Short Communication

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Assessment of quality attributes of tropical and subtropical laboratory reared strains of *Trichogramma chilonis* Ishii

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Trichogramma chilonis Ishii is gregarious endoparasitoid most widely produced and released against many lepidopterous pests including borers of sugarcane (Sithanantham *et al.* 1973, Hassan *et al.* 1988 and Greenberg *et al.* 1998). Biocontrol laboratories supply *Trichogramma chilonis* as Trichocard for their use in field. It is now known that efficiency of *Trichogramma* in bio-control system depends on the quality of the original strain from which mass multiplication was initiated. It's fitness in natural environment is governed by its capability to adapt this variable situation. Lack or loss of ecological adaptability due to rearing at constant temperature and humidity, and the deleterious effects of prolonged inbreeding may be regarded as main factors responsible for the ineffectiveness of various *Trichogramma* spp.in the field.

The quality attributes in laboratory-reared strain of *Trichogramma* is crucial for success in biological control programmes. The quality control in *Trichogramma* mass-rearing is one of the measures used to avoid failures in biological control (Bigler 1994). The overall quality of *Trichogramma* can be defined as the ability to function as intended after release into the field. Greenberg (1991) evaluated quality attributes of *T. evanescens* in the laboratory, such as searching ability, emergence rate, sex ratio and fecundity, and related them to the effectiveness in the field. Longevity and fecundity are frequently used as indexes of wasp quality (Klomp and Teerink 1967 and Waage and Ming 1984). Life time fecundity is thought to be an important measure of a wasp's reproductive potential, thus is an index of its quality as a biological control agent. It is obvious that more fecund *T. chilonis*, females are better biological control agents than less fecund ones for purposes of inundative release programme (van Lenteren 2005) and female biased ratio is a good indicator of better rearing. The present study was undertaken to assess some quality attributes (longevity, fecundity, adult emergence and sex ratio) of tropical and subtropical laboratory reared strains of *T. chilonis* in sugarcane agro- ecosystem.

Laboratory strains (LS) of *T. chilonis* Ishii was obtained from Sugarcane Research Station, Paedegaon (LS_1- tropical strain), Bio Control Laboratory, IISR, Lucknow (LS_2- subtropical) and IISR, Bio-Control Centre Pravaranagar, (LS_3- tropical strain). A female wasp, which had mated within 24 h after emergence, was kept singly in glass vial (70 x 30 mm). The female was fed on honey-water solution (1:1v/v) by making a fine streaks on internal wall of glass vials. *Corcyra cephalonica* eggs (uv treated) were glued 50 eggs on a piece of hard paper (40 x 10 mm).Each female was offered these eggs on the first day for 24h and 25 eggs on subsequent days. Before introducing a fresh card of *Corcyra* eggs, the previous one was taken out. In wild strain (control), newly emerged mated female was used directly in the experiment (methodology was similar to the one used in the laboratory strains) to prevent any aging factor influencing the results. Daily counts on longevity of females, number of eggs laid by a female (fecundity) and number of progeny emerged as female/male was observed. The experiment was conducted at $28 \pm 2\ ^0$C and 60 ± 5 % relative humidity with 10 replications. The data were statistically analysed.

The longevity of laboratory strain of LS_2 (3.90 days) was significantly higher than LS_1 (2.60 days) and LS_3 (2.80 days) and lower than control (6.0 days) (Table 1). Studies have indicated that *Trichogramma* species exhibit decreasing longevity in the laboratory due to inbreeding (Kowalewa, 1954). Prolonged laboratory rearing at constant temperature (usually at 25 ^{0}C), humidity, host, light has an adverse effect on the longevity (Hassan 1988). Wild strain of *T.chilonis* when it reared under constant conditions for many generations, fail to survive extreme temperature fluctuations as encountered in the field (Scott *et al* 1997).

The fecundity of laboratory strains of *T. chilonis* ranged from 17 to 55 and was significantly lower than the control (69). The laboratory strain LS_2 showed higher fecundity than LS_1 and LS_3 (Table 1). The longer the parasite survived, the more eggs it parasitized (fecundity).

Table 1 Quality attributes of laboratory strains of *Trichogramma chilonis* Ishii

Laboratory Strain	Longevity (Days)	Fecundity	Adult emer-gence (%)	Female emer-gence (%)
LS_1	2.60 **c**	41.80 **c**	66.29 **c**	62.41 **c**
LS_2	3.90 **b**	55.20 **b**	78.89 **b**	78.50 **b**
LS_3	2.80 **c**	17.00 **d**	63.19 **d**	56.45 d
Control (ws)	6.00 **a**	68.90 **a**	94.50 **a**	91.10 **a**
CD (0.05)	**0.397**	**1.262**	**2.038**	**1.732**

Means followed by different letters in the same column are significant and wild strain of *T. chilonis* reared on egg mass of *C.s. indicus*; ws-wild strain

The adult emergence was significantly higher in LS_2 (78.89%) than LS_1 (66.29%) and LS_3 (63.19%) and was lower than control (94.50%).

The female emergence in control was 91.10%, and was significantly higher than LS_3 (56.45%), LS_1 (62.41%) and LS_2 (78.50%).

Inbreeding is a major constraint in the maintenance of variability of *Trichogramma* in the laboratory, as it causes reduction in fecundity and vigour. A wild strain when reared in the laboratory for several generations, it becomes a "laboratory strain". Any genetic change thus will be limited to this closed inbred population (Bartlett 1984). The fitness characteristics for the field will be different from those for the laboratory.

Adaptation to captivity (laboratory condition) generally increases productivity but a cost of lower quality. Generally captive populations rapidly adapt to the new environment-the rearing facility and reach a relatively stable state of a laboratory stock within 10-20 generations (Nunney 2007). Thus, in laboratory rearing, due to inbreeding both quantity and quality of strains are affected. Many workers reported that the rearing of the parasitoid under fluctuating temperatures helped to maintain tolerance. Temperature adaptation was observed after a few generations (5-10) reared under constant temperatures and the normal daily rhythm was lost after 15 generations (Schchepilnikova and Kasinskaya 1981).In long term rearing (200+ generation) of *T.chilonis* at constant optimum temperature (26 ± 1 °C) lead to the selection of strains which have limited tolerance for non-optimal temperatures (Nagarkatti 1979).It is now generally accepted that *Trichogramma* reared at alternating low and high temperatures give better results in the field than to those reared at constant temperature (Schchopetilnikova 1970).By changing the mass-production system and colony maintenance, it was possible to improve the quality attributes of *T.brassicae* and achieve the efficiency in the field (Bigler 1994).

It is concluded that quality attributes (longevity, fecundity, adult emergence and female ratio) of subtropical strain of *T. chilonis* (LS_2) is higher than the tropical strains (LS_1 and LS_3).It is suggested that quality *T. chilonis* may be improved through mass multiplication in semi-natural condition and through maintenance of proper balance in competition and rejuvenation of laboratory strain periodically with the wild strain.

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