BREEDING, GENETICS, AND PHYSIOLOGY

Development of Aromatic Rice Varieties
D.K. Ahrent, K.A.K. Moldenhauer, J.W. Gibbons, and V.A. Boyett

ABSTRACT

The University of Arkansas Division of Agriculture has implemented an aromatic rice breeding program to develop cultivars for the U.S. to meet the market demand for aromatic rice. The rice imports have doubled in the last ten years and are composed mainly of aromatic rice. In 2009, 87.4 million cwt of rice were consumed domestically, of which 15% was imported. The largest quantity of imported products in 2008-2009 were Jasmine rice from Thailand, at 422,100 metric tons, and Basmati rice from India, at 74,100 metric tons. There is a need to develop high-quality aromatic rice varieties which will perform well agronomically in the U.S.

INTRODUCTION

Approximately 13.5 million cwt of milled rice was imported to the United States in the fiscal year 2008-2009 (USA Rice Federation, 2009). This is an increase of 33% in the last seven years. United States consumers are purchasing more aromatic or specialty rices and the overseas markets cannot meet the demand. It has been difficult for U.S. producers to grow the true Jasmine and Basmati varieties due to environmental differences, photoperiod sensitivity, fertilizer sensitivity, and low yields, thus making aromatic rice a valuable commodity. Adapted aromatic rice varieties that meet the taste requirement for either Jasmine or Basmati need to be developed for Arkansas producers. Research also needs to be directed at determining what type of Arkansas soils produce the best aromatic rice and what is the optimum fertility to produce the best milling quality which will meet the consumers’ demands.
PROCEDURES

The aromatic rice breeding program collected parental material from the U.S. breeding programs and the USDA World Collection. Crosses were made to incorporate genes for aroma, yield, improved plant type, superior quality, and broad-based disease resistance. The winter nursery in Puerto Rico is being employed to accelerate generation advance of potential varieties for testing in Arkansas during the summer of 2011.

Analysis of DNA were run on the parents and F$_2$ populations (Boyett et al., 2011). The segregating populations and advanced lines will be observed and evaluated for grain and milling yield, quality traits, maturity, plant height and type, and disease and insect resistance in 2011.

An Aromatic Rice by Nitrogen Rate study was conducted in 2010 to help determine the fertility requirements of the various aromatic rice varieties for optimum aroma quality and yield. Eight rice lines ‘Dellrose’, ‘Jasmine 85’, ‘Jazzman’, ‘JES’, ‘Sierra’, ‘Wells’ and two University of Arkansas experimental lines were treated with six different nitrogen rates: 0, 30, 60, 90, 120, and 150 lb/acre. Typical data was collected on the plant characteristics of heading date, plant height, and lodging. The weight and moisture content of each plot were recorded. Hulled and milled samples from each plot have been shipped to the USDA-ARS Southern Quality Lab located at New Orleans for 2a-p analysis.

RESULTS AND DISCUSSION

In 2010, 13 cross-pollinations were made and the F$_2$ populations will be planted in 2011 at the Rice Research and Extension Center (RREC), Stuttgart, Ark., for observation and selection.

In 2010, F$_2$ lines were selected from five populations which were segregating for 2a-p and cooking quality. Marker analysis was conducted on select plants to detect or determine the characteristics of aroma, cooking quality, and blast resistance. Plants meeting the requirements were harvested and the seed was shipped to the winter nursery in Puerto Rico to advance the lines. Over 200 lines which are homozygous and over 600 lines which are heterozygous for 2a-p and/or cooking quality were planted in the Puerto Rico nursery. The harvested seed from Puerto Rico will be planted at RREC for further observation, marker analysis, and selections in 2011.

Results of the 2a-p analysis from the Aromatic Rice by Nitrogen Rate study were not received in time for publication.
ACKNOWLEDGMENTS

The authors appreciate the Rice Research and Promotion Board’s financial support of this research. We thank Vetress Thompson and Veronica Booth for conducting marker analysis. We thank Dr. Chuck Wilson, Donna Frizzell, Jamie Branson, and Chuck Pipkins for planting and fertilizing the experiments.

LITERATURE CITED