Registration of B82-761 Long-Grain Rice Germplasm Resistant to Blast and Sheath Blight

B82-761, a long-grain rice (Oryza sativa L.) germplasm line (Reg. no. GP-79, PI 592507), was jointly released by the USDA-ARS and the Texas A&M University System in January 1996 for its resistance to rice blast [caused by Pyricularia grisea (Cooke) Sacc.] and sheath blight (caused by Rhizoctonia solani Kühn). Since 1987, we have observed yield reductions of 10 to 65% in fields of susceptible cultivars grown in the southern USA. Races of the blast pathogen identified in the USA are IB-54, IH-1, IG-1, IB-45, IB-1, IC-17, IE-1, IE-1K, and IB-49, with the last five currently being the most prevalent. Race IE-1K is so designated because of its unique virulence toward the cultivar Katy (1).

Incorporating major gene resistance and field resistance to blast into genetic lines and cultivars adapted to the southern USA is a major objective of the USDA-ARS Rice Research Unit at Beaumont, TX. In 1977, the cross ‘Vista’/‘Lebonnet’ (B773A1) was made for the purpose of combining two major blast resistance genes. Lebonnet, a long-grain cultivar (2), carries the dominant Pi-kh gene, which provides resistance to Races IB-45, IB-54, IG-1, and IH-1 (3,4). Subsequently, Lebonnet was found to possess the recessive pi-d gene, which confers resistance to Race IB-1 (4). Vista, a medium-grain cultivar (5), carries the dominant Pi-z gene, which confers resistance to Races IC-17, IE-1, IG-1, IE-1K, and IH-1 (4).

In 1978, 121 F3 lines were evaluated using greenhouse inoculations for resistance to isolates of P. grisea, Races IC-17 and IB-45. Resistance to Race IC-17 indicates the presence of the Pi-z gene from Vista, while resistance to Race IB-45 indicates the presence of the Pi-kh gene from Lebonnet. Fifteen F3-derived families identified as having both genes underwent standard selection procedures for agronomic traits, using a pedigree breeding scheme. In the F7 generation, the line B82-761 was identified as having the best combination of agronomic potential and conventional long-grain cooking quality. Further evaluation in greenhouse inoculation tests verified that the line carries the three major blast resistance genes described above, which together confer resistance to all the common pathotypes known to occur in the southern USA except Race IB-49, a broadly virulent race found mostly in Arkansas.

In 2 yr of replicated tests for field resistance (6), B82-761 showed a high level of field resistance to Race IB-49, better than that of Lebonnet and ‘Lemont’, both of which have been characterized as having good field resistance to leaf blast (2,7). Field evaluations during 1992 and 1993 indicated that B82-761 has a level of field resistance to leaf blast similar to Katy, the latter cultivar possessing the Pi-ta2 gene, which conveys resistance to all of the U.S. races except IE-1K. The multiple-gene blast resistance of B82-761 is expected to be more durable than the single-gene resistance found in Katy and its relatives.

In the F7 generation, the line B82-761 was identified as having both genes. Fifteen Fs-derived families identified as having both genes underwent standard selection procedures for agronomic traits, using a pedigree breeding scheme. In 1993, B82-761 was planted as a bulk of an F7 line in replicated field trials conducted at four Texas locations. Plant height averaged 132 cm, compared with 112 cm for Katy (a standard-height cultivar) and 89 cm for Gulfmont and Cypress. Whole-grain milling yields (mg g⁻¹ whole kernel/mg g⁻¹ total milling yield) at 120 mg g⁻¹ moisture were 624/705 (62/71%) for B82-761, 611/692 (61/69%) for Katy, 611/711 (61/71%) for Gulfmont, and 597/696 (60/70%) for Cypress. B82-761 matured in 119 d, similar to Gulfmont and 19 d earlier than Cypress. Rough rice yield (kg ha⁻¹) of B82-761 was 6427 for Katy (11), two popular semidwarf cultivars, and 574487 (RU8703196) (10).

B82-761 is a conventional U.S. long-grain type with intermediate amylose content (21–23% apparent amylose), intermediate gelatinization temperature as measured by number (3-5) in 1.7% KOH. In 1993, B82-761 matured in 119 d, similar to Gulfmont and 19 d earlier than Cypress. Rough rice yield (kg ha⁻¹) of B82-761 was 642/705 (62/71%) for B82-761, 611/692 (61/69%) for Katy, 611/711 (61/71%) for Gulfmont, and 597/696 (60/70%) for Cypress. Whole-grain milling yields (mg g⁻¹ whole kernel/mg g⁻¹ moisture) at 120 mg g⁻¹ moisture were 624/705 (62/71%) for B82-761, 611/692 (61/69%) for Katy, 611/711 (61/71%) for Gulfmont, and 597/696 (60/70%) for Cypress. B82-761 matures in 119 d, similar to Gulfmont and 19 d earlier than Cypress. Rough rice yield (kg ha⁻¹) of B82-761 was 642/705 (62/71%) for B82-761, 611/692 (61/69%) for Katy, 611/711 (61/71%) for Gulfmont, and 597/696 (60/70%) for Cypress.

B82-761 is a conventional U.S. long-grain type, which combines superior blast and sheath blight resistance with good agronomic potential and adaptability to the southern USA.

For an initial 5-yr period, limited quantities of seed are available upon request from the corresponding author. Recipients are asked to make appropriate recognition of the USDA-ARS Rice Research Unit as the source of the germplasm if it is used in the development of new germplasm, parental line, or genetic stock.

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References and Notes