Indian Journal of Entomology 85(4): 1006-1008 (2023) DoI. No.: 10.55446/IJE.2022.168

EFFECT OF MAGNETIC FIELD ON *CORCYRA CEPHALONICA* EGGS FOR PARASITIZATION BY *TRICHOGRAMMA CHILONIS*

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ABSTRACT

This study evaluated the effect of permanent magnetic field on *Corcyra cephalonica* Stainton eggs and effect on parasitisation by the egg parasitoid *Trichogramma chilonis* Ishii. *Corcyra* eggs were exposed to magnetic field for different time periods. It was observed that three hours magnetized eggs were significantly more preferred for parasitisation and revealed maximum adult emergence (76.23%, 98.67%) than non-magnetized *Corcyra* eggs (63.50%, 85.96%). When UV irradiated *Corcyra e*ggs were kept under magnetic field for parasitisation, with increase in the time of exposure to magnetic field, parasitisation also increases along with adult emergence (89.85%, 97.16%) up to 3 hr. Then, it gradually decreases as compared with control (86.80%, 94.54%). Thus, 3 hr magnetized *Corcyra* eggs prevent the emergence of larva and was preferred by *Trichogramma* for maximum parasitisation and adult emergence.

Key words: *Trichogramma chilonis*, *Corcyra cephalonica*, magnetic field, magnetization, parasitisation, adult emergence, *Corcyra* eggs card, U V treated eggs, parasitoid

Trichogramma chilonis Ishii is an egg parasitoid measuring only 0.3 mm in length, belonging to the family Trichogrammatidae of the order Hymenoptera. *Trichogramma* spp., are widely used as egg parasitoids for biological control of insect pests through augmentation and field release (Funde et al., 2020). *Corcyra cephalonica* (Stainton) is being used as a factitious host for mass production of predators and parasitoids under laboratory condition. For production of tricho-card, sterilization of *Corcyra* eggs is essential (Singh and Kumar, 2017). Sometimes, larvae of the host insect emerge from unparasitized eggs and attack parasitized eggs, hampering the performance of the tricho-card in the field. Biocontrol agents constitute an important component of IPM, and demand for these is increasing, and there is potential to boost production and usage of these (Barratt et al., 2017). Insect possess ferromagnetic resonance, and magnetic material is present in the head, thorax and abdomen, and these magnetic nanoparticles in social insects act as geomagnetic sensors (Esquivel, 2007). The magnetic field is a safe, effective, economical and convenient alternative method. It has an effect on orientation (Jones and Macfadden, 1982), oviposition, development, fecundity, and behaviour for a wide variety of insects (Ramirez et al., 1983). Considering these, the present study evaluated the acceptability of magnetized *C. cephalonica* eggs for parasitisation by *T. chilonis* and assessed the effect of magnetic field on parasitisation.

MATERIALS AND METHODS

Trichogramma chilonis and *C. cephalonica* cultures were maintained in the Biocontrol Laboratory, Department of Entomology, Dr. PDKV Akola during 2018-19. Fresh *Corcyra* eggs produced were cleaned and then egg cards (6 x 4 cm) were prepared by sprinkling eggs on yellow coloured cards having acacia gum as sticking material with proper drying (Shinde et al., 2016). Experiments were conducted in two sets, in first set, *C. cephalonica* egg cards were exposed to permanent magnetic field for different time periods as per treatments and magnetized eggs were immediately allowed to be parasitized by freshly emerged female *T. chilonis* adults as a nucleus card (6:1) in a polythene bag containing 50% honey as food under incubation chamber. The preference of magnetized eggs for parasitisation by *T. chilonis* adults was assessed (Pandir et al., 2013). In a second set, *C. cephalonica* egg cards were UV irradiated and then immediately exposed to freshly emerged *T. chilonis* adults (6:1) for parasitisation in a polythene bag under magnetic field condition for different time periods as per treatments. To know the effect of magnetic field on parasitisation was assessed. A complete set of control was maintained and replicated thrice. Observations were made on parasitisation of

eggs at 4th day when eggs turned black (indicating development of parasitoid) and emergence of *T. chilonis* adults on 7th day. Obtained data were converted into % and analysed in completely randomized block design (Panse and Sukhatme, 1967).

RESULTS AND DISCUSSION

Study revealed that magnetic field treated *C. cephalonica* eggs had significant effect on parasitisation by *T. chilonis* (Table 1); maximum parasitisation and emergence was observed in 3 hr magnetized eggs (76.23%, 98.67%) which was at par with 2½ hr magnetized eggs (74.88%, 96.21%); and in control i.e., without magnetic field these values were 63.50 and 85.96%, which was at par with 2 hr, 1½ hr, 1 hr and 45 min magnetized eggs. Group of 30 and 15 min magnetized eggs revealed 57.58%, 80.04% and 56.09 %, 78.30% parasitisation and emergence, respectively and at par with each other. Both these treatments were significantly superior to 4, 5 and 6 hr magnetic field exposure. Similar observations were made by Pandir et al. (2013) with eggs of *E. kuehniella* upon 3 hr magnetization for its effect on *T. embryophagum* for parasitisation. Pan (1996) observed negative effects due to exposure to 7 T magnetic field with egg hatching and maturation of *Corcyra* eggs death causing death of embryo effectively used for parasitisation by *Trichogramma*. Eclosion of eggs in the 7-T field was delayed, and the hatching rate was reduced. Magnetic field for > 4 hrs had negative effect on *Corcyra* eggs

Table 1. Parasitisation/ adult emergence of *T. chilonis* from magnetized *C. cephalonica* eggs

Treatments (Magnetic field exposure)	Magnetic field treated eggs		UV irradiated and magnetic field treated eggs	
	Parasitisation %	Emergence %	Parasitisation %	Emergence %
T_1 – 0 hr	63.50	85.96	86.80	94.54
	(52.82)	(68.02)	(68.71)	(76.64)
T_2 – 15 min.	56.09	78.30	77.92	83.88
	(48.50)	(62.25)	(61.97)	(76.64)
T_3 – 30 min.	57.58	80.04	78.49	84.35
	(49.36)	(63.47)	(62.37)	(66.75)
T_4 – 45 min.	60.78	82.56	78.93	86.54
	(51.22)	(65.40)	(62.68)	(68.53)
T_5 – 1 hr	61.90	83.19	79.69	85.89
	(51.88)	(64.82)	(63.21)	(67.94)
T_6 – 1½ hr	62.72	84.05	82.34	87.40
	(52.36)	(66.49)	(65.15)	(69.21)
T_7 – 2 hr	63.47	85.28	87.18	95.56
	(52.81)	(67.44)	(69.03)	(78.05)
T_8 – 2½ hr	74.88	96.21	88.76	96.06
	(59.92)	(79.03)	(70.42)	(78.65)
T_9 – 3 hr	76.23	98.67	89.85	97.16
	(60.82)	(83.87)	(71.45)	(80.81)
T_{10} – 4 hr	44.30	66.33	67.77	72.84
	(41.72)	(54.23)	(55.41)	(58.59)
T_{11} – 5 hr	41.43	61.02	52.24	65.02
	(40.05)	(51.36)	(46.28)	(53.77)
T_{12} – 6 hr	39.29	63.36	49.95	57.61
	(38.80)	(52.75)	(44.96)	(49.37)
T_{13} – 12 hr	22.42	44.17	43.91	49.09
	(28.24)	(41.56)	(41.49)	(44.47)
T_{14} – 24 hr	20.02	40.80	42.57	48.15
	(26.54)	(39.68)	(40.71)	(43.94)
F test	Sig.	Sig.	Sig.	Sig.
SE (m)±	0.65	0.88	0.50	0.97
CD (p=0.05)	1.86	2.52	1.43	2.78

Figures in parentheses arc sin transformed values

hatching, larval growth and development (Madavi et al., 2020; Zein and Hussein, 2019; Chandrawanshi et al. (2018). Magnetic field significantly affects the orientation and behaviour of *Trichogramma* adults for parasitisation on UV irradiated *Corcyra* eggs (Table 1). Significantly maximum parasitisation and adult emergence was observed in 3 hr magnetic field treated eggs (89.85%, 97.16%, respectively) which was at par with 2½ hrs magnetic field treated ones (87.18%, 95.56%, respectively), which in turn was at par with untreated ones. Thus eggs exposed to magnetic field for 3 hr gave maximum parasitisation. Ram and Irulandi (1989) reported maximum egg parasitisation by *Trichogramma exiguum* with UV treated eggs of *Corcyra.* The nature of the response by insect is depended upon the power supply generating by the magnetic field (Starick et al. 2005)

ACKNOWLEDGEMENTS

The authors acknowledge the Biocontrol unit, Department of Entomology, Post Graduate Institute, Dr. PDKV, Akola, Maharashtra for providing *Trichogramma* culture and necessary facilities.

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(Manuscript Received: May, 2021; Revised: September, 2021;
Accepted: September, 2021; Online Published: February, 2022)
Online First in www.entosocindia.org and indianentomology.org Ref. No. e21149