Wuyujing 3. But the FEAa content and the development difference were neither related to the difference of FEAa of rice host, nor to the difference of silica cell density in outer leaf sheath of the primary stem of the host varieties (Table 1). Shanyou 63, Zhendao 2, and 92109 had lower IVB (the interval between vascular bundles), larger sheath ridge, and higher rate of IVB less than the head width of YSB neonates than the susceptible varieties had(Table 2).□

Table 2. IVB, sheath ridge width, and silica cell density in outer leaf sheaths of primary stems in rice plant[a].

Variety	IVB (μm)	Rate of IVB < head width of YSB neonates(%)	Sheath width (μm)	Silica cell number per 100 μm^2
9-92	370.83 ± 50.74A	0.0	67.50 ± 5.30f	11.78bc
Sanbai-Litou	276.82 ± 42.75c	37.5	91.67 ± 11.11b	18.89b
Wuyujing 3	320.00 ± 21.87b	0.0	74.17 ± 13.75e	24.44a
Shanyou 63	232.50 ± 33.96de	77.8	79.17 ± 6.62de	11.11c
Zhendao 2	216.67 ± 21.36e	100.0	103.33 ± 19.41a	17.11b
92-109	237.50 ± 12.44	100.0	90.00 ± 15.00bc	16.15bc

[a]Varieites were sown on Apr 8, transplanted on May 7, and sampled on May 26, 1998.

Tolerance evaluation of rice varieties to the brown planthopper, *Nilaparvata lugens* feeding

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The brown planthopper, *Nilaparvata lugens* (Stål) (BPH) is one of the most important insect pests of rice in China and other east-southern Asian countries. Utilization of rice resistance varieties is one of the most economic and effective ways for controlling *N. lugens*. The resistance of rice varieties declined due to the change of BPH biotype. The current resistance screening methods based on biotic reaction also may eliminate numerous rice varieties with high-yielding and/ or good grain quality which were not resistant to BPH but had strong tolerance to BPH.

In this experiment, Xiushui 11 (japonica), Shanyou 63 (hybrid rice), Pei'ai 64S/ 32E (super high-yielding rice), Jiayu 948 (indica), and ASD7 (indica) were used as tested varieties, and TN1 and Ptb33 served as susceptible and resistant check, respectively. Tolerance of rice plants to BPH feeding was evaluated using functional plant loss index (FPLI) improved by Panda & Heinriches (1983). Results showed that FPLI and BPH dry weight of Xiushui 11 and Shanyou 63 were higher than or closer to those of TN1. FPLI of Pei'ai 64S/32E was significantly lower than that of TN1, while its BPH dry weight was slightly higher than that of TN1, indicating it had stronger tolerance. FPLI and BPH dry

Table 1. FPLI values of different rice varieties and dry weight of *N. lugens* [a].

Variety	Dry weight (mg)	FPLI value
TN1	0.52 ± 0.03 a A [b]	83.05 ± 27.12 a A
ASD7	0.37 ± 0.05 c B	13.23 ± 9.49 b B
Pei'ai 64S/32E	0.54 ± 0.05 a A	11.08 ± 3.45 b B
Shanyou 63	0.50 ± 0.03 ab A	87.35 ± 19.79 a A
Xiushui 11	0.52 ± 0.03 a A	75.63 ± 27.73 a A
Jiayu 948	0.45 ± 0.03 b A	26.07 ± 11.60 b B
Ptb 33	0.33 ± 0.06 c B	6.35 ± 1.55 b B

[a]Data in the table were the mean ± S.E.; [b] Data in the column followed by the same letter were not significant at 0.05 or 0.01 level.

Table 2. Numbers of *N. lugens* of generation on different rice varieties.

Variety	Damage rate(%)	Population number / unit	
TN1	8.33	1338.33 ± 50.37	ab A
ASD7	2.33	719.67 ± 221.86	c B
Pei'ai 64S/32E	4.33	1244.33 ± 120.34	ab A
Shanyou 63	5.67	1523.67 ± 182.76	a A
Xiushui 11	8.33	1541.00 ± 89.39	a A
Jiayu 948	7.67	1158.33 ± 102.31	b A
Ptb_{33}	0.33	11.00 ± 5.88	d C

weight of Jiayu 948 were obviously lower than those of TN1, but they were significantly higher than those of Ptb33, showing it belonged to resistant variety with some certain tolerance. FPLI and BPH dry weight of ASD7 had no significant differences compared with those of Ptb33, indicating ASD7 had no BPH tolerance (Table 1).

The planthopper densities had no significant differences among TN1, Pei'ai 64S/32E, Shanyou 63, and Xiushui 11, but they were significantly higher than those of Jiayu 948, ASD7, and Ptb33. The plant damage rates of Pei'ai 64S/32E and Shanyou 63 were obviously lower than that of TN1 and higher than that of Ptb33 (Table 2).

Our experiments demonstrated that Xiushui 11 and Shanyou 63 were susceptible, Pei'ai 64S/ 32E had strong tolerance, Jiayu 948 had some tolerance, and ASD7 had no tolerance to BPH feeding.□

Influence of nitrogen on relative parasitic fitness of cultivar-race combinations of rice blast

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Rice blast, caused by *Magnaporthe grisea*, is one of the most important rice diseases in China. Resistance breakdown often happened, especially in the field supplied with high nitrogen fertilizer. In the simulation study on race dynamics and cultivar-race interaction on population level, the influence of nitrogen on the relative parasitic fittness of cultivar-race combinations should be realized quantitatively.

Six rice varieties Lijang-Xintuan-Heigu, Shin 2, Fujisaka 5, Zhonghua 9, Jingyue, and Reimei were inoculated with three rice blast strains. Seven and three levels of nitrogen fertilization were used with three replications in greenhouse and field experiment, respectively. In greenhouse, the number of lesions on unit leaf area, infection probability, and area of sporulation per lesion were recorded 10 d later by spraying equal volume of spore suspension. In field experiment, equal amount of spore suspension was sprayed onto 10 leaves in the center of each plot (1 m × 1 m, for each cultivar). Disease indexes were recorded for each plot every 5 d after symptom appearance.

Relative parasitic fitness (F) was calculated according to the method developed by Zeng. Results showed that response of disease intensity pattern to the amount of N application was similar to a parabola, the disease intensity increased with the increase of N application during the very low to medium N levels, but decreased with further increase (Fig. 1). The influence of the amount of N application on F might be complicated, being very slight in many cultivar-race combinations (Fig. 2). It was obvious that N application must be comprised in the construction of the simulation model for rice blast because it was an important factor affecting the rate of pathogen multiplication. Furthermore, the estimation of relative parasitic fitness of cultivar-race combinations (Fig. 3 and Fig. 4) should be better undertaken under moderate to high amount of N supply in order to reveal the highest range of F value that may led to cultivar resistance break down. So, the reacted mechanism of different cultivar-race combinations to N application in relative parasitic fitness should be further studied.□

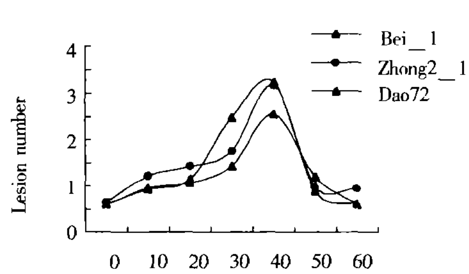

Fig. 1. Influence of nitrogen on lesion number of different cultivar-race combinations of rice blast (Greenhouse experiment, 1998).

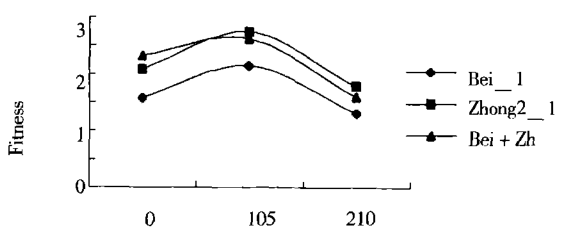

Fig. 2. Influence of nitrogen on disease indexes of different cultivar-race combinations of rice blast (Field experiment, 1998).