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Viviane Baharally
Entomologist, Guyana Rice Development Board, Rice Research Station, Burma, Mahaicony, Guyana

Mahendra Persaud
Chief Scientist/Plant Breeder, Guyana Rice Development Board, Rice Research Station, Burma, Mahaicony, Guyana

Mahendra Gobin
Research Assistants, Guyana Rice Development Board, Rice Research Station, Burma, Mahaicony, Guyana

Alana Peters
Research Assistants, Guyana Rice Development Board, Rice Research Station, Burma, Mahaicony, Guyana

Corresponding Author:
Viviane Baharally
Entomologist, Guyana Rice Development Board, Rice Research Station, Burma, Mahaicony, Guyana

Production of *Telenomus podisi* as a bioagent for inundative releases in Integrated Pest Management (IPM) rice fields against paddy bug (*Oebalus poecilus*) in Guyana

Viviane Baharally, Mahendra Persaud, Mahendra Gobin and Alana Peters

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Abstract
In Guyana, rice is produced on about 94,000 hectares twice a year with a production of approximately 810,000 metric tons in 2025. The quality of grains can be highly compromised by paddy bugs that have been plaguing rice fields season after season for decades. The main type of damage is pecky grains that result from paddy bug feeding on the developing rice grains. Conservation biocontrol has been a key recommendation since spraying an insecticide is only to be done based on threshold levels as found during intense monitoring. Among the bio-agents, is the paddy bug egg parasitoid, *Telenomus podisi*, which was targeted to be mass multiplied in the laboratory. This process was achieved by using a tritrophic level of interaction to rear and mass produce the telenomus. It is projected that this wasp will be released using an inundative approach to biological control. Growing the host plants in a staggered cycle to provide a continuous supply of milk/dough stage paddy; rearing the paddy bugs, *Oebalus poecilus*; and rearing the telenomus on freshly laid paddy bug eggs, form the basis of the methodology outlined in this publication.

Keywords: Biological control, *Telenomus*, *Oebalus poecilus*, paddy bug

Introduction

Rice, *Oryza sativa*, is grown on about 94,000 hectares in Guyana with two crops per year from November to April and May to October, respectively. The production averaged about 810,000 metric tons in 2025 (Newsroom, 2026), which accounted for approximately 1.2% of the Gross Domestic Product (Bureau of Statistics, 2026). However, a major challenge is the paddy bug, *Oebalus poecilus* (Dallas) that has been plaguing the rice fields season after season for decades. Damage was estimated to be as much as 19 million USD in a single crop (Stabroek News, 2024). Paddy bug damage occurs when the insects, both nymphs and adults, pierce and suck the developing rice grain. If the bugs pierce at the flowering stage, the grains abort themselves and remain sterile. When the bugs feed on the milky stage, all or some of the starchy endosperm is removed, while feeding at the dough and ripening stages cause pecky grains. As such, paddy bug feeding on the developing rice grain causes quantitative and qualitative losses. To minimise this damage, killing the bugs with an insecticide has been the main method of control.

At the earliest detection of bugs in or around rice fields, insecticides are sprayed to limit feeding time, as well as to prevent the bugs from reproducing and/or migrating. To reduce the dependence on insecticides, another aspect of the biological control program commenced with the rearing of *Telenomus podisi*, an egg parasitoid of the paddy bug. Prior, biological control of paddy bugs depended on natural existence of its predators and parasites; thus, conservation has been a key recommendation since spraying is only to be done based on threshold levels as found during intense monitoring. Among the bio-agents, the wasp egg parasitoid (*Telenomus podisi*) of paddy bugs, was targeted to be mass multiplied in the laboratory. This process was achieved by using a tritrophic level of interaction to produce the telenomus. It is projected that this wasp will be released using the inundative method of biological control. Growing the host plants in a staggered cycle to provide a continuous supply of milk/dough stage paddy; rearing the paddy bugs, *Oebalus poecilus*; and rearing the telenomus on freshly laid paddy bug eggs, form the basis of the methodology outlined in this publication as adopted from Heinrichs *et al* (1985) [3].

The facility

The biological control laboratory (Fig. 1) was constructed to accommodate a screen house and an insectary. Firstly, the screen house is used to grow staggering stages of the rice plant. It has eight (8) concrete soil beds that measure 10m x 3m x 0.5m each (length x width x depth, respectively). The soil beds are filled up leaving about 10cm to 15 cm space from the top. Rice plants grown in the screen house are protected from the harsh elements of the weather and damaging pests, so there is minimum reliance on the use of chemical pesticides.

Fig 1: Biological control laboratory - screenhouse (translucent roof) and insectary (galvanized roof)

Secondly, the insectary was equally divided into two sections. Section one is used for preparing seedling trays, storage of materials, and for housing field collected paddy bugs prior to placing them into the rearing cages. Section two is used for rearing the paddy bugs in cages.

Growing food plants in concrete soil beds

Each soil bed is transplanted with 15-day old seedlings at a spacing of 15cm between rows and 10cm between hills/plants, with 3 seedlings per hill. The staggered cycle of host plants was created by transplanting each soil bed at 15-day intervals. This cycle provided milk/dough stage paddy for 10 to 14 days before the succeeding soil bed comes into the flowering stage, thus giving a continuous supply of food for the paddy bugs (Fig. 2). The variety grown is GRDB 16 which is early maturing (110-112 days), semi-dwarf in stature (110 cm), tolerant to lodging, and resistant to blast. All crop husbandry, soil and water management as recommended by the package of practices for GRDB 16 were carried out (GRDB). Monitoring for insect pests and diseases was done daily. Any pest found was removed manually and/or an insecticide was applied for symptoms of early and mid-season pests but not beyond 60 days after transplanting, while a fungicide was applied as soon as symptoms appeared.

Fig 2: Concrete soil beds with staggered cycle of host plants

Rearing the paddy bugs

Paddy bug rearing cages are of three categories for field collected bugs, mass multiplication of bugs at varying growth stages, and oviposition, respectively (Fig. 3).

Fig 3: Paddy bug rearing cages

Fig 4: Field collected adult paddy bug kept overnight in isolation

Adult paddy bugs were collected from the field and kept overnight in a cage outside of the rearing area (Fig. 4). Isolating the field collected bugs prior to use was necessary for preventing paddy bugs infected with an entomopathogen from contaminating the rearing area or cages; for allowing only the strong healthy bugs to be transferred to the rearing cages; and minimizing mortality.

Transferring adult paddy bugs the following day was done using a 30 ml test tube. The bugs, a few hundred at a time, were guided into the test tube gently, without squeezing them during this process; then tapped into the mass multiplication cages. In the mass multiplication cages, these paddy bugs were fed with rice panicles in the milk/dough stages and left to multiply. As such, all stages of paddy bugs can be found in these cages (Fig. 5). Milk stage panicles were supplied systematically, that is Mondays, Wednesdays and Fridays, to ensure that the bugs fed *ad lib*. At the same time, the panicles should not wither but remain in its natural state for as long as its contents are not depleted.

Fig 5: All stages of paddy bugs feeding *ad lib* in mass multiplication cage

To supply the oviposition cages, nymphs with wing pads were guided similarly into a test tube and tapped directly onto rice panicles that are in the milk/dough stage. Tapping the bugs onto the panicles allowed them direct access to the food source, which prevented them from roaming away and dying from starvation. Each batch in an oviposition cage presumably was around the same age. These bugs turned into adults around the same time, mated and egg masses became available. The egg masses from the oviposition cages were collected and exposed to the telenomus for parasitism.

Rearing of *Telenomus*

The culture of telenomus is maintained in a separate biocontrol room about 250 meters away from the insectary. Although telenomus is known to have good searchability for finding its host eggs (Silva *et al*, 2006) [5], this short distance is interrupted by the wind, several residential buildings and trees that disrupt any cue that might escape from the greenhouse or insectary.

The telenomus culture was also established with field collected parasitized paddy bug eggs, which were kept in test tubes until hatched. Once hatched, these adults were transferred to the telenomus oviposition chambers (Fig. 6) and fed with sucrose solution 1:1, that is one-part sugar to one-part distilled water soaked on cotton balls (Fig. 6). The sugary cotton balls are refreshed once daily. The wasps can live up to seven (7) weeks; however, a cycle of these parasitoids was created by placing host eggs weekly to keep the wasp culture alive.

Fig 6: Telenomus oviposition chamber (left) and wasps feeding on sugary cotton balls (right)

To maintain this wasp culture, paddy bug egg masses laid within 24 hours and have a fresh green appearance were collected and placed in the telenomus oviposition chambers. Parasitism was completed within 12 hours. The parasitized eggs were left until hatched, then the empty egg masses were removed, along with any dead wasp. This process continued weekly so the wasp population in the chamber remained constant. Further multiplication of the telenomus was achieved by placing additional egg masses that were removed after 24 hours and kept in test tubes where they hatched, and these wasps were used for research purposes. Below is the process of host egg development when parasitized or not (Fig. 7).

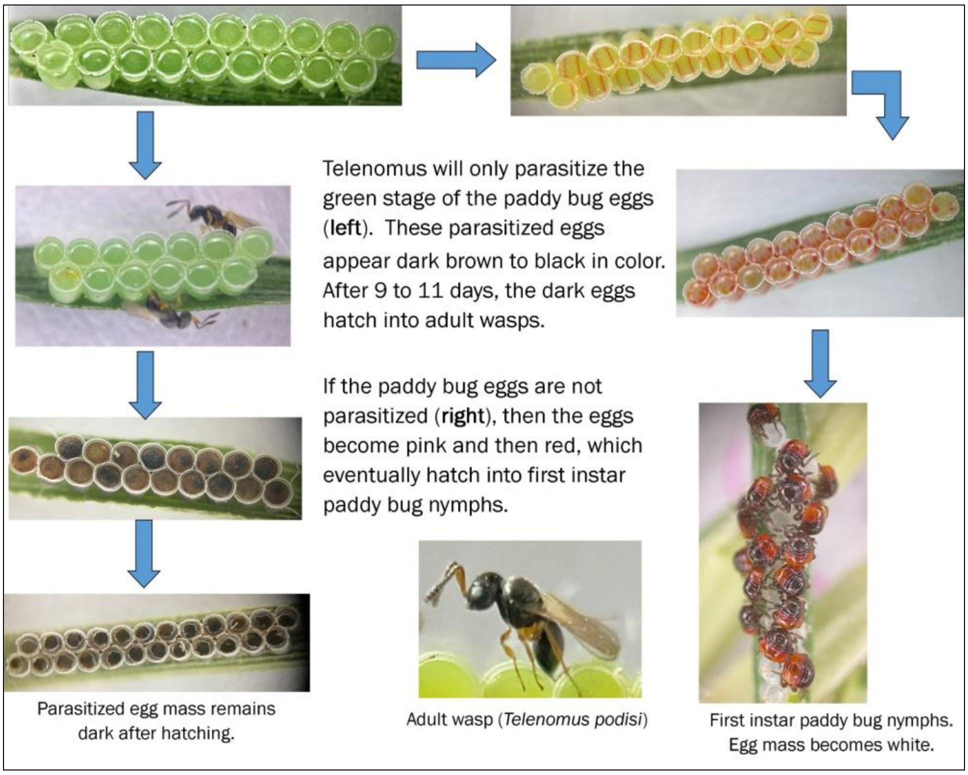

Fig 7: Process of host (paddy bug) egg development when parasitized or not

In Figure 7, the telenomus laid its egg inside the egg of the paddy bug, where it hatched and developed into an adult before the wasps emerged from the paddy bug eggs. Unparasitized paddy bug eggs changed from green to pink then red in 3 to 5 days and hatched into first instar paddy bugs; while telenomus parasitized eggs changed from green to black in 5 to 7 days and emerged as adult telenomus in 9 to 11 days.

This method of mass producing the telenomus will be further established for inundative releases in Integrated Pest Management (IPM) rice fields. Releases are earmarked to be done weekly for six weeks during the period of paddy bug invasions and susceptibility of the rice plants to paddy bug damage. This will enhance the telenomus population in rice fields and limit the number of next generation paddy bugs.

In other studies, to gain knowledge on the host to wasp interaction, which were the paddy bug and telenomus, respectively, it was observed that sterile paddy bug eggs were not parasitized by the telenomus. These sterile eggs remained green even after the parasitized eggs hatched (Fig. 8). Another critical observation was that the telenomus did not parasitize eggs that were older than 24hrs. Paddy bug eggs that were older than 24hrs turned from green to pink, which indicated that the freshly laid green eggs were preferred by the parasitoid. This preference by the wasp limits parasitism to the time when the paddy bugs are laying eggs. Therefore, inundative releases will enhance this process in the natural environment.

Fig 8: Sterile paddy bug eggs remain green and unparasitized

Further research is geared for field releases in rice fields where IPM is practiced, and the surrounding habitat is enhanced to promote survivability of the telenomus. Secondly, to evaluate its impact by comparing the percentage of parasitized paddy bug egg masses in subsequent seasons. Thirdly, to have a constant supply of parasitized eggs, which will be stored in a Biological Oxygen Demand incubator (BOD). These eggs will be used for field releases on demand.

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References

1. Bureau of Statistics. Contribution to Gross Domestic Product Guyana 2012 to 2025. 2026. https://statisticsguyana.gov.gy/subjects/national-accounts-and-production/contribution-gross-domestic-product-guyana-2012-to-2025/
2. Guyana Rice Development Board. Management Guidelines for the Cultivation of GRDB 16. Booklet. 2020.
3. Heinrichs E, Medrano FG, Rapusas HR. Genetic Evaluation for Insect Resistance in Rice. International Rice Research Institute; 1985. p. 285-293.
4. Newsroom. Another record-breaking rice harvest as production surpasses 800,000 tonnes. 2026. https://newsroom.gy/2026/05/14/another-record-breaking-rice-harvest-as-production-surpasses-800000-tonnes/
5. Silva CC, Moraes MCB, Laumann RA, Borges M. Sensory response of the egg parasitoid *Telenomus podisi* to stimuli from the bug *Euschistus heros*. Pesq Agropec Bras. 2006;41(7):1093-1098.
6. Stabroek News. GRDB estimates paddy bug losses this year at $4B. 2024. https://www.stabroeknews.com/2024/09/10/news/guyana/grdb-estimates-paddy-bug-losses-this-year-at-4b/