

we evaluated disease intensity weekly with the *Standard evaluation system for rice* (SES). IR20 served as the susceptible check.

In the greenhouse, disease-free lines were artificially inoculated using two methods. We inoculated one set of lines with a 15-d-old, single-grain culture in between the flag leaf sheath and the unemerged panicle.

In the other set, rice mealy bugs (*Brevinnia rehi* Lindinger) were mass-reared using 45-d-old TN1 rice. Crawlers were collected and soaked in *S. oryzae* spore suspension for 15 min (10⁷ conidia/ml). Crawlers were placed in between the flag leaf sheath and the unemerged panicle using a camel hair brush.

Fifteen derived lines were completely disease-free under natural infection, only a few lines exhibited high resistance under artificial methods (see table). The check had maximum disease severity under all conditions. □

Reactions of derived *O. officinalis* lines to ShR.

Intensity (0-9 scale)	Designation	
	Single-grain inoculation	Mealy bug inoculation
1 (highly resistant)	IR54742-6-34-17-11-1	IR54742-6-34-17-11-1
	IR54742-18-3-8-22-1	IR54742-18-3-8-22-1
	IR54742-22-14-3-7-2	IR54742-22-14-3-7-2
	IR54742-22-19-3-7-1	IR54745-2-21-12-17-1
	IR54742-33-9-14-26-3	
	IR54742-33-18-20-3-2	
	IR54742-33-37-16-10-1	
	IR54745-2-21-12-17-1	
3 (resistant)	IR54751-1-19-13-17-1	
	IR54742-22-14-24-22-3	IR54742-22-14-24-22-3
	IR54742-31-21-20-10-3	IR54742-22-19-3-7-1
	IR54742-22-19-3-7-3	IR54742-33-9-14-26-3
	IR54742-2-21-12-17-5	IR54742-33-18-20-3-2
7 (susceptible)	IR54742-33-18-20-3-1	IR54742-33-37-16-10-1
	IR54745-2-10-17-8-3	IR54751-19-13-17-1
9 (highly susceptible)	-	-
		IR54742-22-19-3-7-3
		IR54742-31-21-20-10-3
		IR54742-33-18-20-3-1
		IR54745-2-16-17-8-3
		IR54745-2-21-12-17-5

Pest resistance — insects

Resistance of rice varieties to whitebacked planthopper (WBPH) in the greenhouse

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We screened 916 new rice varieties and breeding lines during 1986-90 for resistance to WBPH *Sogatella furcifera* by using the bulk seedling test. Test entries were sown in 20-cm rows in plastic seedboxes at 20 seeds/row. Each entry had three replications.

Seedlings were infested 7 d after sowing with second- to third-instar WBPH nymphs at 6-8 nymphs/seedling. Plant damage was scored when all plants of susceptible check TN1 had died.

Ninety of the test entries showed resistance to WBPH (see table).

Resistance of rice varieties to WBPH in the greenhouse. China. 1986-90.

Variety	Damage score ^a	Variety	Damage score ^a
Shanyougui 8	3	Liaoyanru no. 4	3
Bangriai 7	3	C710	3
84570	3	Mingdao 580	3
84547	3	Wanqingzao no. 2	1
Chuangmi no. 1	3	Sanluzhan no. 7	3
Chuangmi no. 2	3	883016	3
8603	3	Zhong 86-44	3
8604	1	Zhong 86-51	1
2314	3	Zhongyu 88-6	3
851193	3	Zhongyu 88-9	3
851515	3	3123	3
851633	3	Jiangyou 594	3
853161	1	85-151	3
853209	3	Wanhui 500065	1
352	1	50239	3
Qishuangzhan	0	Nanjing 58156	1
Xiangzheng 21	1	6267	3
85-2-591	1	Dan42-1	3
Guangye 90	1	Shuangerai	3
7526-4	3	Fu 8329	3
1296	3	Fu 8456	1
Sixizhan	3	Fu 8531	3
Zhehu no. 1	3	V20 A x Pinghui no. 2	3
E3-14	3	Ping 10	3
E3-57	3	H8702	3
E3-147	3	86013	3
Jing15	3	46-204	1
Nonghu no. 3	3	HA8517	1
Dianrui 138	1	HA85-183	0
Dianrui 236	1	V49	1
H11	3	V20 A x 1126	3
Liaoyan 283	3	Yuwanfu no. 5	1

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Table continued

Variety	Damage score ^a	Variety	Damage score ^a
Nanjing 3714	3	Fu 8922	3
Shuangchao no. 25	1	Fu 8971	3
Fu 85-30	3	Dongtingzhengzhuru	3
Zhehu 102	3	Zhongguai	3
Zhehu 129	3	Ewan no. 3	3
Zhongyu 87-3	3	61 jing	3
6ET-198	3	17267	3
1673	3	Zhongxian 86-6	3
Zhongzuo 8531	3	Xianjing no. 1	3
Shun 44	1	HA79317-4	3
8810410	1	8807	3
Zhongyu 89-10	3	LS8713	3
88 Nan 14	3	85-183	3

^aBy the Standard evaluation system for rice.

Feeding behavior of the brown planthopper (BPH) on susceptible and resistant rice cultivars

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The feeding behavior of unstarved, newly molted, adult female BPH *Nilaparvata lugens* Stål was assessed on single tillers of susceptible (IR22) and resistant (IR62) rice cultivars.

Ingestion patterns were electronically monitored using a direct-current system, which recorded voltage changes accompanying stylet activity within the plant. Sap ingestion was assessed by incorporating radioactive P into the rice plant and

monitoring the amount of label within the insect and its excretion after 24 h on the plant. Honeydew excretion was monitored simultaneously by slowly revolving the insect and plant so that honeydew droplets fell separately onto pH indicator paper.

Feeding behavior and weight change of *N. lugens* over 24 h on rootless rice tillers immersed in control and feeding deterrent solutions.^a

	Susceptible cultivar IR22			Resistant cultivar IR62
	Control (H ₂ O)	Beta-sitosterol (0.5% wt/vol)	Oxalic acid (0.5% wt/vol)	Control (H ₂ O)
Duration of phloem ingestion pattern (%)	7.5 a	16.0 a	0.3 a	1.6 a
Duration of xylem ingestion pattern (%)	35.3 a	22.9 a	6.8 b	33.3 a
Mean percentage weight change	17.8 a 2.8 a	-6.0 b -	- -31.3 b	-8.4 b -5.9 a

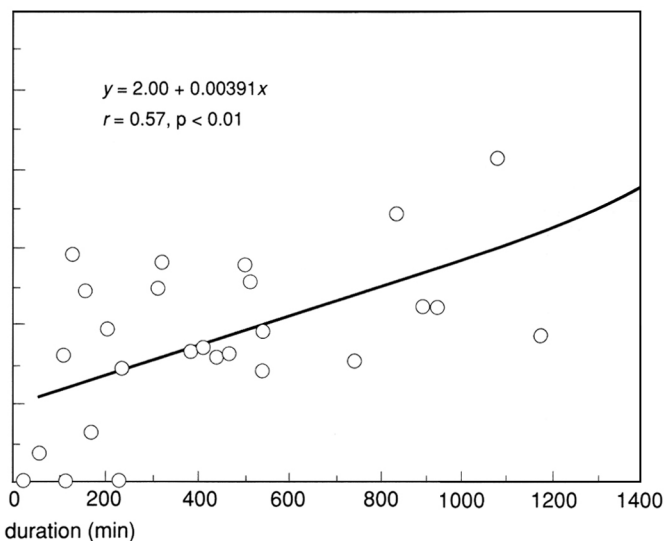
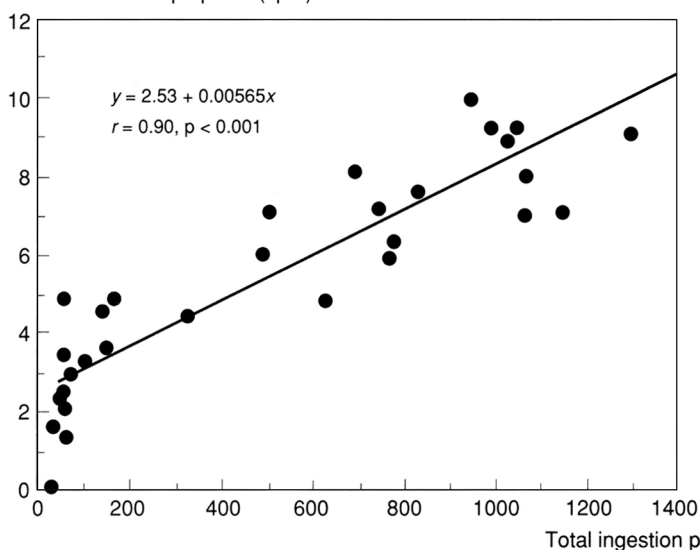
^aIn a row, values followed by the same letter are not significantly different at the 5% level (Mann-Whitney U test).

The total radioactivity of the insect plus excreted honeydew increased exponentially with ingestion pattern duration (see figure). Insects on the resistant cultivar followed the same logarithmic increase, but the total amount of label taken up was significantly less than that taken up by those on the susceptible cultivar.

We investigated the role of feeding deterrents (oxalic acid and beta-sitosterol) in relation to reduced sap ingestion from the resistant cultivar. Rootless tillers were immersed in 0.5% (wt/vol) solutions of either compound. Insect feeding behavior was monitored.

Both compounds induced significant insect weight loss with little influence upon the ingestion pattern duration. This affected the sap ingestion rate (see table). Either or both plant components may be responsible for the reduced sap ingestion and therefore resistance in rice cultivar IR62. □

Ln radioactive sap uptake (cpm)



Radioactivity of insect plus excreted honeydew in relation to total duration of ingestion patterns produced by *N. lugens* on susceptible IR22 (●), and resistant IR62 (○),