CONFIRMATION OF HYBRIDIZATION BETWEEN RICE AND PHENOTYPICALLY DISTINCT RED RICE TYPES IN ARKANSAS RICE FIELDS. David R. Gealy, Leopoldo Estorninos Jr., Charles E. Wilson, and Hesham Agrama, Plant Physiologist, United States Department of Agriculture-Agricultural Research Service, Dale Bumpers National Rice Research Center, Stuttgart, AR 72160, and Post Doctoral Associate, Extension Rice Specialist, and Post Doctoral Associate, University of Arkansas Rice Research and Extension Center, Stuttgart, AR 72160.

This review details several key findings from rice-red rice outcrossing evaluations in research plots and in grower fields in Arkansas from 2000 to 2005. Observations from research plots, controlled crosses, and grower fields have provided us with several easily discernable phenotypic traits (e.g. leaf pubescence, stem and leaf coloration, days to flowering, awn length) that can be very useful in establishing the general biotype of the red rice parent involved in the original cross with rice. For instance blackhull awned red rice types crossed with commercial long grain rice typically produce hybrids (first generation cross) with purple colored lower stems (basal leaf sheaths), and/or pink awns, and normal flowering patterns, while hybrids derived from strawhull awnless red rice types produce hybrids with normal green stems, no awns, and extremely delayed flowering periods. In combination with these and other phenotypic traits (e.g. seed pericarp color, seed shape, leaf pubescence, plant height, culm growth angle), SSR DNA fingerprinting and subsequent mathematical analyses can be used to infer population structure and the probable parentage of unknown crosses.

Evaluation of reciprocal outcrossing between pairs of rice cultivars (both herbicide-resistant and non-resistant) and red rice biotypes, chosen for their overlapping flowering periods in order to optimize outcrossing, has revealed substantial year-to-year and cultivar-biotype variations at Stuttgart, AR. Outcrossing estimates (based on phenotypic traits only) from adjacent rice and red rice rows have ranged from as high as 0.79% in 2004 in a 'Kaybonnet' rice / #8 awned blackhull red rice plot with red rice as the pollen donor to as low as 0.006% in 2001 in a StgS awnless strawhull red rice / 'CL121' imidazolinone-resistant rice plot with rice as the pollen donor. The greatest outcrossing between imidazolinone-resistant rice and red rice was 0.54% in a 'CL161' rice / #8 awned blackhull red rice plot in 2004 with red rice serving as the pollen donor. Outcrossing was usually much greater when red rice, instead of rice, served as the pollen donor. When this advantage for red rice as a pollen donor is very large, the future infestation levels of red rice hybrid derivatives in the affected rice fields will be minimized because most of the hybrid seeds formed on rice panicles (from red rice pollen) are harvested and removed from the field along with the rice seed (most hybrid seeds formed on red rice panicles shatter to the ground and remain in the field). Conversely, the harvested rice seed will be much more contaminated with red rice hybrid seeds under these conditions, and thus, much less valuable for milling and more risky for replanting.

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