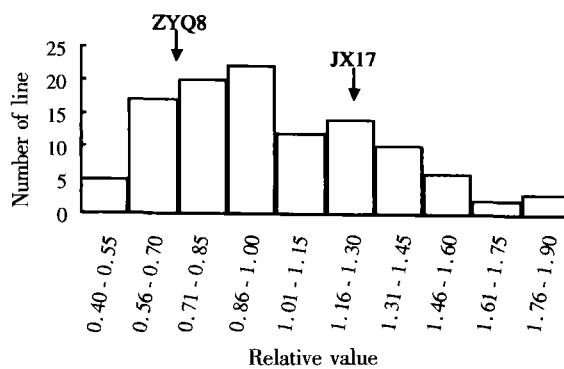
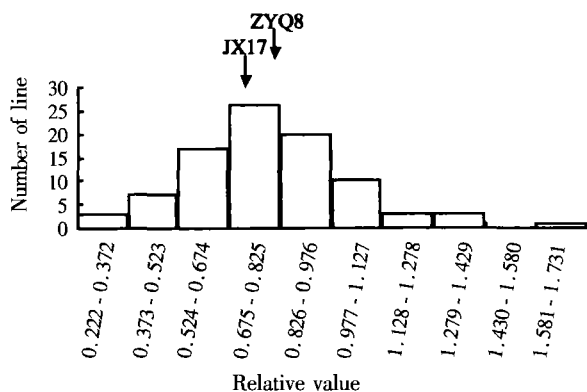


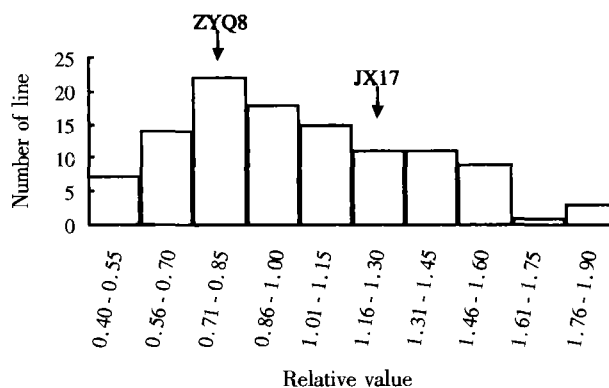
Distribution of relative shoot dry weight among DH lines (treatment for 20 d).



Distribution of relative shoot dry weight among DH lines (treatment for 30 d).



Distribution of relative total dry weight among DH lines (treatment for 20 d).



Distribution of relative total dry weight among DH lines (treatment for 30 d).

Distribution of relative dry weight among DH lines responding to low-P stress under different plant development stages.

**Resistance of transgenic rice pure lines to brown planthopper**

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Brown planthopper (*Nilaparvata lugens*, BPH) is one of the most damaging rice insect pests. Recent studies showed that lectin (GNA), coded by the *gna* gene from snowdrop (*Galanthus nivalis*) was toxic to BPH in artificial diet assay (Powell et al, 1993, 1995). Here we report the development of homozygous transgenic rice lines contained the *gna* gene and the BPH bioassay test of the homozygous lines.

Mature seed-derived callus of japonica rice Eyi 105 was bombarded with 2 plasmids, pWRC1515 and pRSS-GNA1 (Tang et al, 1999). The former containing the *gusA*

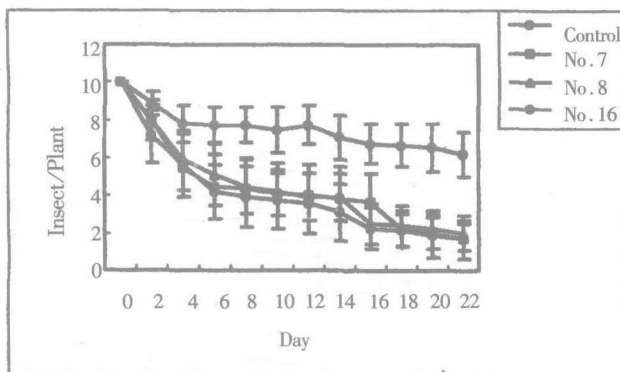
gene and the hygromycin-resistance gene (*hpt*), while the latter harboured the *gna* gene. The transformation, selection, and identification of homozygous lines among R<sub>2</sub> progenies were essentially the same as what described by Tang et al (2000). Three-leaf plants of 3 transgenic homozygous lines (No. 7, 8, and 16) with the expressing of GNA over 0.3 % of total soluble protein were challenged by BPH (biotype I) and investigated for their effects on BPH survival and development by using a protocol as described by Rao et al (1998).

Of the total 26 independent transgenic plants regenerated from 152 bombarded calli (17 %), 19 contained the *gna* gene. Western blot analysis revealed that 13 out of the 19 *gna*-containing transgenic plants (68 %) expressed GNA at various levels. Southern blot analysis confirmed that the GNA-expressing plants were indeed independent transformation events (Fig. 1).

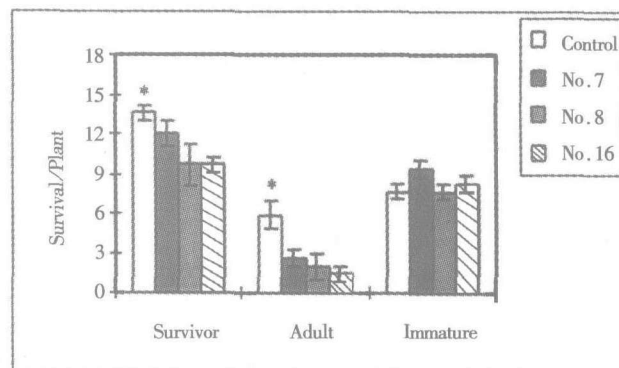
BPH bioassay results showed that BPH survival was decreased by 73% on homozygous lines No. 7, 68% on

No. 8, and 73% on No. 16, as compared to the control (Fig. 2a). BPH development assay indicated that BPH survival on lines 7, 8, and 16 was significantly reduced from initial inoculum of 25 first-instar BPH nymphs/plant to 12.0, 9.7, and 9.7 insects/plant, respectively, while it was 13.6 insects/plant on the control plants. Compared with the results presented by Rao et al (1998) (Fig. 2b), the development of insects was also significantly retarded on all the transgenic lines.

In this study, it was demonstrated that homozygous transgenic rice lines with enhanced resistance to BPH could be obtained via particle bombardment-mediated co-transformation and through genetic analysis-based selection, and transformation technology was an important supplement to conventional breeding for improving multiple traits. □



(a)



(b)

Fig. 2. BPH bioassay of homozygous transgenic rice lines 7, 8, and 16.

Points and bars indicated means and SE (standard error), respectively. (a) BPH survival on the transgenic lines. Ten first-instar BPH nymphs were introduced into each plant on 0 d and the insect survival was measured at 2 d intervals for 22 d period. Differences between transgenic lines and the control were significant after being released 2 d. (b) BPH development assay. Twenty-five first-instar BPH nymphs were released into each plant on 0 d and the survival BPH nymphs and adults were monitored after being released 13 d. \* was significant at 0.05 level.

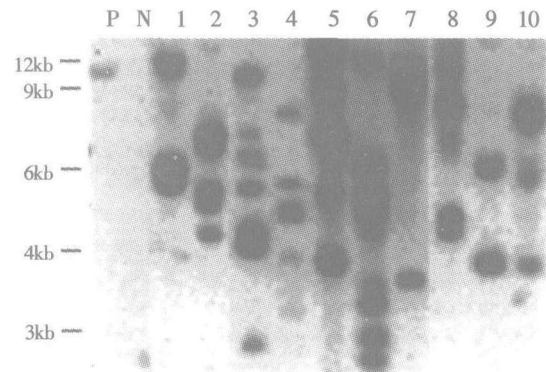


Fig. 1. Southern blot analysis of transgenic rice plants.

Genomic DNA (10 μg) of the plants and plasmid DNA were digested with *Sac*I, separated on 0.8% agarose gel and hybridized with the DIG-labeled *gna* gene probe.

P = Positive control (pRSSGNA1); N = An untransformed plant; Lanes 1-10 = Transgenic plants.

**Rice fertility affected by lower temperature in intersubspecific hybrid**

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Intersubspecific hybrids of indica-japonica show strong heterosis on yield, and the partial sterility in F<sub>1</sub> hybrids can be mitigated by using the wide-compatibility gene, *S<sub>5</sub><sup>n</sup>*. In the past decade, such hybrids showed normal fertility and high level of heterosis on grain yield, but some

of them showed unstable seed-setting rate at low temperature. The present study was conducted to examine the effect of low temperature on fertility of intersubspecific hybrids and to investigate the male gamete abortion at some markers.

Six intersubspecific crosses including two crosses between a wide-compatibility variety (WCV, 02428 or KN) and an indica variety were used as materials, and IR36 and Kanou262 were used as controls. Materials and controls were seeded from May 1 to Jul 1 in Nanjing (32.0 ° N) in 1996 and 1997 to differentiate the flower time in a temperature range of 19.6 -29.7 ° C. The average tem-