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Management of Defoliation of Teak Defoliator through the Release of the Indigenous Egg Parasitoid Trichogramma

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Abstract

The biological control approach also offers an environmentally friendly alternative to traditional chemical pesticides, reducing the need for harmful chemicals and supporting the development of more integrated and sustainable pest management strategies. This study presents compelling evidence that releasing the indigenous egg parasitoid *Trichogramma chilonis* at a rate of 1.25 lakh/ha effectively helped control the populations of major insect pest, *Hyblaea puera*, in both natural forest ecosystems and teak plantations. The release of *Trichogramma chilonis* notably reduced the severity of defoliation caused by this pest, as well as lowered larval infestation rates, which are known to adversely affect the health and productivity of teak trees.

***Key words*:** Biological control, Indigenous, Egg parasitoid, Teak defoliator, Defoliation

Effective management of insect pests, particularly *Hyblaea puera* is essential for the sustainable management of teak forests and for enhancing the economic value of teak timber. Traditional pest control methods, such as chemical pesticides, have often proven ineffective or unsustainable due to their negative environmental impacts and the development of pest resistance over time. As a result, there is a need for more ecologically balanced and sustainable pest management strategies. Biological control, which uses natural predators, parasitoids, and pathogens to regulate pest populations, is one such promising alternative to chemical control. It has been explored as an environmentally friendly approach to managing pests in teak forests [1-13]. Among the various natural enemies of teak pests, egg parasitoids like *Trichogramma* species have shown great promise in controlling pest populations. These parasitoids lay their eggs in the eggs of target pests, preventing them from hatching and further developing.

One of the most effective egg parasitoids for controlling teak pests is *Trichogramma chilonis*, a native species that targets the eggs of various insect pests, including those damaging teak trees. Research has shown that releasing *T. chilonis* in teak forests can significantly reduce the populations of key pests such as *Hyblaea puera*, effectively mitigating damage caused by these insects. By parasitizing the eggs of these pests, *T. chilonis* plays a critical role in reducing pest populations in an environmentally safe and effective manner.

However, despite promising results, the knowledge regarding the mass production and field application of *T. chilonis* remains limited. Most research has focused on laboratory rearing and the potential use of *T. chilonis* in biological control programs, with large-scale field applications not yet fully explored. Therefore, more systematic research is needed to develop methods for mass-producing *T. chilonis* in laboratories and releasing it on a large scale in teak plantations. This would facilitate the widespread adoption of *T. chilonis* in Integrated Pest Management (IPM) strategies for teak forests.

The use of *Trichogramma* species in an Integrated Insect Pest Management (IIPM) strategy offers a promising approach to controlling insect pests in teak forests. IIPM combines multiple pest control methods—biological control, cultural practices, and minimal chemical interventions—to manage pests in a sustainable and environmentally friendly manner. By incorporating biological control agents like *T. chilonis* into teak management programs, forest managers can reduce their reliance on chemical pesticides, promoting more sustainable pest control practices and healthier forest ecosystems.

MATERIALS AND METHODS

An Indigenous *Trichogramma* species, *Trichogramma chilonis* Nagaraja (Hymenoptera: Trichogrammatidae) was mass multiplied on stored grain pest as laboratory host, *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae) for preparation of IFB Tricho cards for field release. About 30 million parasitoids were produced in the insectary of this Institute, out of which about 25 million parasitoids of *Trichogramma chilonis* were utilized for field release, and five million were required for culture rotation and as the base population for mass multiplication.

At the release and control sites of both natural forests and plantations of teak, observations were taken on defoliation and skeletonization, caused by *Hyblaea*. The defoliation caused by

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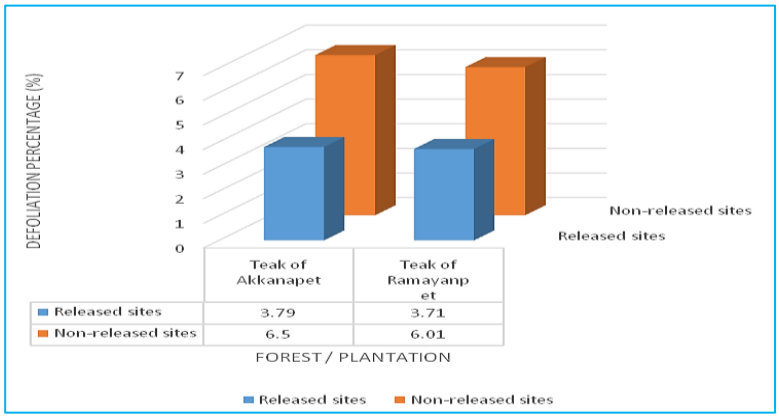
teak defoliator in 20 released plots and 20 non-released plots of natural teak forests and, 20 released plots and 20 non-released plots of teak plantations was measured randomly after the outbreak period of these pests. The data collected on assessment of defoliation caused by defoliator includes observation of 20 whole trees in a plot and 20 leaves of each tree, both in released and non-released plots of natural forests of teak and plantations of teak. The data collected on different parameters of infestation, such as defoliation and incidence in released and non-released sites were subjected to statistical analysis, Student's 't'-test [14] (Gosset, 1908) mentioned by Kumar and Verri [15] (2002), to find out the impact of biological control by *Trichogramma* against major insect pests of teak in natural forest and plantation.

Trichocard preparation, Entomology Lab. IFB, Hyderabad

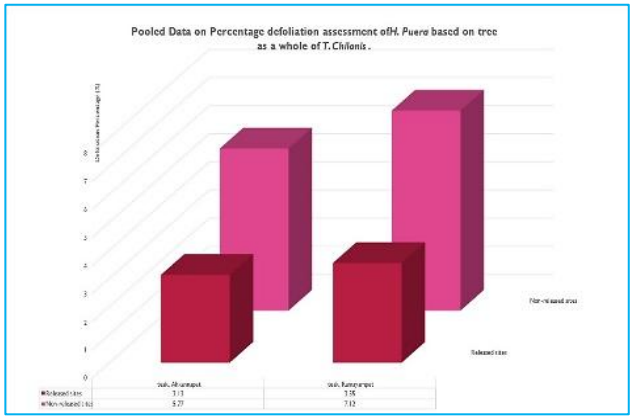
Techniques of release in field

RESULTS AND DISCUSSION

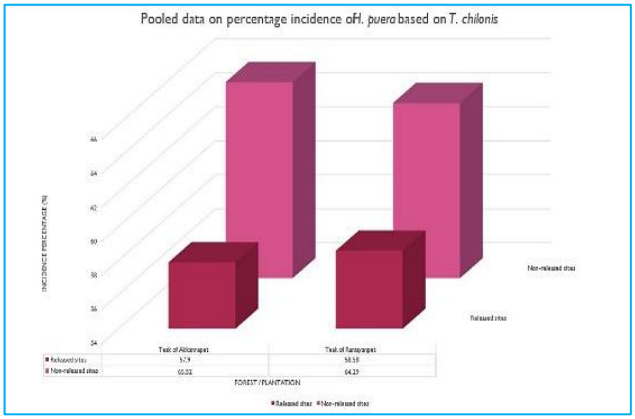
The release of the indigenous egg parasitoid *Trichogramma chilonis* at a rate of 1.25 lakh per hectare in both natural teak forests and plantations led to significant reductions in defoliation caused by the pest *Hyblaea puera*, compared to areas where no parasitoids were released. The data from both released and non-released sites show notable differences. For *H. puera*, defoliation assessments based on the entire tree showed considerable reductions at the sites where *T. chilonis* was released. These reductions were observed in both natural forests and plantations, with the release sites showing lower damage compared to non-released sites. The reduction in defoliation was evident in areas where the parasitoid was introduced. The difference of percentage defoliation based on tree as a whole and number of leaves of a tree and percentage incidence was recorded as 2.64% out of 5.77%, 2.71% out of 6.50%, and 7.62% out of 65.52% for natural forests of teak respectively and 3.57% out of 7.12%, 2.30% out of 6.01% and 5.71% out of 64.29% for plantations of teak respectively [16-18]. The release of *T. chilonis* proved to be an effective biocontrol measure in reducing defoliation caused by *H. puera* in both natural teak forests and plantations. The significant differences in defoliation rates between release and non-release sites highlight the parasitoid's impact in suppressing pest populations. These findings support the potential of *T. chilonis* as a sustainable and environmentally friendly approach to managing *H. puera*, contributing to healthier teak ecosystems.



Pooled data on percentage defoliation assessment of *Hyblaea puera* based on leaves of tree of *Trichogramma chilonis*



Pooled data on percentage defoliation of assessment of *Hyblaea puera* on tree as a whole of *Trichogramma chilonis*



Pooled data on percentage incidence of *Hyblaea puera* based on *Trichogramma chilonis*

CONCLUSION

The research on *Trichogramma* has significantly contributed to the development of more sustainable pest management strategies, especially in the context of integrated pest management (IPM) for pests like Teak defoliators. By reducing chemical pesticide use, promoting biodiversity, enhancing pest control efficiency, and offering a cost-effective solution, *Trichogramma* is an essential tool for modern agriculture. Research findings highlight its effectiveness in protecting crops, improving yields, and supporting environmentally friendly farming practices, making it an invaluable asset for sustainable pest management systems worldwide.

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