Technique for evaluating rice pest predators in the laboratory

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Field evaluation of rice pest predators often involves indirect assessment. The simplest method is correlation of numbers of prey found with numbers of predators present. A significant correlation implies that the predators are important.

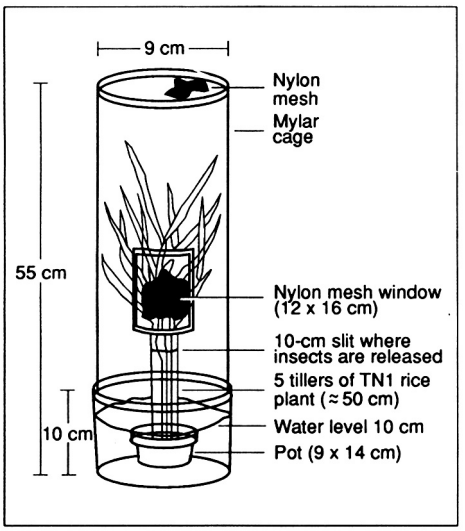
Techniques of field manipulation also have been found useful. Addition methods involve before-and-after comparisons: plots colonized by predators are compared with plots not colonized. Exclusion methods involve eliminating and excluding predators, mechanically or by using selective insecticides.

Direct assessments of predators are difficult. Counts are possible when predators leave carcasses of their prey, as do spiders, hunting wasps, and water striders. But counts do not provide good estimates for assessing the predators' role in pest control.

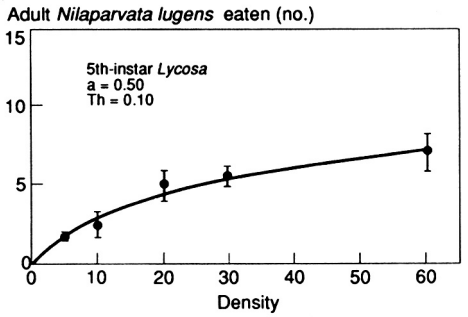
Laboratory evaluation provides more precise assessments of a predator's role as it changes with prey density. Such experiments often lead to estimates of searching efficiencies, handling times, interference between predators, and predator dispersion.

We use a standard experimental arena. A 35-d-old TN1 rice plant in a pot is trimmed to four tillers and placed in a 1/2-gallon ice cream container with 10-cm water. Each pot is enclosed in a mylar cage (19-cm diam, 55-cm high) with a 12- × 16-cm window at the top covered by nylon mesh (Fig. 1).

Prey used in all experiments are obtained in the appropriate stage from IRRI's insect culture. Experimental predators are subjected to standard pre-experimental conditions. □



1. Experimental arena for estimating predation rates.



2. Functional response of *L.pseudoannulata* to BPH density. (F value = 243, p , 0.01)

For example, in an experiment using wolf spiders, 1-d-old female spiders are starved for 3 d before release inside cages containing hopper prey. Spiders are caged with a range of brown planthopper (BPH) densities (5, 10, 20, 30, and 60). Number of BPH attacked within 24 h are plotted for 2-3 d against number of BPH initially offered (Fig. 2) and fitted to the following Random Predator Model:

$$N_a = N(1 - \exp(-TaP/(1 + aT_bN)))$$

where N_a is number of BPH attacked, N is BPH density, P is spider density (= 1 in this experiment), T is total search time (= 1 for a 24-h experiment), a is attack rate of spider, and T_b is handling time (time spent by the spider not searching). This model is essentially derived from Holling's Type II functional response.

Estimates of a and T_h may be obtained using a standard nonlinear least squares technique, available in the NLIN procedure of SAS. Parameter estimates and the statistics are shown in Figure 2. □

Infectivity of tungro-viruliferous leafhoppers confined with seedlings in cages

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We transplanted 369 2-wk-old seedlings of IR50 and TN1 (1 seedling/hill, 20- × 20-cm spacing) in two separate cages in a screenhouse. At 30 d after transplanting, 738 adult green leafhoppers (GLH) *Nephotettix virescens* that had previously fed for 3 d on TN1 plants infected with both rice tungro bacilliform virus (RTBV) and rice tungro spherical virus (RTSV) were released uniformly in the four corners of each cage.

After 24 h, 80-90 leafhoppers were collected from each cage and individually confined for 1 d on TNl seedlings in test tubes, for inoculation feeding. Similar leafhopper collection and infectivity tests were done daily for 5 d. Then the cages were sprayed with insecticide cypermethrin 5 EC. One month after GLH release, all plants in the cages and plants inoculated in test tubes were tested by ELISA for the presence of RTBV and RTSV.

In a separate treatment, GLH adults that had fed on RTBV- and RTSV-infected TN1 source plants in the cages were allowed serial daily inoculation access feeding on TN1 or IR50 seed-