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Superior Strain Selection of the Egg Parasitoid *Trichogramma chilonis* Ishii - Biological Parameters

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ABSTRACT

To select superior strains of the egg parasitoid *Trichogramma chilonis* Ishii, collections were made from cotton ecosystems of six different agroclimatic zones of the country *viz.*, Anand (Gujarat), Ludhiana (Punjab), Coimbatore (Tamil Nadu), Bangalore (Karnataka), Rajahmundry (Andhra Pradesh) and Nagpur (Maharashtra). These ecotypes are referred as BioC1, BioC2, BioC3, BioC4, BioC5, and BioC6 respectively. Mean fecundity during F1, F20, and F40 generations in the laboratory was significantly more in BioC1, BioC2, and BioC6 than in others. Longevity of males was 4.0, 4.0 and 4.2 days and that of females was 7.0, 7.4 and 7.3 days respectively in BioC1, BioC2 and BioC6 strains, which was higher than in the other three ecotypes. Net reproductive rate (Ro) and rate of increase per female per generation (λ) was higher in BioC1 and BioC2. There was no difference in emergence pattern and sex- ratio amongst six ecotypes. Results thus, indicated that BioC1 and BioC2 are superior to other ecotypes.

KEY WORDS: *Trichogramma chilonis*, superior strains, selection

Trichogramma spp. have been used extensively for the suppression of several lepidopterous pests world over. The genus *Trichogramma* attacks only the egg stage of the host. The results obtained with releases are of conflicting nature. The main reason is perhaps the lack of knowledge of strains / species used in particular crop ecosystem. It has been in practice to release laboratory - reared *Trichogramma* spp. without taking into consideration the crop ecosystem and the environmental conditions from which the parasitoids were originally collected. In the past, many biological control workers have recognised the occurrence of strains, races, ecotypes or biotypes of *Trichogramma* spp. (Kot,1979; Diehl and Bush, 1984; Pak and Van Heininger, 1985; Smith and Hubbes, 1986). Proper knowledge and identification of the strains, will be critical to the success of inundative release of *Trichogramma* spp.

The present study was initiated to investigate the relative performance of the egg parasitoid, *Trichogramma chilonis* Ishii collected from six different agroclimatic zones of the country *viz.*, Anand (Arid Western plains), Ludhiana (Sub-humid North Western plains), Coimbatore (Semi-arid Southern plains), Bangalore (Humid peninsular Plateau), Rajahmundry (sub- humid South eastern upland), and Nagpur (Semi-arid Central Plateau). These ecotypes are referred in the text as BioC1, BioC2, BioC3, BioC4, BioC5 and BioC6.The ecotypes of *T. chilonis* were evaluated for various biological parameters in order to select a superior ecotype for large scale field evaluation for biological suppression of *Helicoverpa armigera* (Hbn.) in different agro-climatic zones. The results are presented in this communication.

MATERIALS AND METHODS

T.chilonis was collected from cotton ecosystem from Anand, Ludhiana, Coimbatore, Bangalore, Rajahmundry and Nagpur and reared separately on the eggs of *Corcyra cephalonica* Stainton. Five glass vials (15 x 4 cm), each containing 20 parasitised eggs were kept for emergence. Each glass vial was con-

sidered as one replication. On emergence, 1000 *C.cephalonica* eggs were exposed to the parasitoids and this was repeated till all the parasitoids died in order to know the fecundity. Simultaneously, observations on per cent emergence, longevity, and sex-ratio were also recorded. All these biological parameters were recorded in F20 and F40 generations also to ascertain biological degradation if any. Life table studies on the six ecotypes were conducted to select a superior strain finally. The parameters followed were after (Andrewartha and Birch, 1954; Southwood, 1966). The parameters recorded were

Pivotal age in days = x
Age specific longevity = Lx
Age specific fecundity = Mx
Net reproductive rate (Ro) = $\sum xMx$
Approximate duration of a generation $T_c = x\ LxMx/ \sum xMx$
Approximate intrinsic rate of increase $rc = \log_e Ro/ Tc - rm$
Precise intrinsic rate of increase $rm = e^{-rm} \times lx\ Mx = 1$
Net generation time $T = \log_e ro/rm$
Finite rate of increase (λ) = anti $\log_e rm$

The experiment was conducted under the laboratory temperature of 25±1.5°C and 68% R.H.

RESULTS AND DISCUSSION

Emergence during F1, F20, and F40 generations in BioC1 was 99.0, 97.0, 96.0%; in BioC2 96.0, 94.0, 91.0%; in BioC3 86.0, 85.3, and 89.0%; BioC4 93.0, 92.0, and 91.0%; in BioC5 89.0, 89.6, and 92.7% and in BioC6 87.0, 87.8, and 92.3%, respectively (Table 1). It is clear that irrespective of the collection area, per cent emergence in the laboratory was at par in all ecotypes. Earlier, uniform emergence pattern in six different strains of *T. minutum* Riley collected from different agroclimatic zones of Canada was reported by Smith and Hubbes (1986).

Fecundity varied significantly among various ecotypes. BioC1 and BioC2 ecotypes parasitised 69.0, 62.0, and 59.0; 64.0, 59.0, and 55.0 eggs in F1, F20 and F40 generations, respectively. Fecundity in other four ecotypes was significantly less as compared to BioC1, and BioC2 (Table 1). Studies conducted at Germany showed that a strain of *T. dendrolimi* Matsumara collected from China was more fecund than those collected from other countries (Hassan, 1988). Similarly, *T.minutum* strains collected from Plummer and Maine provinces in Canada had significantly higher fecundity than those from five different zones of Canada (Smith and Hubbes, 1986). Sex-ratio did not differ significantly amongst ecotypes. Longevity of males and females during F1 generation in BioC1 ecotype was 4.0 and 7.0 days; in BioC2 4.0 and 7.4 days and in BioC6 4.2 and 7.3 days. It was slightly more than in BioC3, BioC4, and BioC5 ecotypes. Similar trend was observed during F20 and F40 generations (Table 1).

Data recorded on various parameters like daily fecundity, survival and number of females produced per female per day were utilised for construction of life table statistics to determine variations in various ecotypes. It is clear from table 2 that net reproductive rate (Ro) was higher in BioC1 and BioC2 (22.05 and 22.54) than in BioC3 to BioC6 (20.08, 20.0, 18.33, 17.6). Precise rate of intrinsic increase (rm) per female was also higher in BioC1 and BioC2. Finite rate of increase per female day was (λ) 1.29 and 1.36 per day in BioC1 and BioC2 respectively and 1.20, 1.18, 1.21 and 1.14 in BioC3 to BioC6, respectively. These results indicate that BioC1 and BioC2 are significantly better than others and hence may be used for further mass production and field release.

Table 1. Biological parameters of *Trichogramma chilonis* ecotypes

Ecotypes	% Emergence			Fecundity			Sex-ratio (% females)			Longevity					
	F1	F20	F40	F1	F20	F40	F1	F20	F 40	F1		F20		F20	
										♂	♀	♂	♀	♂	♀
BioC1	97.7	94.7	95.7	69.0	62.0	59.0	60.0	55.0	60.0	4.0	7.0	4.0	6.8	4.0	7.1
BioC2	95.0	94.0	95.3	64.0	55.0	54.0	54.0	48.0	49.0	4.0	7.4	4.0	7.2	4.0	7.2
BioC3	94.0	93.3	94.7	41.3	38.0	34.0	60.0	58.0	53.0	3.8	6.8	3.8	6.4	3.7	6.2
BioC4	94.0	93.0	94.7	36.0	32.0	29.0	53.0	56.0	54.0	3.9	6.9	3.7	6.4	3.6	6.0
BioC5	95.3	93.3	94.0	45.0	41.0	38.0	60.0	62.0	56.0	3.8	6.9	3.9	6.6	4.0	6.0
BioC6	96.0	94.3	94.7	52.7	50.7	39.0	63.0	55.0	54.0	4.2	7.3	4.0	7.0	4.0	7.2
S.Em.	2.30	2.14	1.16	1.41	2.63	1.47	3.26	1.46	2.02	0.36	0.41	0.23	0.20	0.20	0.40
C.D. at 5%	-	-	-	4.5	8.3	4.7	-	4.9	-	-	-	-	0.7	-	-
F Test	NS	NS	NS	**	**	**	NS	**	NS	NS	NS	NS	**	NS	NS

Table 2. Life table statistics of *T.chilonis* ecotypes

Particulars	BioC1	BioC2	BioC3	BioC4	BioC5	BioC6
Ro	22.05	22.54	20.08	20.00	18.33	17.60
Tc	8.8911	8.9755	8.7910	8.9804	8.9804	8.9516
rc	0.2479	0.3470	0.3110	0.3043	0.3200	0.3008
rm	0.2575	0.3110	0.2918	0.2838	0.2732	0.2430
T	12.012	10.017	11.343	11.458	11.478	11.929
λ	1.2936	1.3640	1.2010	1.1820	1.2110	1.1400
Average Longevity (days)	4.60	4.66	4.20	3.88	3.92	3.64

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