NORTH CAROLINA
Measured Crop Performance
Small Grains 2016

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Official Variety Testing Program

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INTRODUCTION

Across the state, North Carolina growers planted 40,000 acres of oats and 490,000 acres of wheat during the fall of 2015. With the large number of commercially available and prospective varieties of oats and wheat, it becomes difficult for growers to select a superior variety suited for their particular area of the state. To make this decision, the grower needs up-to-date, unbiased, reliable information. The Official Variety Testing Program, in collaboration with the small grain specialists[1] at North Carolina State University, seeks to provide that information through this report.

EXPERIMENTAL PROCEDURE

Entries: Commercial varieties and experimental lines developed by private and public agencies are included in these tests. Any individual or firm is welcome to submit entries to the Official Variety Testing Program. An entry fee is charged for all private entries. During the 2015-2016 growing season, 15 oat entries and 88 wheat entries (57 commercial varieties and 31 experimental lines) were tested in North Carolina.

Locations: Oat trials were conducted at three locations across the state, while wheat trials were conducted at six. Trials were located in the Piedmont, Coastal Plain and Tidewater regions of North Carolina, and were conducted on North Carolina Department of Agriculture Research Stations, as well as, private farms. A list of our cooperators, along with their location, is listed in the Acknowledgments.

Field Plot Design: A unique randomized, complete block design, with four or five replications per entry, was used at each location. Each plot consisted of eight rows, 7.5 inches apart, with 2.5 feet between adjoining plots. Plots were planted as 28 feet long, and ends trimmed after emergence, to establish a uniform plot length of 22 feet. Given the number of wheat entries, the commercial varieties and experimental lines were split into separate trials. Five commercial varieties were included as checks in the experimental trials. Both trials were planted in the same field at each location.

[1] Drs. Angela Post, Christina Cowger and Paul Murphy contributed to wheat variety characteristics.

Crop Management: Cultural practices, such as seedbed preparation, date of planting, fertilization and topdressing were in accord with good farming practices and were uniform for all entries at a given location (Table 2). Prior to planting each test, soil samples were obtained from the test field and fertilizer and lime applications were made accordingly (Table 3). Seeding rate was 23 seed per row-foot. In order to provide pest resistance information (Table 1), the wheat trials were only sprayed for cereal leaf beetle, where necessary.

SEASONAL CONDITIONS

The 2015-2016 growing season began with on-time to late small grain plantings for the OVT program (Table 1).

The fall was characterized by average temperatures and very wet soil conditions, while the winter months experienced average to below-average temperatures. Average and above average temperatures, and above-average rainfall were characteristic of the spring. The crop matured slightly early than normal, which resulted in some varieties experiencing spring freeze damage .

DATA

Plant height: Average height of fully matured plants was measured from ground level to tip of wheat heads for all varieties at all locations. Values are reported as statewide averages.

Lodging: Ratings were recorded prior to plot harvest. These values are reported as statewide averages. Lodging data does not necessarily correlate to harvest yield, as harvest equipment can capture most of the lodged crop. Lodging ratings are recorded on a 1 – 5 scale, where:

1 = almost all tillers are erect
2 = less than 25% of tillers are lodged, or all plants have a slight lean (>60° from ground)
3 = 25 - 50% of tillers are lodged, or all plants have a moderate lean (45° from ground)

4 = 50 - 80% of tillers are lodged, or all plants have substantial lean (<45° from ground)

5 = almost all tillers are lodged

Heading date: Varieties head out at different times. This data can be useful when selecting varieties, both to extend the planting window and mitigate risk of spring freeze damage. Medium and late heading varieties perform best when planted at the start of season, while early heading varieties produce higher yields when planted later in the fall. Early heading varieties are most susceptible to yield loss if a late-spring freeze occurs, while late heading varieties are most likely to avoid damage. Heading date has minimal impact come harvest. Refer to the NC Small Grain Production Guide: http://www.smallgrains.ncsu.edu/production-guide.html for more information. Heading date, insect, and disease ratings for wheat varieties are reported in Table 1. Statewide averages for plant height and lodging data are reported for all wheat varieties in Tables 8 and 9. Averages for plant height and lodging for oat varieties are reported in Table 16.

Yield: Commercial and experimental entries are reported in separate tables since they were planted in separate tests. Yields were adjusted to 13.5% moisture, and reported as bushels per acre based on 32 pounds per bushel for oats and 60 pounds per bushel for wheat. Additionally, all yield values reflect a 23.6% yield reduction to account for small plot border effects that have historically been determined in our field trials. Therefore, reported yields indicate relative performance and may differ from on-farm yields.

Test Weight: This measures grain density as pounds per bushel, while taking grain moisture into account. This information is reported as statewide averages, as well as for individual locations.

COMPARING VARIETIES

Performance of a variety cannot be determined with absolute precision. Even though the tests are conducted in a uniform manner, uncontrollable variability exists among experimental plots due to environmental differences in soil, fertility, moisture, insects, diseases, and other sources of variation. Because this variability exists, statistics are used as a tool to examine differences among varieties. A statistical method of spatial analysis has been used to allow for similarities between neighboring plots based on their location in the field in order to adjust for the unknown environmental variation (Brownie et al., 1993). The particular

spatial model allows for correlations that decrease exponentially as distance between plots increases in both row and column directions.

Coefficient of variation (**CV**) is a relative assessment of trial variability. It measures experimental error caused by variation in management practices and immeasurable factors in the environment as a percent of mean yield for the trial. Lower values generally indicate less variation, hence, a more reliable trial (though high mean yields also tend to produce lower CV).

The average standard error of the mean (**avg SEM**) is listed as a general indicator of trial precision since it measures how well a true variety mean was estimated. Lower values indicate greater trial precision. Avg SEM is calculated as the square root of the average variance of a variety mean.

The size of difference between two varieties, which may have been due to chance variation, is listed at the bottom of each table as the average least significant difference **(avg LSD)**. Varieties whose yields differ by less than the average LSD are not statistically different. Those varieties that are not different from the highest observed yield are denoted in the tables with an asterisk (*). The LSD for comparisons among variety means is applied at the 10% level, which indicates 90% confidence that yield differences are not due to chance variation. The degrees of freedom associated with the LSD (**df LSD**) are also reported in the tables.

Variety performance may appear inconsistent among locations within an area or among years at a particular location. Enough year-to-year variation in weather occurs to make single-year data less predictable than multiple-year data. Research has shown that multiple-year means across locations provide the best prediction of varietal performance. Thus it is important to examine results from more than one location and more than one year to obtain a more accurate picture of relative variety performance.

New varieties are being introduced each year and these varieties are potentially higher yielding than the current varieties. It is suggested that growers plant new varieties on a small number of acres to determine if it is adapted to their farm. Other agronomic characteristics may be as equally important as yield. Yield and characteristic information presented in this report should be used in junction with other available information and personal experience when selecting varieties.

Research conducted at North Carolina State University and several other universities has consistently shown a significant yield advantage where professionally grown/certified seed is used rather than farmer-saved seed. These tests were planted with professionally grown/certified seed provided by the sponsoring agencies. Farmers who use inferior seed sources can expect accompanying decreases in performance.

RESULTS AND DISCUSSION

Oats: Late season lodging was evident. Yield and test weight are presented as statewide and individual performance in Tables 14, 15 and 16, respectively. Yields were average to below average, and test weights were average.

Wheat: Characteristics are reported in Table 1 for both commercial varieties and experimental lines. Rowan and Union trials did not evidence Hessian fly or disease pressure. However, Lenoir, Robeson and Washington trials had a spring infestation of Hessian fly, which damaged tillers and reduced yield. The Lenoir county wheat trials were discarded due to poor precision. Statistical analysis indicated these trials produced a poor estimate of the true mean (see Comparing Varieties section for more detail).

Yield and test weight are presented as average statewide and multiple year performance in (Tables 4 – 9). Performance of individual locations, (Tables 10 – 13). Multi-year data across locations provide the best predictors of performance. Yields were good to below average, and test weights were average.

RECENTLY COMMERCIALIZED EXPERIMENTAL VARIETIES

Since experimental varieties and commercial varieties are now evaluated in separate tests it is now more difficult to represent multi-year data for these varieties until they have been in the commercial test for two or three seasons. This year, to capture these varieties, we are presenting additional data tables for all varieties as a percent of the average control varieties with which producers are familiar. These data are represented as two and three

year statewide averages as percent of the control in Tables 17 and 18. The number of trials and/or locations vary across years for this data.

The control varieties are Syngenta Oakes and Dyna-Gro Shirley which would represent the 100% mark. To give a relative picture of how to interpret this data, take Pioneer 26R20 for example. In 2014, it performed approximately 10% better than the check varieties across all locations in North Carolina. In 2015 it performed similarly to the checks and, in 2016, it again performed 10% better than the check varieties. But note that its ranking varies from year to year. We have represented all available data across locations in the three years to give the most accurate picture of how these varieties perform. No statistical analysis is presented for Tables 17 and 18.

All information found in this report
is available on the web at:
http://www.ncovt.com