Management and Cultivar Effects on Malt-Type Barley Performance and End Use Quality in Virginia

L.D. Boyd, K. Brasier, W.E. Thomason, M.S. Reiter, W.H. Frame, C.A. Griffey, W.S. Brooks

VirginiaTech
College of Agriculture and Life Sciences

Introduction

Craft breweries and the craft beer industry have grown significantly in Virginia and across the country. Currently there are over 150 craft breweries in the state of Virginia, and according to the Virginia Craft Brewers Guild that number is expected to increase by 40% over the next five years; increasing demand for malt type barley in the state and the Mid-Atlantic region. In order to supply this growing industry with quality raw materials from local farmers, evaluation of the impact and value of various management practices for malt barley production is needed.

Objectives

The objective of this study is to quantify the rate and timing of spring N fertilizer that optimizes both malt barley yield and end-use quality in Virginia.

Materials and Methods

- Studies were conducted in 2015-16 at the Tidewater Agricultural Research and Extension Center (TAREC), near Suffolk, VA and at the Virginia Tech Northern Piedmont Research Center (NPC), near Orange, VA. In 2016-17, studies were located at TAREC, NPC and on a private farm in Amelia County, VA, and will be repeated at three locations in 2017-18.
- Experiments were planted in mid October each year using two cultivars, Flavia and Thoroughbred, seeded at 377 seeds m^{-1} in plots of 1.25 by 4.25 m using a Great Plains no-till grain drill.
- Treatments consisted of an incomplete factorial arrangement of rates (0, 33, 78, and 112 kg N ha^{-1}) applied using a backpack sprayer at growth stage (GS) 25 and GS 30 (Table 1) in a randomized complete block design with three replications.

Table 1. Split N treatment application

Treatment	----Timing----	
	GS 25	GS 30
	N rate, kg ha^{-1}	
1	56	56
2	34	78
3	78	34
4	112	0
5	0	112
6	78	0
7	0	78

- At GS 54 flagleaf N concentration was measured by incising the entire flagleaf from approximately 50 adjacent plants in the outer rows of each plot.
- Production practices followed Virginia Cooperative Extension recommendations, with the exception of spring N rate and timing treatments.
- At grain maturity, the entire plot was harvested in the area of 1.25 by 2.74 m using a small-plot harvester and yield determined on a 14% moisture basis.
- Grain moisture and test weight was determined using a dickey-John GAC instrument (dickey-John, Auburn, IL).
- Statistical analysis was performed as analysis of variance using Proc GLM available in SAS 9.4 (SAS Institute, 2012). Mean comparisons were performed using PDIFF test to separate treatment means where F-tests indicate that significant differences exist ($P<0.05$).

Results

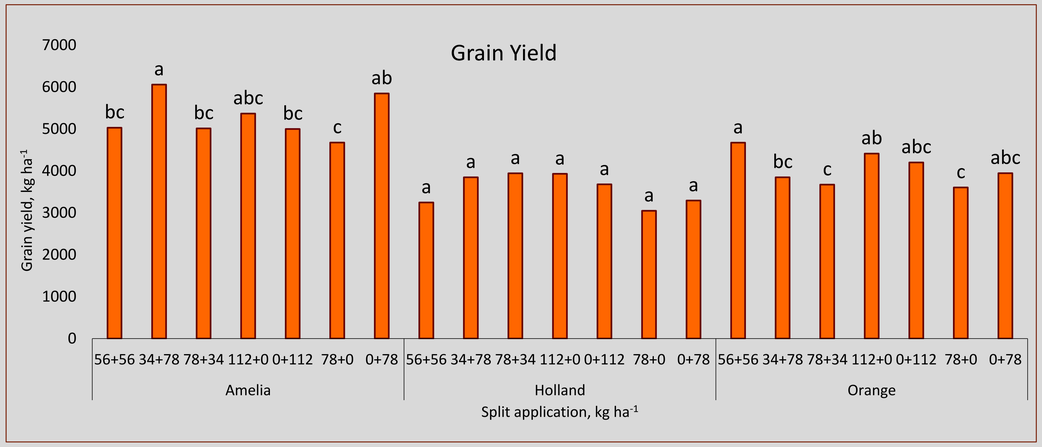

Figure 1. Grain yield (kg ha^{-1}) by split N application treatment at Amelia, Holland, and Orange, VA, 2016-2017

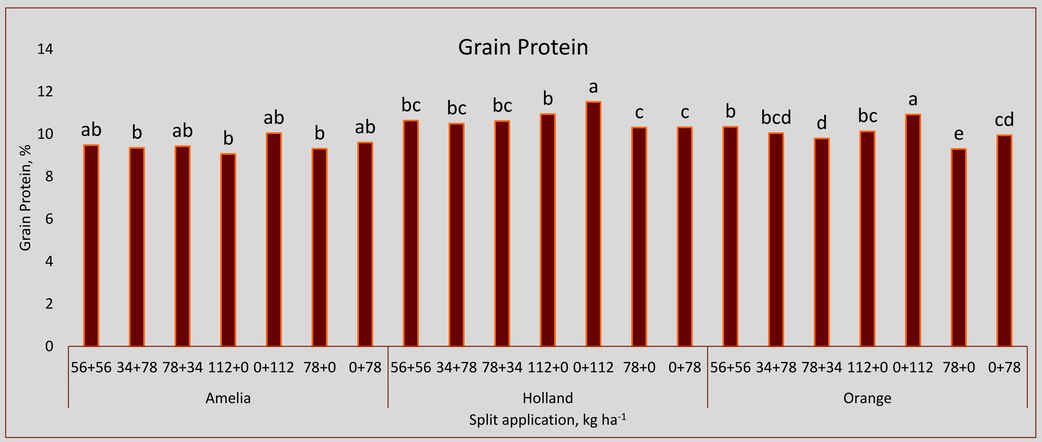

Figure 2. Grain protein (%) by split N application treatment at Amelia, Holland, and Orange, VA, 2016-2017

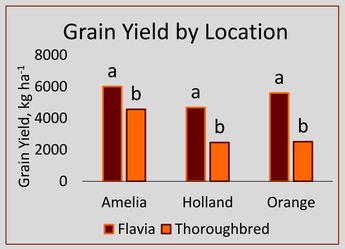

Figure 3. Grain yield (kg ha^{-1}) of Flavia and Thoroughbred at Amelia, Holland, and Orange, VA, 2016-2017.

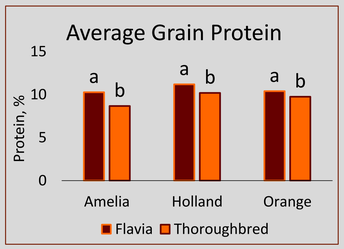

Figure 4. Grain protein (%) of Flavia and Thoroughbred at Amelia, Holland, and Orange, VA, 2016-2017.

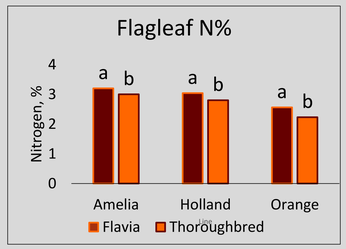

Figure 5. Flagleaf N (%) of Flavia and Thoroughbred at Amelia, Holland, and Orange, VA, 2016-2017.

Summary

- N rate treatments significantly affected grain yield at two locations, Amelia and Orange.
- Split N applications of 34,78; 0,78; and 112,0 kg ha^{-1} resulted in the highest yields at Amelia.
- Split N applications of 56,56; 112,0; 0,112; and 0,78 kg ha^{-1} resulted in the highest yields at Orange.
- Flavia had the highest yields and grain protein across all locations, while Thoroughbred had the lowest.
- The effect of split N application on grain protein was only significant at Holland and Orange.
- All split N applications resulted in grain protein less than 12%.
- Split applications of 0,112 kg ha^{-1} resulted in the highest grain protein at all sites.
- Flavia had the highest flagleaf N concentration at GS 54 compared to Thoroughbred at all locations.