**Technology Description**

1. The strain *T. chilonis* is resistant to multiple insecticides (oc, op, sp, neonicotinoids, oxadiazine, spinosyn) with a high resistance factor of up to 3.00 - 76.46; therefore, can be used efficiently by farmers in insecticide stressed farm conditions (i.e., mainly on vegetable and paddy based ecosystems) to efficiently control lepidopteran pests.

2. *T. chilonis* is an egg parasitoid of lepidopteron pests. The strain is resistant to high temperature (up to 40°C), therefore, can be used efficiently by farmers in high temperature regions farm conditions (i.e. on vegetable/paddy and sugarcane based ecosystems) to efficiently control lepidopteran pests.

3. The strain of *C. zastrowi sillemi* (Multiple insecticides - oc, op and sp) is resistant to insecticides, therefore, can be used efficiently by farmers in insecticide stressed farm conditions (i.e., mainly on vegetable and paddy based ecosystems) to efficiently control lepidopteran pests.

**Background**

Agricultural productivity in India is affected largely by insect pests and diseases, which cause losses to the tune of 20-30%. 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 insecticide-induced stresses, perceived slow action, lack of timely availability, etc. Biocontrol agents are very susceptible to insecticides and abiotic 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 strains of *T. chilonis* (TESI Multiple insecticide resistant), *C. zastrowi sillemi* (PTSR) and temperature resistant

**Benefits / Utility**

The Multiple insecticide resistant and temperature resistant strains of *T. chilonis* and multiple insecticides resistant strain of *Chrysoperla zastrowi sillemi* can be used in insecticides and high temperature conditions.

**Country**

India. Already biocontrol agent manufacturers are having the scaled up technology. The intervention in this technology is the new stress tolerant isolates being introduced. Based on the fermentation facility available the quantum of production may be scaled up.

**Scalability**

![](Image)

Scale of production is 5 kg per batch which may be increased even up to 30 kg per batch

**Business and Commercial Potential**

Business Potential: No toxicological data or registration is required for its commercial use. Since these strains are multiple insecticides and high temperature resistant, these can be used field along with farmers practice and go well with IPM. These can be used in most of the crops like rice, maize, sugarcane, cotton, several vegetable and fruit crops.

Potential investors to this technical innovation: Producers of commercial bio control agents.

**Financials**

**Potential investors to this technical innovation:** Producers of commercial bio control agents.

**Country**

India

**Stage of development:** Ready for commercialization

**Patent status:** No

**Business Potential:** No toxicological data or registration is required for its commercial use. These strains are multiple insecticides and high temperature resistant, these can be used field along with farmers practice and go well with IPM. These can be used in most of the crops like rice, maize, sugarcane, cotton, several vegetable and fruit crops.

**Potential investors:** Producers of commercial bio control agents.

**Financials**

VALUE OF THE TECHNOLOGY: Project cost: Rs. 50 lakh for coverage of 15500 hectares per season, thus about in (including for production of Corcyra culture, egg of which are required for production these bioagents, building about 1200 sq ft area, rearing boxes and small equipments). Financial Required: for (50 batches in a year, each with 200 kg using 100L fermentor) Non-recurring: Rs. 40 lakh, Recurring: Rs. 10 Lakh. Working thus Rs. 120 lakhs return is possible. Economic analysis The insecticide and temperature resistant strains of *T. chilonis* and *C. zastrowi sillemi* are very effective in reducing the number of harmful pests and have great impact on growth of vegetables and commercial crop production and will generate employment. The analysis done for Kharif and Rabi seasons of 2011-2012 indicated Production of Multiple insecticide resistant strain of *T. chilonis* and *C. zastrowi sillemi*: Production of *Corcyra* for *Chrysoperla* to cover 100 acre and *Trichogramma* to cover 300 acre - 720 man days. Release at fields: *Chrysoperla* - 24 man days for 100 acre, *Trichogramma* - 48 man days for 300 acre. Pesticide tolerant *Trichogramma* and *Chrysoperla* tested in 400 acres. Cost of Cultivation with insecticides = 14000/acre. Cost of cultivation with bioagents = Rs. 9600/acre. Direct savings by farmers = Rs. 5400/acre, therefore savings for 400 acres = Rs. 21.60 lakh. The analysis done for Rabi seasons of 2013 indicated that insecticide application was 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 insecticide-induced stresses, perceived slow action, lack of timely availability, etc. Biocontrol agents are very susceptible to insecticides and abiotic 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 strains of *T. chilonis* (TESI Multiple insecticide resistant), *C. zastrowi sillemi* (PTSR) and temperature resistant

**Social impact of the technology**

- Individual Farmers
- Contract farming companies
- Farmer’s federations / Groups
- Unemployed youth can start small production units through NABARD support and help farming system and themselves

**Target Market / Customer**

**[Image]"