as 4.06 and 1.88 numbers in organic and chemically treated tomato field, respectively. The species of *Trichogramma* collected from the organic tomato field was identified on *T. chilonis*.

KEY WORDS : *Trichogramma* spp., Sentinel cards, Tomato crop, Organic and Chemical field, Raipur.

INTRODUCTION

Tomato (*Solanum lycopersicum* L.) botanically referred to the family Solanaceae is one of the most important and popular vegetable crop. Food value of tomato is very rich because of higher contents of vitamins A, B and C including calcium and carotene (Bose and Som, 1990). A number of insect pests, i.e. about 100 insect pests and 25 non insect pests species are reported to ravage the tomato fields (Lange and Bronson, 1981). Among the various constraints responsible for low yield of tomato, one of the major factor is insect pests viz., the fruit borer, *Helicoverpa armigera* (Hubner) and sucking insect pests viz. whitefly *Bemisia tabaci* (Genn.), Jassids, *Amrasca biguttula biguttula* (Ishida), thrips *Thrips*

tabaci (Lin.) and serpentine leaf miner, *Liriomyza trifolii* (Burgess) are highly destructive causing serious damage and are responsible for lowering the yield of tomato crop (Lal et al., 2008). Tomato crops can be infected with a large number of insects.

One of the most destructive pests is the *Helicoverpa armigera* (Hubner) commonly known as the tomato fruit borer, which can cause up to 40% to 50% damage to tomato crops (Pareek and Bhargava 2003). Fruits infested by the pest's larvae becomes unfit for human consumption. Early larval stages consume foliage, while later instars bore inside of fruits. (Singh and Narang, 1990).

The eggs and larvae of many species of lepidopteran are attacked by parasitic Hymenoptera in the diverse cropping system. The egg parasitoids

belonging to genera *Trichogramma* Westwood and *Trichogrammatoidea* Girault (Hymenoptera: Trichogrammatidae) are extensively used for the management of lepidopteran pests in different parts of the world (Smith, 1996). These egg parasitoids, primarily trichogrammatids, are produced easily on laboratory hosts and have the added advantage over other biocontrol agents in that they can easily destroy the egg stage before it hatches out to harm by larvae on crops. (Ulrichs and Mewis, 2004; Gardner *et al.*, 2011).

MATERIALS AND METHODS

In these research organic (without chemical insecticide treatment) and insecticide treated tomato crop fields were used. Sentinel cards of four different colours *viz.*, yellow, pink, blue and white were prepared in laboratory on one cc eggs of *Corcyra cephalonica*, which were uniformly spread and pasted on a card measuring 15 cm x 4cm . To kill the host embryo, the eggs were treated with UV light for 20 minutes. Sentinel cards with *Corcyra* eggs were then left in the tomato fields above for 48 hours

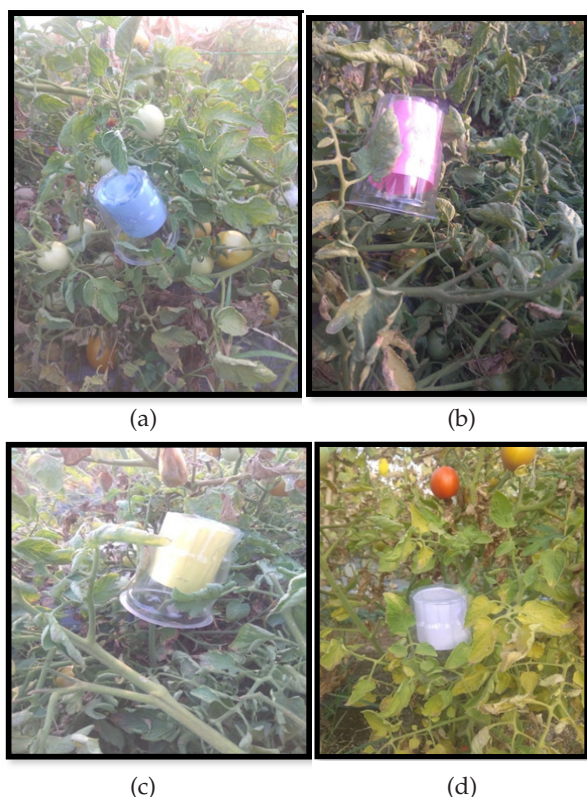


Fig. 1. Application of Sentinel cards under protection inside disposable plastic tumbler in organic and chemically treated tomato field (a) blue card (b) pink card (c) yellow card (d) white card

i.e., organic and chemical treated crop during flowering and fruiting conditions for giving exposure to *Trichogramma* adults in the field. After 48 hrs. the sentinel cards were brought back in the laboratory to observe the parasitization by *Trichogramma* spp. Parasitized egg turned black and these cards were placed in separate polythene bags for observing and recording the emergence of *Trichogramma* species.

RESULTS AND DISCUSSION

The naturally occurring *Trichogramma* species were collected on pieces of four different colours (yellow, blue, pink and white) sentinel cards (15x4 cm) which was glued with *Corcyra* eggs exposed to ultraviolet light for 20 min. In order to protect the cards from the environment, they were first fixed in plastic cups before being stapled to the upper third of the tomato plants in the experimental location. In total, four different cards were then placed in four different areas. They were left in the field for 48 hours. then they were taken out and brought back to the lab. These cards were individualized in polythene bags at room temperature of 25 ± 2 °C and RH- $56\pm 2\%$.

Four days after the cards were removed from the field, the presence of parasitism by *Trichogramma* was determined by counting the number of darkened eggs. After they died, the parasitoids were counted in the laboratory to determine their emergence rate. Part of these adults were sent preserved in vials with 70% alcohol for identification, to NBAIR, Bengaluru.

The experiment started 30 days after the tomato crop was sown and continued every week until the



Fig. 2. Recovered sentinel cards kept in individually in polythene bags

Table 1. *Trichogramma* spp. Identified from the tomato field

S.No	Name of <i>Trichogramma</i> species	Host plant	Identifier
1.	<i>Trichogramma chilonis</i>	Organic tomato field	Dr. Omprakash Navik ICAR- NBAIR, Bengaluru
2.	<i>Trichogramma</i> spp. (specimens were damaged)	Inorganic tomato field	Dr. Omprakash Navik ICAR- NBAIR, Bengaluru

Table 2. Observation of naturally occurring *Trichogramma* spp. over the season of tomato crops in two different fields during 2021-22

Naturally occurring <i>Trichogramma</i> spp. over the season in tomato crop during 2021-22											
Colour cards	Organic field					Over all mean	Chemically treated field				
	January	February	March	April	January		February	March	April	Over all mean	
Yellow	11.25	18.5	18.25	1.5	12.38	18	12.75	7.25	0.75	9.69	
Blue	23.25	20	10.75	2.5	14.13	4	6.5	2.75	0	3.31	
Pink	9.25	11.5	13.25	0.75	8.69	8.5	15.25	5.75	0.75	7.56	
White	6.25	4	4.5	1.5	4.06	1.75	3	1.75	1	1.88	
Monthly mean	12.5	13.5	11.6	1.56		8.06	9.38	4.38	0.63		

crop was harvested. In order to generate data during the tomato cultivation period, means of the weekly data of *Trichogramma* spp. emergence of were calculated per month which are presented in the Table 2.

The naturally occurring *Trichogramma* collected from the organic tomato field was sent to NBAIR, Bengaluru for identification. It was identified as *T. chilonis* in organic tomato field whereas as sample from chemical use tomato field were identified upto only generic level i.e., *Trichogramma* spp.

The result from the experiment showed that maximum population of *Trichogramma* spp. in organic and chemical fields, was seen in the month of February and March (13.5 and 9.38 numbers), and minimum population was seen in month of April (1.56 and 1.00 numbers). *Trichogramma* spp. preferred blue colour cards the most frequently, which was observed at 14.13 numbers in the organic field and 9.69 numbers on yellow in the chemical

field. White was the least preferred colour, with parasitization rates of 4.06 and 1.88 numbers in tomato fields that had been organic and chemically treated, respectively.

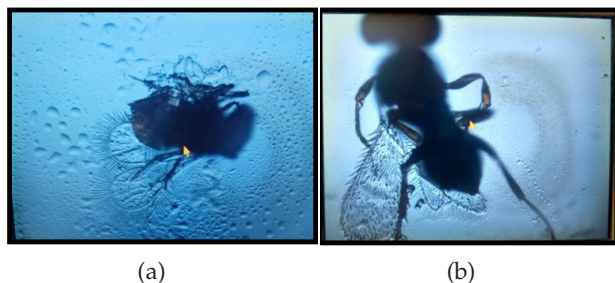
The present finding is in agreement with Suroshe *et al.* (2015) who also reported *T. chilonis* in tomato, lettuce, broccoli and cauliflower; in the evaluation of the diversity of egg parasitoids in 24 horticulture crops at IARI, New Delhi. Similar to the present finding, Hasnain *et al.* (2015) also reported that per cent parasitization of host eggs by *Trichogramma* spp. was higher in fields which were isolated by cotton fields (chemically sprayed).

CONCLUSION

Thus, from the present studies it can be concluded that *Trichogramma* spp. naturally occurred throughout the cropping season of tomato even after spraying with insecticides and in organic insecticide treated field.

The species of *Trichogramma* collected from the organic tomato crop was identified as *T. chilonis*, which exhibited its activity from January, February and March with a maximum numbers of 13.5 in February which minimum activity was recorded during April (1.56 numbers).

The species of *Trichogramma* collected from organic field was identified as *T. chilonis* preferred blue coloured sentinel cards over rest of the tested colour in organic field with 14.13 in numbers

**Fig. 3.** Naturally occurring *Trichogramma* spp. (a) Inorganic field (b) Organic field

followed by yellow 12.38 numbers ; whereas in chemically treated field, *Trichogramma* exhibited maximum preference towards yellow cards (9.69 numbers) followed by pink colour cards (7.56 numbers).

Looking to the overall data, comparatively lesser per cent parasitization by *Trichogramma* spp. was exhibited in chemically treated plots as compared to organic field.

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