

2009 Progress Report

Kentucky Small Grain Growers Association

Assessment and Improvement of Yield Potential in Hulless Barley

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The Virginia Tech barley project will continue to focus efforts on improving grain yields, starch, and protein content of barley and develop varieties with excellent quality and disease resistance for the Eastern United States. In addition, the project will focus on the development of varieties that provide improved human health benefits and/or improved animal feed value, and/or lessen environmental impacts. Development of these improved varieties will increase the value of barley for fuel, food and feed applications, help retain or expand demand for barley, and promote profitable production for local producers, this will result in an average per acre revenue increase across this region for our growers.

The primary objective of this project is designed to assess and improve the yield potential of both hulless and hulled barley lines derived from common crosses to determine whether the hulless trait or genetic background is the factor causing current yield drag in hulless barley. Marker assisted backcrossing also will be used to transfer the hulless trait into the high yielding cultivar Thoroughbred to obtain hulless lines having similar yield potential minus the hull weight. This transformation should make hulless barley more competitive with traditional hulled barley and will enhance profitability of barley producers.

The second objective is to develop hulless barley varieties comparable in yield to hulled barley and with greater marketability in both domestic and foreign markets and, thereby, make barley an economical cash crop. The proposed research is designed to improve the end use value of barley by developing hulless varieties with high yield, lower concentrations of fiber and phytic acid, and higher metabolizable energy. This transformation should bring the feed value of barley closer to that of corn or wheat. Potential use of barley in ethanol production necessitates the development of high-energy barley varieties with low fiber and beta glucan concentrations. Realization of new markets for barley such as this one would greatly enhance value of this crop.

The Virginia Tech Breeding Program has completed another season (2008-2009) of the barley project. Rapid progress is being made by the program in developing new barley varieties for production in the mid Atlantic region. Emphasis will be placed on improving grain yields, end use quality, and resistance to net blotch, leaf rust, powdery mildew, and scab. Meanwhile, we are pleased to report the release of 'Dan' (tested as VA03H-61) as the third winter hulless barley developed by the Virginia Tech barley breeding program. Advance hulless (VA05H-147 and VA06H-25) and hulled (VA06B-48, VA06B-32 and VA06B-19) barley lines are being considered for potential release. This season (2009-2010), we will continue to assess and evaluate yield potential of hulless versus hulled barley lines derived from crosses made between superior hulled cultivars, such as Thoroughbred, with elite hulless lines (VA06H-25, VA05H-147, VA07H-35, VA07H-31, DAN, and others) to determine the factor(s) resulting in current yield drag in hulless barley.

This year (2009), single heads (approximately one hundred) were selected from four hulled and hulless population subgroups in the F₄ generation derived from crosses between Thoroughbred and Doyce with other advanced hulless and hulled (VA04HDH-6, VA04HDH-19, Spont03-44 and Spont03-48) lines. These heads will be threshed individually, planted in head rows this fall and evaluated to derive pure lines next summer. Hulled and hulless sister lines derived from the same crosses will be evaluated along with parental lines and check cultivars in replicated yield trails at 4 to 5 locations for 2-3 years. In addition, other Thoroughbred crosses in the F₂ and F₃ generations were bulked selected and will be advanced. Last spring (2009), F₁ plants derived from crosses between Thoroughbred and elite hulless lines (Doyce, Dan, VA06H-25, VA05H-147, VA05H-120, VA06H-18WS and VA07H-31WS) were backcrossed to Thoroughbred. This fall DNA Markers will be used to identify individual backcross progeny having the hulless gene in a Thoroughbred genetic background. Additional crosses were made between Thoroughbred and other elite hulless lines possessing resistance to leaf rust, powdery mildew, net blotch and scab to transfer disease resistance as well as hulless genes into Thoroughbred type barley lines.

Significant commercial interest continues to exist for use of barley in ethanol production. In support of this effort, Osage Bio Energy recently broke ground for the first barley-based ethanol and protein-feed production facility in Virginia. The Virginia Tech program will continue to work with interested parties in evaluating the potential of barley for this and other diverse purposes.