Biological management of rice stem borer in the farmers field of Assam.

G.K. Upamanya[1], P. Dutta[2], R. Sarma[3], A.K. Sarmah[4], N. Kalita[5] and H. Sarma[6]

1. SMS (Pl. Prot.), 2. Scientist, Department of Plant Pathology, AAU, Jorhat, Assam- 785013. 3. Programme Coordinator, 4. SMS (Agron.), 5. SMS (Soil. Sc.) 6. SMS (Ag. Ext.), KVK, Barpeta, Howly-7813 16, Assam

gku_2003@yahoo.com

Rice is one among the three important food crops in the world. It serves as a staple diet for around 2.7 billion people. Asia is the major producer and consumer of rice in the world. In this continent, India is the largest rice growing country with an area of 43.7 million ha and annual production of 91.7 million tons. The loss of yield of rice due to insect pests in India is estimated approximately upto 25 per cent (31 million tons) of hypothetical production in absence of losses due to insect pests (124.1 million tons) worth Rs 164300 million (Dhaliwal et al, 2004). More than 100 insect pests are associated with the rice crop and 20 of these are pests of major economic significance. The major pests of rice are brown plant hoppers, white backed plant hoppers, green leaf hoppers, yellow stem borers, pale headed striped borers, pink stem borers, rice leaf folders, rice case worms, rice hispas, rice bugs, rice grass hoppers etc. Among them, the rice stem borers and leaf folders cause considerable damage to the rice crop. A number of chemicals like triazophos, monocrotophos, chloropyriphos, cartap hydrochloride, fipronil or phorate 10 G etc have been used indiscriminately against rice pests. The misuse and abuse during the last few decades caused wide spread damage to the environment and human health. In this circumstances, there is a growing need to promote eco friendly biological control methods against insect pests of crops. An effective biological control method used against rice stem borers (*Scirpophaga incertulas & S. innotata)* is the use of parasitoid. The majority of parasitoids belong to the orders hymenoptera and diptera. *Trichogramma*, the egg parasitoid under order hymenoptera parasitizes on eggs of more than 200 insect pests of rice, sugarcane and cotton. *T. chilonis* and *T. japonicum* are the two predominantly used species in India. The present work was conducted in the farmer's field with an aim to evaluate the performance of *T. japonicum*, in comparison to chloropyriphos and Azadirachtin against rice stem borer (*S. incertulas* and *S. innotata*).

Trichocards containing sterilized eggs of *T. japonicum* were taken from the State Bio Control Laboratory, Guwahati, Assam for this trial. The cards were used in the paddy field before emergence of the adult parasite. *T. japonicum* @ 50000/ha were released eight times at weekly interval starting from 30 days after transplanting of paddy. The release of *Trichogramma* was coincided with the egg laying period of rice stem borers. Each Trichocard were cut into 6 pieces and evenly kept over the entire field by fixing them to the inner side of the leaf of the plants by using stapler. Trichocard were stapled in the morning hours and just before emergence to avoid predation.

The experiment was conducted in the farmer's field of Bhawanipur Development Block of Barpeta district, Assam during 2010-11 and 2011-12 under Krishi Vigyan Kendra, Barpeta, to evaluate the effectiveness of *T. japonicum* for the management of rice stem borers. The results were compared with the application of chloropyriphos @ 2 ml/L and a botanical Azadirachtin @ 3 ml/L in winter paddy var. Ranjit. Four different plots with an area of 780 m^2 were used for four different treatments. The trial was replicated in the field of five farmers of Bhawanipur Development Block of Barpeta district.

The treatments of the on-farm trial were T_1: Eight releases of *T. japonicum* @50000/ha/week starting from one month after transplanting; $T_{2:}$ Two sprays of Chloropyriphos 20 EC one at vegetative and another at reproductive phase of the crop; T_3: Two sprays of Azadirachtin 5000 ppm @ 3 ml/L one at vegetative and another at reproductive phase of the crop. The observations were recorded by following standard method for stem borer (Anon., 2007). The per cent infestation was calculated by counting the number of dead hearts/white ears and total number of tiller/panicle from 10 randomly selected hills. The per cent incidence dead hearts/white ears was calculated as follows.

$$\text{Percent incidence} = \frac{\text{Number of dead hearts/white ears}}{\text{Total number of tillers/panicles}} \times 100$$

The results of the trial indicated that eight releases of *T. japonicum* and chloropyriphos can provide the same level of control against stem borers (Table 1). Manjunath (1991) also found that inundative release of *T. japonicum* at 50000 per ha during egg laying period of rice stem borer reduced borer damage and increase crop yield. Significantly higher control was achieved in *T. japonicum* released plots and chloropyriphos treated plot than the Azadirachtin

treated plot. Azadirachtin proved significantly superior to the untreated check. These findings are in agreement with the result of Kulagod *et al* (2011). There was no significant difference in the yield of rice in *Trichogramma* released and chloropyriphos sprayed fields but significant yield difference was observed between Azadirachtin sprayed plot and the former two treatments. Highest B:C ratio (2.47) was recorded in *Trichogramma* released plot followed by 2.33 in chloropyriphos treated plot.

Table 1: Field efficacy of bioagents, chemicals and botanicals for the management of rice stem borers*

Treatments	**% Dead heart**	**% White ear**	**Yield (q/ha)**	**B:C ratio**
Trichogramma japonicum	1.64[a]	2.35[a]	64.60[a]	2.47
Chloropyriphos 20 EC	2.22[a]	2.91[a]	63.84[a]	2.33
Azadirachtin 5000 ppm	4.00[b]	7.59[b]	58.32[b]	2.13
Control	7.24[c]	10.03[c]	47.94[c]	1.92
CD at 5%	**0.62**	**0.62**	**2.00**	

* Data pooled for two years

In India, 17-18% of total pesticide used in agriculture is applied in paddy field to manage the major pests. Indiscriminate use of agrochemicals in the field of agriculture led to the problems like development of insecticidal resistance, resurgence, residue in the food chain, degradation of ecosystem, human health and ill effect on beneficial micro biota. Chemical control of rice stem borer can be successfully substituted by timely releasing of *Trichogramma*, while reducing the cost of plant protection and minimizing the ecological hazard. Systematic inclusion of parasitoid, predators and biopesticides in IPM strategy would be the key method of management of insect pests for maintaining the productivity in sustainable manner.

References:

Anonymous, 2007. *Annu. Rep*., Dir. Rice Res., Hyderabad. pp: 2.59-2.60

Dhaliwal, G.S., Arora, R. and Dhawan, A.K. 2004. *Indian J. Ecol*. **31** (1): 1-7

Kulagod, S.D., Hegde, M., Nayak, G.V., Vastrad, A.S., Hugar, P.S., Basavanagoud, K. 2011. *Karnataka J. Agric. Sci*. **24** (2): 244-246.

Manjunath, T.M. 1991. *Indo-USSR Joint Workshop on Problems and Potentials of Biocontrol of Pests and Diseases*, June 26-28, 1990, Biological Control Centre, National Centre for Integrated Pest Management, Bangalore, India. pp. 31-56.