Total Fe content in the leaves of tolerant and susceptible lines was unrelated to deficiency symptoms (Table 2). However, orthophenanthroline reactive Fe^{2+} content of the leaves appeared to be related with deficiency symptoms. Lines with less than 30 ppm orthophenanthroline reactive Fe^{2+} in the upper leaves were more susceptible than those with 30 to 40 ppm Fe^{2+}. Lines with more than 40 ppm Fe^{2+} were tolerant.

Dry matter accumulation was significantly and positively correlated with orthophenanthroline reactive Fe^{2+} (r = 0.90**). □

Table 2. Total dry matter content, Fe, and orthophenanthroline reactive Fe^{2+} in upper leaves of ric genotypes, Samastipur, India.

Entry	Dry matter yield (g/20 plants)	Total Fe (ppm)	Orthophenanthroline Fe^{2+} (ppm)
IET7973	6.7	240	50
IET7972	6.3	255	42
IET5882	6.0	260	37
Pankaj	3.4	375	33
IET6263	5.2	450	36
Pusa 33	3.1	490	32
Mahsuri	2.6	337	28
Saket 4	2.7	288	30
T141	3.6	500	33

Pest control and management DISEASES

Effect of planting date on rice tungro virus (RTV) infection

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In 1980 wet season RTV infection increased in north and south Bihar. At the Pusa Experimental Farm, RTV developed the first week of Aug and attained maximum severity in Sep. In a yield evaluation trial with 16 entries planted at 3 dates, RTV infection developed at different times.

The entries were planted in a randomized block on 25 May, 9 Jun, and 24 Jun 1980 and 30-d-old seedlings were transplanted in 20- × 15-cm spacing in 7.5-m^2 plots. NPK was applied at 80, 40, and 20 kg/ha. PK was applied basally and N was applied in three splits. The maximum score from three replications was used to classify entries for RTV reaction (see table). Green leafhopper population was high.

Only RP967-11-1-4-2-2 was infected on the first planting date, but many other entries developed RTV when planted on the second and third dates. Pusa 33, Pusa 2-21, Saket 4, and Ratna were resistant. Rajendra Dhan 201 and IET5656 had intermediate resistance.

The recorded infection rate show that agronomic manipulations such as early planting can minimize RTV infection in susceptible cultivars. Plant age and varying incubation period also may affect disease development. □

RTV infection of varieties planted at different dates at Pusa, India.

Entry	RTV reaction[a]		
	25 May	9 Jun	24 Jun
Pusa 33	1	1	1
Pusa 2-21	1	1	1
Govind (UPR82-1-7)	1	1	7
Saket 4 (CR44-35)	1	1	1
Ratna	1	1	1
Prasad	1	7	9
Jaya	1	7	9
IR8	1	7	9
Sita	1	7	9
Rajendra Dhan 201	1	1	5
BG90-2	1	9	9
SPR7284-57-5	1	1	9
RP967-11-1-4-2-2	7	7	9
Pankaj	1	1	7
RP975-109-2 (IET5656)	1	1	5
MR1	1	7	9

[a]By the 0–9 scale of the 1980 Standard Evaluation System for Rice.

A new rice virus disease in India

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In late samba 1983, many rice varieties with yellow-orange leaves were observed in farmer fields and at the University of Coimbatore. Only a few plants showed symptoms that resembled those of rice tungro virus (RTV). Plants had mild stunting and increased tillering. Brown planthopper (BPH) was in the fields. Infected plants were collected and transmission tests were conducted by using the green leafhopper (GLH) *Nephotettix virescens* Dist. and BPH *Nilaparvata lugens* Stål.

Virus-free GLH adults given 4-d acquisition access feeding on source plants were transferred to 10-d-old TN1 seedlings at 2 insects/seedling for 4-d inoculation access. The inoculated plants did not develop disease symptoms (Table 1).

Second-instar nymphs from a virus-free BPH colony were released on source plants for 7-d acquisition access feeding, and then collected and released on 10-d-old TN1 seedlings at 2 insects/plant for 10-d inoculation access feeding. The inoculated plants developed yellow-

orange leaves 25 d later. The plants were slightly stunted and had more tillers than the control plants. BPH-inoculated *Oryza nivara* developed similar symptoms but those exposed to GLH did not.

Dried leaves of infected TN1 plants were sent to IRRI for serological tests. In a latex test using antiserum to rice grassy stunt virus (GSV), sap of the dried leaves reacted positively up to 1:8 dilution; sap of GSV-infected fresh leaves collected at IRRI reacted positively at 1:512 dilution; and sap of virus-free fresh leaves did not react, even at 1:1 dilution (Table 2).

We therefore identified the new disease as a strain of GSV. It is similar to GSV strain 2 in the Philippines. So far there are no reports from India of BPH-transmitted leaf yellowing.□

Table 1. Transmission of the new virus to TNl and *O. nivara* by *N. virescens* and *N. lugens*. Coimbatore, India, and IRRI.

Insect	TN1		*O. nivara*	
	Inoculated	Infected	Inoculated	Infected
N. virescens	25	0	6	0
N. lugens	61	19	18	9

Table 2. Serological reaction of the sap of leaves infected with new virus or GSV to GSV antiserum by latex test, IRRI.

Sample	Reaction to given sap dilution									
	Undiluted	2	4	8	16	32	64	128	256	512
Dried TN1 leaf infected with new virus	+	+	+	+	–	–	–	–	–	–
Fresh TN1 leaf infected with GSV	+	+	+	+	+	+	+	+	+	+
Fresh TN1 leaf free from virus	–	–	–	–	–	–	–	–	–	–

+ = positive, – = negative.

Rice yield loss to sheath blight (ShB)

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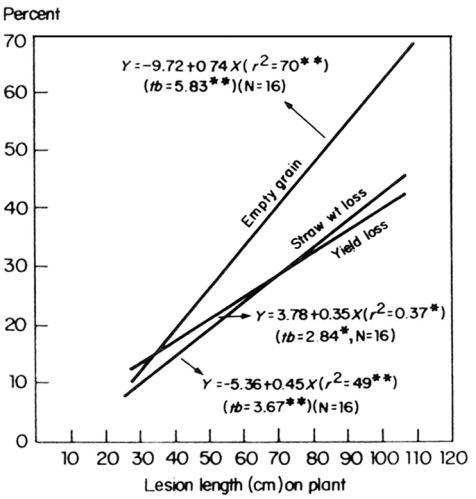
ShB, caused by *Thanatephorus cucumeris* (Frank) Donk, normally infects rice at tillering stage. ShB damage is increasing in Thailand.

In Jul-Dec 1983, we studied yield loss caused by different stages of ShB infestation to determine an economic threshold at which to apply chemical controls. The experiment was in a randomized complete block design with 4 replications of 5 treatments of different disease intensities: 0, 3, 5, 7, and 9 by the Standard Evaluation System for Rice. RD7, the most ShB-susceptible variety, was transplanted in 6- × 4-m plots and artificially inoculated at tillering by inserting a packet of mycelia and sclerotia of *T. cucumeris* in each hill. Validamycin was used to keep disease intensity at the desired levels. Straw weight, grain weight, and number of empty grains were analyzed.



Relationship between lesion length and percentages of yield loss, straw weight loss, and empty grains. Bangkhen, Thailand.

Infected plants with disease severity 3, 5, 7, and 9 reduced yield 15, 22, 28, and 40% (see table). Correlation between disease severity and percent yield loss, straw weight loss, and empty grains was a linear regression (see figure).□

Rice yield characters affected by different ShB severity, Bangkhen, Thailand.

Disease index	Av yield (kg/8 m)	Yield reduction (%)	Av straw wt (kg/8 m)	100-grain wt (g)	Empty grain (%)
0	4.05 a	0 a	26 a	3.0 a	21 a
3	3.42 b	15 b	24 ab	3.0 a	24 b
5	3.10 bc	22 bc	21 b	2.9 a	26 b
7	2.88 c	28 c	18 c	2.9 ab	30 c
9	2.39 d	40 d	15 c	2.6 b	33 d

Yield loss to bacterial blight (BB) in central Thailand

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BB, caused by *Xanthomonas campestris* pv. *oryzae,* is a serious constraint in parts of Thailand.

We studied yield loss caused by BB at Bangkhen Rice Experiment Station in 1983 rainy season. RD1, a susceptible rice cultivar, was transplanted in 4 of 5 10-m^2 plots. Ammophos 16-20-0 was topdressed at 250 kg/ha, and plants were fully protected from other diseases and insect pests. Every hill in alternate rows was clip-inoculated at midtillering. When