Hybrid Rice Breeding

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ABSTRACT

Breeding lines developed in 2010 were tested in various hybrid combinations in 2011 for yield and for seed production. Replicated and single plot tests of various 2-line and 3-line combinations were evaluated at the Rice Research and Extension Center (RREC) for grain yield, plant type, heading date, and other traits related to general agronomic performance. Grain was evaluated for milling quality and will be quantified for amylose and alkalai spread. Hybrid seed production was evaluated for 6 male-sterile lines and 6 restorers.

INTRODUCTION

In 2010, accessions from diverse worldwide locations were used to develop male-sterile, restorer, and maintainer lines for 2-line and 3-line hybrids. Evaluation of potential breeding lines requires testing various combinations as F₁ hybrids for yield and the complete array of traits necessary for a rice variety to be commercially acceptable. In addition, potential parent lines must be tested for seed production, which requires evaluating isolation, planting schemes, synchronization of flowering, and pollen distribution, etc.

PROCEDURE

Yield Tests

Yield was evaluated in 2 tests, one with 3 replications, and another with single plots. In the replicated test, 21 2-line hybrids and 5 3-line hybrids were evaluated against Wells, Francis, Cybonnet, and CL 171AR as checks. Plots were drilled on 5 May. Seeds
were planted in 6-row plots, 3-m long and 1.5-m wide. In the single plot test, 64 hybrids, 27 restorers, and the check varieties Wells, Francis, and CL171AR were planted in plots of the same size and conformation as the replicated test.

**Hybrid Seed Production**

Seed production was tested in 2 locations chosen for maximum isolation from other rice to reduce the chance of pollen contamination. Site 1 (Woods) contained 4 bays, with each bay planted with a different restorer: 190R, 376R, 378R, and 385R. Restorers were drilled on 15 April in single rows, 3 m apart, and 10 m long. Between the restorer rows, male sterile lines were transplanted on 30 May and water-seeded on 14 June. The male-sterile lines were 873A, 799s, 800s, 805s, 811s, and 810s. At Site 2 (Field), tests were planted with the same methods, distances, and male-sterile lines. However, only 2 bays were planted, one for restorer 190R and the second for 376R. Restorers were planted on 7 May, and the male-sterile lines were transplanted on 30 May and water-seeded on 14 June. Corn was planted around the tests and between bays to help reduce chances for pollen contamination.

**RESULTS AND DISCUSSION**

**Yield Tests**

In the replicated yield test, Francis was the highest yielding check variety, so all comparisons are made with that check. Twenty of the hybrids had yields greater than Francis. Of these, 12 had yields exceeding that of Francis by 20% or more. Based on these observations, several parent lines will be tested in new and repeated combinations in 2012. Only four hybrids had yields less than Francis. Of these, 3 were hybrids with restorer 181R as the male parent. Though those combinations did not perform well, 181R does show promise in other combinations.

In the single plot test, Francis was again the check with the greatest yield. Fifty-two of the hybrid combinations had grain yield equal to or greater than Francis. After consideration of all traits including plant height, heading date, pubescence, etc., some of these hybrids will go on for replicated testing in 2012.

**Seed Production**

Getting the parent lines synchronized for heading was a challenge, but planting at different dates and by both water-seeding and transplanting, some seed production was quite respectable. In the Field site, birds ate a lot of the male-sterile seed that was water-seeded. A deeper flood will need to be maintained. Restorer 190R was far superior to 376R in successful pollination of the 6 male sterile lines. Seed yields ranged from 253 kg/ha to 2763 kg/ha for the various combinations of restorer 190R.

In the Woods site, seed production was much greater. This was due in part to less bird damage. Seed yields ranged from 160 kg/ha to 1504 kg/ha. Transplanting gave
the best stands for the male-sterile lines, but proper depth after water-seeding should improve stands as well.

**SIGNIFICANCE OF FINDINGS**

As very preliminary evaluations of selected hybrids for both yield and seed production, tests in 2012 were very informative. Selected hybrids will be tested in replicated, multi-location tests in 2012. Seed production schemes will continue to develop with improved synchrony between parent lines.

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