Isolation and evaluation of native biocontrol agents for management of Lepidoptera pests

Four split releases of *Trichogramma japonicum* @ 50,000 wasps/ha/release × four releases at weekly interval on the 32nd, 39th, 56th and 63rd day after transplanting of rice reduced the damages caused by YSB over control of 57.3 per cent dead heart and 44.7 per cent white ear in comparison with control (no wasp release). The grain yield of 16.9 per cent which about to be lost by YSB infestation was saved through split releases of *T. japonicum* (Fig. 1).

**Figure 1.** Mean per cent damage caused by rice yellow stem borer, as influenced by split release of *Trichogramma japonicum* during rainy season 2017 & 2018.

Out of 20 chemicals detected from yellow stem borer and its by-products and yellow stem borer damaged rice plant through GC-MS analyses, four chemicals belonging to carboxyl, alkane and saturated fatty acid [n-hexadecanoic acid (palmitic acid), tetradecane, octadecane, n-octadecanoic acid (stearic acid)] from female YSB hexane extract and three sesquiterpenoids (β pinene, α pinene, caryophyllene) from YSB damaged rice plant extracts, were detected in greater concentrations. In laboratory assays with the synthetic form of seven chemicals, three, n-hexadecanoic acid, n-octadecanoic acid and octadecane were promising in enhancing the parasitic activity of *T. japonicum* on YSB eggs from 26.4 to 92.6% at 200 ppm, 27.3 to 96.5% at 500 ppm and 23.6 to 82.8% at 500 ppm, respectively in contrast to untreated eggs (87.3% at 7th day after exposure) and hexane washed eggs (16.7% at 7th day after exposure) (Fig. 2, 3).
Figure 2. Percentage of parasitization by *Trichogramma japonicum* on eggs of yellow stem-borer (YSB), as influenced by hexane extracts of by-products of YSB

WB-YSBF: whole body extract of yellow stemborer female; Wing YSBF: wing scales extract of yellow stemborer female; Egg YSBF: Egg wash of yellow stemborer female; Untr Egg: Untreated Egg; Lar YSB: Larval extract of yellow stemborer; WB-YSBM: whole body extract of yellow stemborer male; Hex Egg: hexane treated Egg

DAE: Days after exposure

Figure 3. Percentage of parasitisation of *T. japonicum* on *Cocyra cephalonica*, as influenced by saturated hydrocarbons

n-hexa: n-hexadecanoic acid, n-Octa: n-octadecanoic acid, Tetra: tetradecane, a-pinene: alfa-pinene, Trico: tricosane, Hex wash: hexane washed egg, Untreat: untreated control, DAE: days after emergence

Application of octadecane @ 500 ppm (randomly 25 places/ha), 24 h later to each release of wasps @ 50,000 wasps/ha/release at weekly interval on 14th, 21st, 28th and 35th DAT recorded the dead heart and white ear of 5.75 and 0.7%, in contrast to *T. japonicum* alone (8.12% dead heart; 1.64% white ear; positive control) and untreated check (15.44% dead heart; 3.28% white ear; negative control), respectively which enhanced the parasitic activity from 15.35 to 16.46 per cent by reducing dead heart and white ear incidences (Fig. 4).
TJ + Octadecane: *Trichogramma japonicum* + Octadecane (500 ppm)
TJ alone: *T. japonicum* alone

Native biocontrol agents

A total of 18 districts of Chhattisgarh including Kanker, Durg, Raipur, Rajnandgaon, Ballod, Bametra, Balloda Bazar, Mungeli, Bilaspur, Korba, Koria, Surajpur, Balrampur, Sarguja, Dhamtari, Kondagaon, Baster and Narayanpur were surveyed during 2019-20 to collect native biocontrol agents. During the surveys, 14 eco-types of *Trichogramma* spp. and 12 isolates of *Bacillus thuringiensis* were recovered.

Mapping of genetic groups of *Bemisia tabaci* in India and their begomovirus transmission efficiency

- Standardized PCR protocol for characterisation of genetic groups of *Bemisia tabaci* distributed in India.
- Characterized and identified 10 genetic groups of *Bemisia tabaci* in south and central India.
- Developed whitefly map of Chhattisgarh depicting occurrence and distribution of various genetic groups of *Bemisia tabaci* in central and south India.
Host Plant Resistance

- Three and 16 pigeonpea lines were categorized as moderately resistant to Helicoverpa armigera and pod fly, respectively under field condition
- Identified three resistant mini core subsets of wheat to pink stem borer, Sesamia inferens in central India
- Identified 22 moderately tolerant mini-core accessions of Lathyrus to thrips
- Wheat varieties (HD2329, Agra local and WH147) were found resistant to pink stem borer
- Identified three resistant mini core subsets of wheat to pink stem borer, Sesamia inferens in central India.

Wheat Pink stem borer management

- Among nine districts of Chhattisgarh surveyed, maximum infestation of 10% was recorded at Kharora and minimum at Ambikapur (1-2%)
- High PSB infestation was recorded in late sown wheat crop than timely sown crop
- Soil application of diatomaceous clay @ 300 kg/ha enhances total phenols and defense enzymes viz., peroxidase, polyphenol oxidase, phenylalanine ammonia lyase and Beta1-3 glucanase), besides reducing the pink stem borer infestation in wheat
Nematology

Rice root-knot nematode, *Meloidogyne graminicola* was first reported by ICAR-NIBSM in Chhattisgarh.

**Important Publications**


