

Mississippi Wheat and Oat Variety Trials, 2021

INTRODUCTION

Small grains are grown throughout Mississippi. Wheat is the primary crop, followed by oats. Wheat variety trials were conducted at nine locations, while oat trials were conducted at five locations in Mississippi in 2020–2120. Wheat yields typically range from 40–60 bushels per acre and often produce 60–80 bushels per acre under good management and favorable weather conditions. Oat yields from 50–80 bushels per acre are common.

PROCEDURES

Experimental Design. Experimental design for each crop species at each location was a randomized complete block with four replications. Plots consisted of seven 15-foot rows spaced 7.5 inches apart.

Cultural Practices. Plots were limed and fertilized according to soil test recommendations. Foliar fungicides were not applied to most trial locations to insure that genetic performance of the varieties was evaluated under natural environmental conditions. Herbicides were applied as needed at each location for weed control.

Seed Source. Seeds of all private entries were supplied by participating companies. Seeds of all public varieties were breeder or foundation seed from the state that developed the variety.

Planting Rate. All seeds were packaged for planting at the rate of 20 seeds per foot of row for both crops. Plots were planted with a cone, spinner-divider planter.

Yield. A plot combine was used to harvest the total plot area after the plots were trimmed to a standard length. Harvested seed were converted to bushels per acre (60 pounds per bushel for wheat and 32 pounds per bushel for oats).

Heading Date. At most locations, the heading date for each variety was recorded. This is the date when 50% of the heads were extended above the flag leaf.

Plant Height. The height of plants was measured from the soil to the top of the spike or head.

Lodging. Lodging was rated on a 1–5 scale: 1 = almost all plants erect; 2 = all plants leaning slightly or only a few plants down; 3 = all plants leaning moderately or 25–50% of plants down; 4 = all plants leaning considerably or 50–80% of plants down; and 5 = all plants down.

Seed Test Weight. The test weight for each variety was determined from a composite sample from all replications.

Disease Ratings. All varieties were rated for development of leaf rust and Septoria leaf and Stagonospora glume blotch according to *James' Manual of Assessment Keys for Plant Diseases*. At growth stages 10.5 (spikes emerged) and 11.1 (milky ripe), 10 plants were selected at random from each plot. The percentage of leaf area affected by each disease on the flag leaf was recorded. From these data, an assessment was made of the overall disease response of each variety.

IMPORTANT FACTORS FOR PRODUCERS

Land Selection. Waterlogged soils often limit wheat productivity. Poorly drained, heavy soils of the Delta and bottomland areas of east Mississippi should be avoided.

Seeding Methods. Timely and proper seeding techniques insure rapid, successful establishment of small-grain seedlings. Planting into a moist weed-free seedbed with a grain drill is the preferred seeding method for small grains. Modern drills are capable of seeding in many unprepared (no tillage) as well as traditionally prepared seedbeds. The optimum seeding depth ranges from 1–1.5 inches, depending upon soil moisture status and soil type. Deep seeding is recommended when soil moisture is marginally dry, particularly on light, sandy soils. Producers who do not have grain drills may “rough in” small grains by broadcast sowing on recently tilled soil and covering the seed with a light tillage operation, such as a harrow, field cultivator, or shallow disking. Seeding rates should be increased approximately 25% when utilizing the “rough in” system to compensate for poorer establishment since seeding depth is random and no firming over the seed occurs with this method. When field conditions are too wet to permit tractor operations, or when over-seeding an existing crop, small grains may be aerially broadcast seeded. Seeding rates should be increased about 75% compared with drilled rates since surface establishment is extremely dependent upon ambient environmental conditions. Thus, aerial seeding is usually only recommended for late-planted small grains since evaporation rates are much lower late in the fall and little time remains to seed using normal planting methods.

Seeding Rates. Normal seeding rates for planting with a drill vary from 80–100 pounds of seed per acre, depending upon the variety and planting date. The low rate should be used when planting at the normal date and the higher rates when planting late or when planting conditions are poor. If seed is broadcast and covered with a disk or field cultivator, 100–120 pounds of seed per acre should be planted. When seeding aerially, about 150 pounds per acre should be applied. Seeding rates are similar for oats. This rate should result in final plant stands of approximately 25–30 plants per square foot.

Cold Requirements. Winter varieties of small grains require a certain amount of cold weather (less than 40°F) before the plants will form seed heads. This process is called vernalization. Most of the wheat varieties planted in Mississippi require low temperatures to reproduce; oats do not. In some years, there is not enough cold weather in south Mississippi for some northern-adapted wheat varieties, resulting in little or no seed-head production.

Normally, these varieties have late heading dates at south Mississippi locations. Check adaptation of unfamiliar varieties with an MSU Extension Service agent or seed company representative.

Planting Dates. Planting before recommended planting dates often results in establishment difficulty, increased stress and pest problems (freeze injury, aphids, Hessian fly, and disease). Late planting may not expose wheat plants to cool temperatures long enough for proper development. Recommended planting dates vary according to the region:

| | |
|---------------------|--------------------|
| North Mississippi | Oct. 1 to Nov. 5 |
| Central Mississippi | Oct. 15 to Nov. 25 |
| South Mississippi | Nov. 1 to Dec. 10 |

Disease Management. Several diseases may attack wheat and oat plants in Mississippi. Leaf rust, Stripe rust, and several head diseases are very common. Planting disease-resistant varieties is the most practical and economical method to manage diseases; however, chemical control may be required to control severe outbreaks.

Fertilization. Keep soil pH 6 or higher. Growers should test and apply lime, phosphate, and potash according to soil analysis recommendations. If soybeans follow a wheat crop on heavy soils (clays, clay loams, and silt loams), apply phosphate and potash for the soybean crop before planting the wheat. This practice is not recommended on sandy soils because potash may be leached away. Nitrogen rate recommendations vary from 90–160 pounds per acre depending primarily upon soil texture, with higher rates needed on clay soils. Split application of nitrogen fertilizer is strongly encouraged for wheat production to improve crop-fertilizer use efficiency. One-third or less of the total nitrogen should be applied when dormancy breaks in the spring on tillering wheat. Apply the balance of the nitrogen when wheat becomes strongly erect and stem elongation begins, which generally occurs from late February through mid-March.

Weed Control. Mississippi State University Extension Service Publication 1532, *Weed Control Guidelines for Mississippi*, provides detailed information for controlling weeds in wheat and oats. For more specific information, refer to MSU Extension Information Sheet 961, *Small Grains Production*.

Saving Seed. Many private and public wheat varieties are protected from unauthorized replanting by the Plant Variety Protection Act (PVPA) and/or United States patent. Seed produced from a **patented variety** cannot be planted for any purpose, including nontraditional uses. PVPA-protected seed cannot be sold, advertised, offered, delivered,

consigned, exchanged, or exposed for sale without permission from the proprietary seed owner. In addition, no one can try to buy, transfer, or possess the variety in any way. It also is illegal to clean or condition such seed to sell for planting purposes. Retail dealers, seed cleaners, and consumers all are legally responsible for these violations. An exemption to the 1994 amended PVPA allows growers to collect and save seed produced from any legally purchased PVPA-protected variety. They can use this seed for their *own* future planting, but they cannot sell, trade, or transfer it to *others* for planting purposes. No one can replant a wheat variety

that is **patented** for any reason. For further information please refer to these websites:

MSU Extension Service Information Sheet 1763:
<http://msucares.com/pubs/infosheets/is1763.pdf>

Plant Variety Protection Act
http://151.121.3.150/science/PVPO/PVPO_Act/whole2.pdf

Plant Variety Protection Office PVP Database
<http://www.ars-grin.gov/cgi-bin/npgs/html/pvplist.pl>

United States Patent Database
<http://www.uspto.gov/patft/index.html>

USE OF DATA TABLES AND SUMMARY STATISTICS

The yield potential of a given variety cannot be predicted with complete accuracy. Consequently, replicate plots of all varieties are evaluated for yield, and the yield of a given variety is estimated as the mean of all replicate plots of that variety. Yields vary somewhat from one replicate plot to another, which introduces a certain degree of error to the estimation of yield potential. This natural variation is often responsible for yield differences among different varieties. Thus, even if the mean yields of two varieties are numerically different, they are not necessarily significantly different in terms of yield potential. In other words, the ability to measure yield is not precise enough to determine whether such small differences are observed purely by chance or because of superior performance.

The least significant difference (LSD) is an estimate of the smallest difference between two varieties that can be declared to be the result of something other than random variation in a particular trial. Consider the following example for a given trial:

| Variety | Yield |
|---------|---------|
| Abe | 60 bu/A |
| Bill | 55 bu/A |
| Charlie | 51 bu/A |
| LSD | 7 bu/A |

The difference between variety Abe and variety Bill is 5 bushels per acre (60 - 55 = 5). This difference is **smaller** than

the LSD (7 bushels per acre). Consequently, it is concluded that variety Abe and variety Bill have the same yield potential since the observed difference occurred purely due to chance.

The difference between variety Abe and variety Charlie is 9 bushels per acre (60 - 51 = 9), which is **larger** than the LSD (7 bushels per acre). Therefore, it is concluded that the yield potential of variety Abe is superior to that of variety Charlie since the difference is larger than would be expected purely by chance.

The coefficient of variation (CV) is a measure of the relative precision of a given trial and is used to compare the relative precision of different trials. The CV is generally considered to be an estimate of the amount of unexplained variation in a given trial. This unexplained variation could be the result of variation between plots with respect to soil type, fertility, insects, diseases, weather stress, etc. In general, the higher the CV is, the lower the precision in a given trial.

The coefficient of determination (R^2) is another measure of the level of precision in a trial and is also used to compare the relative precision of different trials. The R^2 is a measure of the amount of variation that is explained, or accounted for, in a given trial. For example, an R^2 value of 90% indicates that 90% of the observed variation in the trial has been accounted for in the trial with the remaining 10% being unaccounted for. The higher the R^2 value is, the more precise the trial. The R^2 is generally considered to be a better measure of precision than is the CV for comparison of different trials.

Table. 1 2020–21 MSU OVT wheat and oat locations and dates.

| Location | Soil type | Planting date | Harvest date | Crop tested |
|-------------|-----------------------------|---------------|--------------|-------------|
| Beaumont | McLaurin sandy loam | 11/12/20 | 6/1/21 | wheat |
| Bolton | Loring silt loam | 11/6/20 | 6/15/21 | wheat |
| Brooksville | Brooksville silty clay | 11/9/20 | 6/24/21 | wheat & oat |
| Coldwater | Calloway silt loam | 11/13/20 | 6/23/21 | wheat |
| Starkville | Marietta fine sandy loam | 11/3/20 | 6/4/21 | wheat & oat |
| Stoneville | Bosket very fine sandy loam | 11/10/20 | 6/16/21 | wheat & oat |
| Verona | Leeper silty clay | 11/4/20 | 6/17/21 | wheat & oat |