

Multiple insecticide tolerant strain of egg parasitoid *Trichogramma chilonis* for the management of fall armyworm *Spodoptera frugiperda* (MITS-FAW)



Larva of *Spodoptera frugiperda*

Technology Description

Fall armyworm, *S. frugiperda* is a serious invasive in the country. This highly polyphagous pest insatiably feed on maize and survives on more than 274 crop plants Worldwide. The sole dependency on chemical control increases the cases of fall armyworm resistance to insecticides and increases the risk to human health due to the insufficiency of appropriate safety measures.

Further, the high crop protection cost, and effect on the non-target organism and environmental contamination underpin the need to develop alternative and more compatible options such as use of biological control agents. The invasive pest species can cause a serious threat to agricultural production and the ecosystem in the absence of their specific natural enemies in the newly arrived country.

Trichogramma chilonis, is an egg parasitoid of lepidopteran pests in many crops including the invasive pest *Spodoptera frugiperda* in maize. The strain (MITS-FAW), is tolerant to multiple insecticides (Organo-phosphate, pyrethroids, oxadiazine & spinosyn) with a high resistance factor. Recently, the strain was further selected for resistance to field recommended dosage chlrolantriprole (18.5 % SC) (0.4 ml/ha), an insecticide which is recommended to be used the management of fall armyworm in maize. The strain was further submitted to Arthropod Germplasm Registration Committee and awarded Germplasm Acc. No. (NBAIL-MP-TRI-15).

Background

Agricultural productivity in India is affected largely by insect pests and diseases, which cause losses to the tune of 10-30%. Though there has been increasing awareness in India about the hazards of indiscriminate use of insecticides in agriculture, use of biological agents for pest management has not taken off in a big way due to the susceptibility of bioagents to abiotic and insecticides-induced stresses, though in a totally insecticide free environment, they have been reported to be effective to the tune of 50-60%. Hence, by developing multiple insecticide resistant strain of *T. chilonis* (MITS-FAW), which can be released against fall armyworm in combination with Chlorantraniliprole in maize and other crops.

Benefits /Utility

No such product is currently available in our country. The existing normal strain is not effective in insecticide affected fields, whereas multiple insecticide tolerant strain of *T. chilonis* had an enhanced level of resistance to different groups of insecticides viz., organophosphorus, synthetic pyrethroids, oxadiazine, and neonicotinoid. The MITS strain was further showed enhanced spectrum of resistance to chlorantraniliprole 18.5 % SC (0.4 ml/ha) to be used against fall armyworm *S. frugiperda* and showed high resistance (8.8 fold resistance) factor. The MITS-FAW strain had higher activity (4-5 fold) of detoxifying enzymes viz., glutathione S-transferase and carboxyesterase. At field recommended dose of chlorantraniliprole (0.4 ml/L), resistant population of *T. chilonis* parasitized around 44.0 % of FAW eggs as against mere 6.9 % parasitism by susceptible population. Therefore, the strain of *T. chilonis* (MITS-FAW) could be utilized against fall armyworm under chlorantraniliprole stressed crops as well as in normal conditions.

Scalability

The technology can be extended to any extent.

Business and commercial potential

A total of 27000 cc of *Corcyra* eggs can be obtained from rearing unit based on investment. Market rate per card is Rs. 100 therefore, revenue of Rs 27.0 lakh will be obtained in first year of operation of the unit. The unit will be in profit after 2nd year of operation and from third year unit will be in profit of Rs. 27.0 lakh / annum with all cost recovered. No toxicological data or registration is required for its commercialization.

Financial requirement

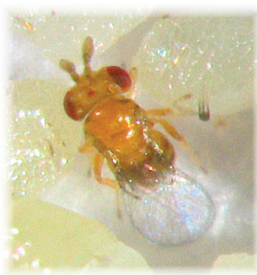
For coverage of 100 ha of cropped area, initially an investment of Rs. 18.0-20.0 lakh is required. The investment on rearing facility is one time only and all equipment and rearing boxes can be used for 10 years. The recurring cost for a year would be about Rs. 8.4 lakh/annum. A mass rearing unit consisting of rearing boxes, egg laying cages, refrigerator, table UV hood, vacuum unit, etc are required.

Economic analysis

The insecticides tolerant strain of *T. chilonis* is very effective in reducing the number of harmful pests and has great impact on growth of maize and generate employment.



Damaged maize crop by FAW



MITS of *T. chilonis* adult

Target Market/Customer

- Farmers
- Contract farming companies
- Farmer's federations/Groups
- Biocontrol producing companies

Social Impact of the Technology

- Trichogrammatids are safe biological control agents and are specific against insect pests
- It will reduce the cost of production by reducing cost on chemical insecticides.
- Cost-benefit ratio will be improved
- Unemployed youth can start small production units through NABARD support to meet the farmers demand