Progress Report
FY20 (October 2019 – September 2020)
David Marshall, USDA-ARS

Increased Evaluation of Malting Barley Breeding Lines and Varieties in North Carolina

Before reviewing the specifics on increased evaluation of our malting barley lines, first is a recap of USDA-ARS field breeding program in North Carolina. In the 2019-20 growing season, we conducted field research at six locations in North Carolina:

Location	Trials	Planting Date	Harvest Date	Description
Plymouth	Malting barley elite; bread wheat elite; Uniform soft wheat elite	10/30/19	5/26/20 to 6/4/20	Good field prep. Good stands and winter growth. Average yield, test weight and grain quality; some preharvest sprouting.
Kinston-Lower Coastal Farm	Malting barley elite and advanced; Uniform bread wheat; 50 seed increases	10/25/19	5/27 to 5/28/20	Good field prep. Good stands; early Hessian Fly infestation and spread; Eight inches of rain after grain was dry resulted in very high preharvest sprouting.
Raleigh	All wheat, barley, and oat trials (12 Uniform trials from across the U.S., as well as ARS-Raleigh lines in three elite, five Advanced, and 2 preliminary trials. In addition, 530 lines in first year yield trials, 4500 head-rows, and 630 segregating populations); 230 seed increases.	From 10/24/19 to 11/4/19	From 5/27/20 to 6/4/20	Good field prep. Good stands and winter growth. Average yield, test weight and grain quality; some preharvest sprouting. Barley elite and advanced trials not harvested due to being in a water-logged spot of the field.
Goldsboro	Organic production of bread wheat elite and malting barley elite trials.	11/1/19	No harvest	Minimal field prep. Poor stands, flooding in December; field abandoned mid-December.
Salisbury	Malting barley elite and advanced; Uniform oats; Uniform bread wheat; and 4 wheat advanced trials.	10/15/19	5/2720 to 6/8/20	Good field prep. Good stands and winter growth. Average yield, test weight and grain quality; some preharvest sprouting.
Laurel Springs	All USDA Uniform wheat & barley trials plus 17 cooperative trials from U.S. breeders. All in single 3ft rows for evaluation to stripe rust.	10/4/19	No harvest	Good field prep. Poor stands due to heavy rains following planting (about one-third lost by mid-November). Excellent inoculation, infection and spread of stripe rust disease. However, prolonged freezing temperatures on May 9 and 10 killed most leaves and heads. No data; field abandoned May 26.

Results from NCSGGA 2019-2020 funds:

The NCSGGA granted $4,000 in 2019-20 to help support our malting barley breeding program. The funds were used to partially pay the salary for one summer employee from May 15-August 31, 2020. This student, from the NC State Ag Institute assisted in field harvest, process the grain, obtain yield-related data, and obtaining initial grain quality data. As with all summer employees, the student also obtained formal training in safety, environmental management, and employee diversity and inclusion. The student also learn to use our field equipment (combine, tractors, threshers); grain processing equipment for yield, test weight, protein, and moisture; and grain quality instrumentation for milling and falling number.

The additional assistance enabled us to obtain timely data on grain plumpness on our malting barleys. This is determined by the percent of grain retained on a 6/64 inch slotted screen (plump grain) and the percent that goes through a 5/64 inch slotted screen (thin grain). The higher the percent plump, the better for malt production. Usable data were available only for the Plymouth and Salisbury locations of the Malting Barley Trial (Table 1). Preliminary data show that yields were average, and test weights and proteins were below average. Plump grain percentages were good and there was no significant difference among the lines listed in Table 1 for thin grain percentage. The line we are recommending for release from USDA-ARS in ARS15B12. It has shown to have the best yield, agronomics, disease resistance, and malting quality compared to commercial varieties.

Table 1. Preliminary data on standard two-row malting barley varieties and selected USDA-ARS experimental lines from the 2019-20 Malting Barley Trial averaged for Plymouth and Salisbury locations.

Entry	Yield	Test weight	Protein	% Plump	% Thin
Calypso	110.1	45.7	8.55	98.0	0.3
Violetta	87.2	44.6	9.15	95.2	1.0
Flavia	82.6	45.6	7.95	97.5	0.7
ARS15B12	111.2	45.2	8.88	96.1	0.8
ARS15B19	74.2	44.9	9.80	96.9	0.9
ARS12W589-n-07	99.4	44.0	7.85	94.7	0.7
ARS12W595-n-05	91.7	44.4	8.50	96.8	1.0
ARS12W587-n-23	100.6	46.7	8.30	95.0	0.6
Trial Mean	83.2	44.3	8.89	93.9	1.1
Trial CV	16.5	3.0	5.73	2.1	50.4
Trial LSD	22.9	2.2	0.85	3.4	0.9