Electronically recorded feeding events of 16 tungro-viruliferous GLH adult females that transmitted or failed to transmit RTBV and RTSV during 10 serial inoculation feedings of 11 min each on 7-d-old TN1 seedlings.[a] IRRI, 1989.

Leaf-hopper number	Feedings (no.) in which GLH transmitted or failed to transmit viruses	Viruses transmitted	Probes (no.) Range	Probes (no.) Average	Salivation (min) Range	Salivation (min) Average	Xylem feeding (min) Range	Xylem feeding (min) Average	Phloem feeding (min) Range	Phloem feeding (min) Average
1	1	RTBV	-	2	-	1.0	-	0.7	-	9.9
	5	None	3-10	6.4	3.1-4.4	3.8	1.3-4.3	2.3	1.1-6.6	3.4
2	1	RTBV	-	1	-	0.8	-	0.4	-	9.4
	9	None	2-9	5.2	0.9-4.8	2.5	0.4-3.4	1.8	1.3-7.3	4.7
3	1	RTBV+ RTSV	-	1	-	0.3	-	0	-	10.8
	9	None	1-9	4.7	0.6-5.1	2.9	0- 9.7	3.8	0-8.8	3.9
4	1	RTBV + RTSV	-	5	-	3.7	-	6.7	-	0.5
	9	None	1-6	3.1	1.4-3.2	2.4	0- 9.2	4.3	0-9.7	4.1
5	1	RTBV	-	1	-	1.4	-	0.3	-	8.9
	9	None	1-6	3	0.9-8.8	2.8	0- 8.9	2.3	0.8-9.8	5.7
6-10[b]	10	None	1-14	4	0.5-8.8	2.3	0- 8.1	3.2	0-9.2	3.9
11-16[c]	10	None	1-14	4	0.1-8.6	3.1	0-10.9	2.8	0-9.4	3.9
GLH that transmitted viruses in 10 serial feedings										
Feedings with successful transmission			1-5	2	0.3-3.7	1.5	0- 6.7	1.6	5-10.8	7.9
Feedings with unsuccessful transmission			1-10	4.5	0.6-8.8	2.9	0- 9.7	2.9	0- 9.8	4.4
GLH that did not transmit viruses in 10 serial feedings			1-14	4	1-8.8	3.0	0-10.9	3.0	0- 9.4	3.9

[a] After the feeding, leafhoppers were individually given overnight inoculation access feeding on TN1 seedlings. [b] GLH that transmitted the viruses in overnight inoculation feeding but failed to transmit in 10 serial inoculation feedings. [c] GLH that did not transmit the viruses both in the overnight and in the 10 serial inoculation feedings.

from the phloem for about 9 min. Some nontransmitters also fed from the phloem for about 9 min in one or two feedings. There were no significant differences among the five virus transmitters in feeding events, except in number of probes between successful and unsuccessful feedings.

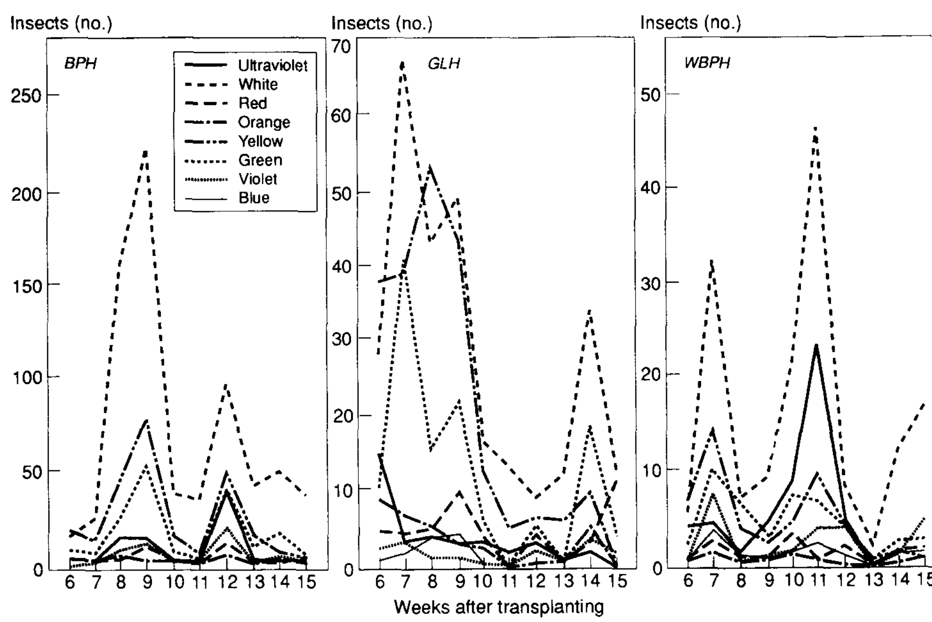
Transmission of the viruses by GLH appears to be associated with phloem feeding. The minimum phloem feeding period required for virus transmission was 0.5 min. □

Attraction of rice leafhoppers and planthoppers to different light colors

M. L. P. Abenes and Z. R. Khan, ICIPE-IRRI Project, IRRI

Many rice insect pests are phototrophic, and rice entomologists have used this characteristic to sample insect populations. However, insects differ in their responses to different colors of light. We experimented to identify which colors are most attractive to leafhoppers and planthoppers.

Traps with different colors of lights were set up 15 m apart in a 2,500-m^2 irrigated ricefield in Calauan, Laguna, Philippines, in 1988 wet season. Colors used were ultraviolet, violet, blue, green, yellow, orange, red, and white.



Average weekly catches of rice leafhopper and planthoppers in traps using lights of different colors. IRRI, 1988.

To minimize the effect of neighboring colors on insect catches, the traps were repositioned weekly in a randomized scheme. Traps were operated each night from 5 wk after transplanting to harvest.

Insects collected in the water pan below the light bulb were preserved in 70% ethyl alcohol. Brown planthopper (BPH), whitebacked planthopper (WBPH), and green leafhopper (GLH) were identified and counted in the laboratory.

White light attracted significantly more BPH, WBPH, and GLH (see figure). Yellow light was the second most efficient attractant (see table). Green and ultraviolet light moderately attracted; violet, blue, red, and orange light attracted the fewest insects. ☐

Leafhoppers and planthoppers caught in traps with different colors of light IRRI, 1988 wet season.

Color	Insects/trap per night[a] (no.)		
	BPH	WBPH	GLH
Ultraviolet	10.0 d	5.5 b	3.7 de
Violet	6.3 e	2.7 c	1.8 e
Blue	4.6 ef	1.3 cd	2.2 de
Green	18.9 c	4.5 b	12.5 c
Yellow	25.2 b	4.8 b	21.3 b
Orange	3.1 f	0.8 d	3.4 de
Red	4.5 ef	1.4 cd	4.6 d
White	72.1 a	16.2 a	28.3 a

[a] Av catches over 10 wk. Means followed by a common letter are not significantly different at the 5% level by DMRT.

Integrated pest management—other pests

Management practices to control golden apple snail *Pomacea canaliculata* Lamarck damage in transplanted rice

I. Watanabe and W. Ventura, Soil Microbiology Department, IRRI

The freshwater snail *Pomacea canaliculata* (Lamarck), better known as the golden apple snail, was introduced into the Philippines in 1982, as a source of human food. It is now a major pest of rice.

Molluscicides in the market are costly and likely to have adverse effects, such as eradication of other favored organisms and pollution of nearby waterways. Most important, they are toxic to humans and animals.

We evaluated some crop management practices to protect transplanted rice seedlings from damage by *Pomacea.* The practices studied were continuous flooding, ridge planting, drained plots for 3 wk after transplanting, and ring canal.

For ridge planting, two rows of rice seedlings were planted on 20-cm-wide ridges at 10- × 10-cm spacing. Distance between the centers of two ridges was 60 cm. For ring canals, a 20-cm-wide canal, 4-5 cm deep, was constructed along the periphery of the dikes. Snails were added to experimental plots at 2 kg assorted sizes/30 m^2, an average of 16 snails/m^2.

Under continuous flooding, snail damage on transplanted rice was severe: 52% of 16-d-old seedlings were eaten up after 6 h, 75% after 24 h, and 100% after 4 d (see figure).

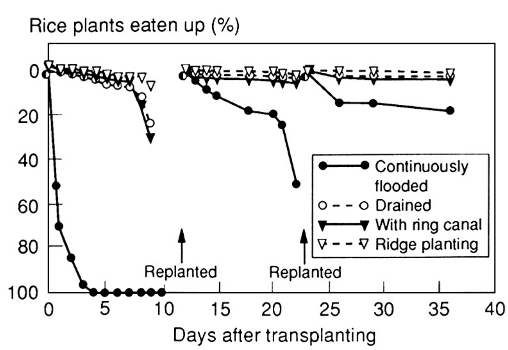
The other cultural practices had less than 8% seedling damage up to 7 d after transplanting (DT). Where seedlings were planted on ridges, snails stayed in the row where there was standing water. Where the plot was drained, snails burrowed into the mud. With the ring canal with 2-4 cm standing water, snails sought refuge there.

As a rule, snails did not eat rice plants when there is no standing water at the base. Heavy rains on days 7 and 8 of the experiment overflowed the ring canal and ridges and reactivated the hibernating snails. They then caused some damage to the rice seedlings.

Damage decreased with the age of seedlings. At 13 DT, we replanted from the same batch of seedlings (now 29 d old). In the continuously flooded plot, snails devoured 52% of the plants within 11 d. A second replanting was done at 23 DT with 39-d-old seedlings. Snails ate less than 18% of the plants within 13 d.

Damage was limited to newly transplanted seedlings. At 3 wk after transplanting, when plants were established, snail damage was not important. Irrigation water could be introduced and all plots could be kept continuously submerged.

In the continuously flooded plots, snail damage delayed rice maturity 18 d, with a 35% reduction in grain yield compared to yield in drained plots and plots with ring canals (see table). Ridge planting reduced rice yield, but this possibly was due to plant spacing and to reduced nutrient availability caused by soil moisture availability in the ridges. ☐



Golden snail *Pomacea canaliculata* Lamarck damage on transplanted rice. IRRI, 1989 dry season.

Effect of golden apple snail damage on rice yield under different management practices. IRRI, 1989 dry season.

Management practice	Straw (t/ha)	Grain (t/ha)
Continuously flooded	4.5	3.9
Drained field[a]	5.2	6.0
Ring canal[b]	4.6	6.1
Ridge planting[c]	4.1	5.0
LSD (0.05)	ns	0.9

[a] Plots kept drained (no irrigation water added) for 21 DT. [b] A 20-cm-wide canal (4-5 cm deep) constructed along the periphery of the dikes. [c] Ridges about 20 cm wide, with 2 rows of rice seedlings planted on a ridge at l0-cm distance. Distance between centers of 2 ridges was 60 cm, distance between hills in a row was 10 cm.