

Efficiency of a natural biocontrol agent for brown planthopper

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Natural enemies play a primary role in the control of the brown planthopper (BPH) *Nilaparvata lugens* (Stål). We describe here aspects of the behavior of

Laccotrephes griseus (Hemiptera: Nepidae), a BPH predator that has been little studied.

Adult *L. griseus* were collected from freshwater and maintained in the laboratory. Prey-predator interaction was determined on individual rice plants in pots, each covered with a 45- × 10-cm cylinder of cellophane paper. Fifth-instar *N. lugens* nymphs and adults were introduced using an aspirator at densities of 5, 10, or 20 per pot. The experiment was not disturbed for an hour. The

number of prey killed by the predator was then recorded. Five trials were conducted.

L. griseus was an active predator during the day and at night. Both male and female predators consumed all prey types offered. In general, the number of prey consumed increased with density (see table).

L. griseus is commonly found in freshwater bodies. When present in large numbers, the predator is a potent biocontrol agent. ■

Number of *N. lugens* killed by predator *L. griseus* per hour.

| Developmental stage | Morphotype | Prey sex | Male predator | | | | | | Female predator | | | | | | |
|---------------------|---------------|----------|---------------|------|------|--------------|------|------|-----------------|------|------|--------------|------|------|------|
| | | | Day | | | Night | | | Day | | | Night | | | |
| | | | Prey density | | | Prey density | | | Prey density | | | Prey density | | | |
| | | | 5 | 10 | 20 | 5 | 10 | 20 | 5 | 10 | 20 | 5 | 10 | 20 | |
| Nymph | | | \bar{X} | 0.20 | 0.60 | 1.00 | 0.40 | 0.40 | 0.80 | 0.20 | 0.20 | 0.60 | 0.00 | 0.20 | 0.40 |
| | | | SD = | 0.40 | 0.49 | 0.63 | 0.49 | 0.80 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.49 | 0.00 |
| Adult | Brachypterous | Male | \bar{X} | 0.40 | 1.00 | 0.80 | 0.20 | 0.40 | 0.80 | 0.40 | 0.60 | 0.60 | 0.20 | 0.40 | 0.60 |
| | | SD = | 0.49 | 0.63 | 0.75 | 0.40 | 0.49 | 0.40 | 0.49 | 0.49 | 0.80 | 0.40 | 0.49 | 0.40 | 0.49 |
| | | Female | \bar{X} | 1.00 | 1.40 | 2.00 | 0.80 | 1.20 | 1.80 | 0.40 | 1.00 | 1.60 | 0.40 | 1.00 | 1.40 |
| | SD = | 0.89 | 0.49 | 0.00 | 0.75 | 0.75 | 0.75 | 0.49 | 0.63 | 0.49 | 0.49 | 0.49 | 0.00 | 0.49 | |
| | Macropterous | Male | \bar{X} | 0.40 | 0.60 | 0.40 | 0.20 | 0.40 | 0.60 | 0.20 | 0.20 | 0.40 | 0.00 | 0.20 | 0.40 |
| SD = | | 0.49 | 0.49 | 0.49 | 0.49 | 0.40 | 0.40 | 0.40 | 0.40 | 0.49 | 0.49 | 0.49 | 0.00 | 0.40 | 0.49 |
| | | Female | \bar{X} | 0.60 | 0.80 | 0.80 | 0.40 | 0.80 | 1.00 | 0.20 | 0.40 | 0.60 | 0.20 | 0.40 | 0.60 |
| | | SD = | 0.49 | 0.75 | 0.40 | 0.49 | 0.40 | 0.63 | 0.40 | 0.49 | 0.49 | 0.40 | 0.49 | 0.49 | |

Integrated pest management—other pests

Rice stem nematode *Ditylenchus angustus* development and survival

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The plant parasitic nematode *Ditylenchus angustus* is an important pest of both deepwater and lowland rice. A research program, funded by the Levelhulme Trust, has been undertaken to investigate the population dynamics, development, and survival of *D. angustus* under controlled experimental conditions. Infectivity studies demonstrated that third (J3) and fourth (J4)- stage juveniles and adults were able to infect IR36 rice

seedlings in pot cultures kept under lowland growing conditions. Second-stage juveniles (J2) molt rapidly to J3. It may only be J3, J4, and adults that invade.

Quantitative extraction and viability determination of *D. angustus* eggs are difficult to achieve accurately. However, eggs of *D. angustus* hatch readily once J2 development is complete, so accurate assessment of population dynamics is more appropriately done at active, hatched stages. Four months after a suspension of *D. angustus* from a diseased plant was inoculated onto 2-wk-old rice seedlings, the population increased tenfold. No marked variation, however, occurred in the percentage of stages from the original inoculum, with J4 accounting

for 56-64% of the population. Few nematodes were found in the folded leaves of the rice plants. No one specific life cycle stage accumulated as the plant senesced, although J4 always predominated (Fig. 1). With increasing host plant age, the nematodes were found in large numbers at the top of the stems, in the panicles, and frequently accumulated on the seeds. In heavy infestations, nematodes aggregated to form a cotton wool-like mass on empty seeds or in partially emerged panicles enclosed by folded leaves. The analysis of stages present in freshly harvested seeds showed that between 49 and 72% of the nematodes extracted were J4.

The desiccation survival of J3, J4, and adults was examined at different relative