Regression analysis showed that GLH density (1n y+ 1) was positively related to the inverse of distance in both cultivars. The relationship within time was negative in IR29 but positive in IR1917 (see table). At 75 h after release, 358 (28.6%) marked GLH were counted on the source plant in IR1917; only 20 (1.6%) were counted in IR29.

Leafhoppers tend to make less plant-to-plant movements on susceptible rice. Antixenosis may stimulate dispersal on resistant rice, but higher mortality rates may suppress the number of dispersing insects. □

Best-fit regression equations relating GLH density/hill (y) to time after release in hours (x_1) and distance from source in hills (x_2), IRRI, 1982 wet season. Numbers in parentheses are *t* -values of regression coefficients. [a]

Cultivar	Model	df	*F* value	R^2
IR29	$1n(y+1) = -0.026 - 0.003x_1 + 1.153(1/x_2)$ (–0.8 ns) (–4.1**) (23.2**)	2,435	276.9**	0.56**
IR1917	$1n(y+1) = -0.129 + 0.002x_1 + 1.838(1/x_2)$ (–3.7**) (2.4*) (25.3**)	2,451	322.3**	0.59**

[a] ns = not significant, * = 0.01 <p<0.05, ** = p <0.01

Effect of neem seed and leaf bitters on oviposition and development of green leafhopper (GLH) and brown planthopper (BPH)

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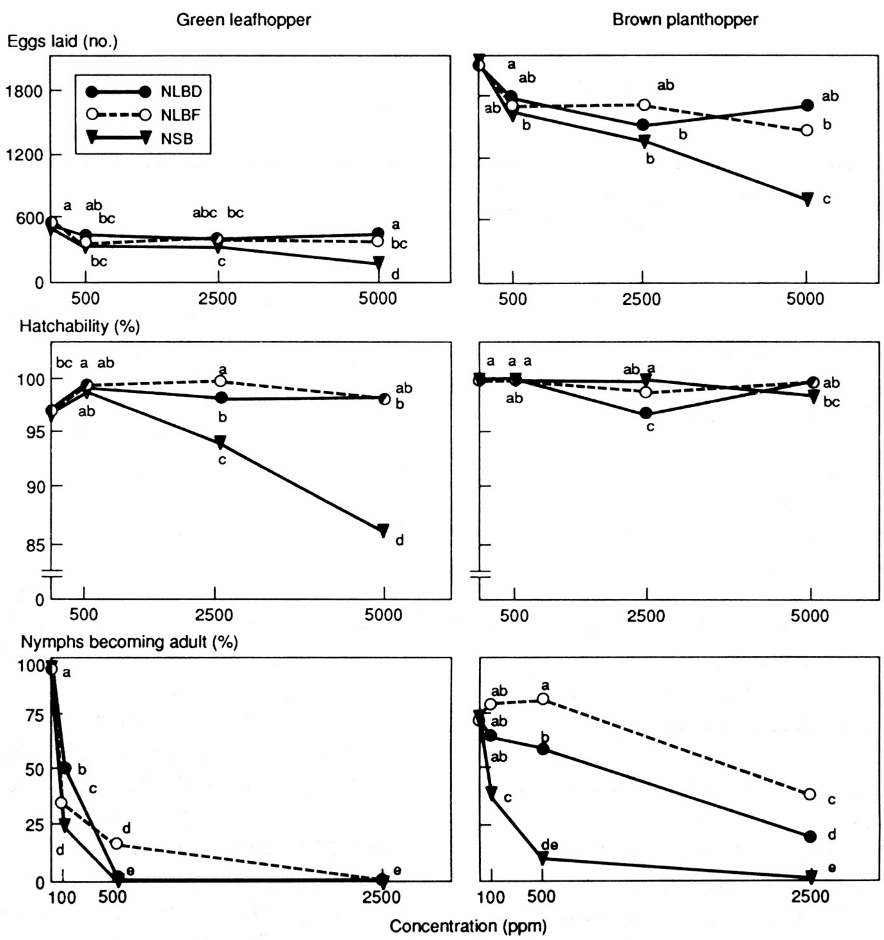
Neem seed bitters (NSB) have shown promise for controlling rice leafhoppers and planthoppers. Neem leaves could also be a source of bitters principals (NLB). We compared the effect of NLB and NSB on oviposition and development of GLH *Nephotettix virescens* and BPH *Nilaparvata lugens* pests.

NLB were extracted from fresh or dried ground leaves; NSB were extracted from crushed kernels using water as a solvent, followed by lyophilization. TN1 rice plants (10 tillers/l2-cm-diam pot) were sprayed at 30 d with aqueous solutions of NLB from fresh and from dried leaves and NSB at 500, 2,500, and 5,000 ppm, using an ultralow-volume applicator. Control plants were sprayed with water. The experiment was set up in a randomized complete block design with five replications.

Caged plants were infested with five pairs of newly emerged GLH or BPH males and females. Insects were removed after 5 d and caged plants were kept at 27 ± 1°C and 70 ± 5% relative humidity for nymph emergence. Nymphs were counted daily. Plants were dissected and unhatched eggs counted. Total viable and unhatched eggs represented number of eggs laid.

In another trial, roots of 7-d-old TN1 rice seedlings were dipped for 12 h in 100, 500, or 2,500 ppm solutions of NLB or NSB. Each seedling was transferred to a test tube (1.6 by 12.5 cm) with about 2 ml water and infested with a 1st-instar GLH or BPH nymph. Treatments were replicated 10 times.



Comparison of GLH and BPH eggs laid, eggs hatched, and nymphs that developed to adult stage on rice plants treated with a solution of neem seed bitters (NSB), or bitters from dried (NLBD) or fresh leaves (NLBF), IRRI, 1988. Mean separation at each concentration by DMRT at 5% level. In each box, means at each concentration followed by the same letter are not significantly different.

Percentage of nymphs becoming adults and the developmental period were recorded.

Neem treatment significantly reduced GLH and BPH egg laying, and nymph emergence and development (see figure). Fewer eggs were laid on plants sprayed with NSB at 5,000 ppm. No GLH nymphs became adults on seedlings treated with either NSB or NLB extracted from dried leaves at 500 ppm; 16% of the nymphs developed on seedlings treated with NLB extracted from fresh leaves at 500 ppm. Development on seedlings treated with NLB from dried and from fresh leaves at 2,500 ppm was completely suppressed.

BPH development was reduced to 20% with 2,500 ppm NLB from dried leaves and to 39% with NLB from fresh leeaves. No BPH nymphs developed on seedlings treated with 2,500 ppm NSB. □

Color morphism of rice swarming armyworm larvae

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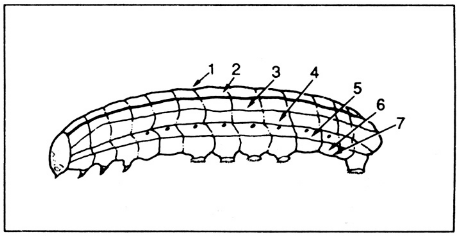
Identification of *Spodoptera mauritia acronyctoides* (Gueneé) larvae collected in the field is often difficult, because of color variations. We reared newly hatched larvae individually to the last instar on 35-d-old TN1 rice. The insects were kept at an average 28 °C temperature and 80% relative humidity.

Color patterns on seven abdominal areas−three dorsal (median, subdorsal, dorsolateral) and four lateral (laterodorsal, midlateral, laterobasal, basal) M were recorded daily (see figure).



Lateral view of *S. m. acronyctoides* larva: dorsum (1) median, (2) subdorsal, (3) dorsolateral; lateral (4) midlateral, (5) laterodosal. (6) laterobasal, and (7) basal. IRRI, 1989.

Bodies of 1st- and 2d-instar larvae were green. However, the 2d-instar larvae had a reddish violet posterior half laterodorsal and whitish laterobasal.

Third-instar larvae exhibited four color morphs. The first was yellow-green with brownish violet laterodorsal and pinkish laterobasal. The other color morphs were a combination of green, dull brown, brownish violet, and brownish green. Laterodorsal and laterobasal color bands were the most stable in the four color morphs observed. Traces of subdorsal black semilunar spots were already discernible on color morphs II and III.

Five color morphs were exhibited by 4th- and 5th-instar larvae (see table). Black semilunar spots were, prominent subdorsally on the firs three color morphs but were replaced by a thin black line on the fourth color morph. The prominent broad, semilunar spots with black laterodorsal band in mature 5th-instar larvae were the most important distinguishing character of *S. m. acronyctoides* larvae. Color morph III was the most dominant. □

Color polymorphism in the 4th and 5th larval instars of *Spodoptera mauritia acronyctoides.* **IRRI greenhouse, Jun-Jul 1988.**

Abdominal region	Color morph				
	I	II	III	IV	V
Dorsum					
Median	Grayish brown	Dull brown	Dull brown	Tinged pink and violet	Tinged pink and violet
Subdorsal	Very black sublunar spots	Dirty brown with black lunar spots	Dirty brown with black lunar spots	Greenish with thin black line beneath	Dark green with 4 black lunar spots on 1/3 of body anteriorly
Dorsolateral	Light grayish brown	Dull green	Dull brown	Dull green	Dull green
Lateral					
Midlateral	Dark grayish brown, light beneath grayish brown	Dark green and beneath is dull green line	Tinged green and brown	Greenish	Dark green and dull green beneath
Laterodorsal	Black	Black	Black	Black	Black
Laterobasal	Grayish brown	Dull brown	Dull brown	Dark pinkish violet	Dark pinkish violet
Basal	Dark greenish	Dull greenish	Brownish green	Greenish	Dark green
n	36	71	175	35	23