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Mississippi Wheat and Oat Variety Trials, 1999

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Introduction

Small grains are grown throughout Mississippi for grain. Wheat is the primary crop, followed by oats. Wheat and oat variety trials were conducted at eight locations in Mississippi in 1998-99. Wheat yields in the range of 30-50 bushels per acre were common, and yields in the 60- to 80-bushel range were produced under good management and favorable weather conditions. Oat yields from 50-80 bushels per acre were 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 20-foot rows spaced 7 inches apart.

Cultural Practices. Plots were limed and fertilized according to soil test recommendations. Foliar fungicides were not applied at branch stations to ensure that varieties were evaluated under maximum disease pressure. Fungicides at off-station locations were applied at producer discretion. Herbicides were applied as needed at each location for weed control.

Seed Source. Seeds of all private entries were supplied by participating companies. Public varieties were selected by the Technical Advisory Committee. Seeds of all public varieties were breeder or foundation seeds 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 wheat and oats. 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 seeds 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 panicle.

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 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 at each location. 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. Avoid the poorly drained, heavy soils of the Delta and bottom land areas of East Mississippi.

Seeding Methods. Timely and proper seeding technique ensures 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) and traditionally prepared seedbeds. The optimum depth ranges from 1-2 inches, depending upon soil moisture status and soil type. Deep seeding is recommended when the soil 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 discing. Seeding rates should be increased about 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 recommended for late planted small grains, since evaporation rates are much lower 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 70-100 pounds of seed per acre, depending upon the variety and planting date. Use the low rate when planting at the normal date and the higher rates when planting late or when planting conditions are poor. If seeds are broadcast and covered with a disk or field cultivator, then plant 100-110 pounds per acre. When aerial seeding, apply about 150 pounds per acre. Seeding rates are similar for oats. This should result in final plant stands of about 20 plants per square foot.

Cold Requirements. Winter varieties of small grains require a period of cold weather (less than 40 ^{o}F) before the plants will form seed heads. The time varies with variety, but approximately 4-9 weeks are required. This process is called vernalization. Most of the wheat varieties planted in Mississippi require low temperatures to reproduce; oats do not. In some years, South Mississippi does not have enough cold weather for some northern-adapted wheat varieties, causing almost 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 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. 05**
Central Mississippi	**Oct. 15 to Nov. 25**
South Mississippi	**Nov. 1 to Dec. 10**

Disease and Disease Resistance. Several diseases may attack wheat and oat plants in Mississippi. Leaf rust, stem rust, and several head diseases are very common. Planting disease-resistant varieties is the most practical and economical control. However, chemical control may be required to control severe outbreaks. For more specific information, refer to *Extension Plant Disease Dispatch M-123* .

Fertilization. Keep soil pH at 6 or higher. Have soil tested and apply lime, phosphate, and potash according to 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. Wheat requires about 2 pounds of nitrogen for each bushel of grain it produces. Apply approximately 25% of the nitrogen in the fall. Apply the remainder in the spring after dormancy breaks but before the second node is visible, which generally occurs from mid-February through mid-March.

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

Use of Data Tables and Summary Statistics

The yield potential of a given variety cannot be measured 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 estimate of yield potential. This natural variation is often responsible for yield

differences seen 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 an estimate of the amount of unexplained variation in a given trial. This unexplained variation can be the result of variation between plots, with respect to soil type, fertility, insects, diseases, drought stress, etc. Overall, the higher the CV, the lower the precision in a given trial.

The coefficient of determination (R2) is another measure of the level of precision in a trial and is also used to compare the relative precision of different trials. The R2 is a measure of the amount of variation that is explained, or accounted for, in a given trial. For example, an R2 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. The higher the R2 value, the more precise the trial. The R2 is generally considered a better measure of precision than the CV for comparison of different trials.

Weather Summary by Location

Location 1 - Prairie Research Unit, Prairie. Soil moisture was good at planting, which resulted in quick emergence after planting. Rainfall was sufficient for the entire growing season. Temperatures were above normal, except for the first 2 weeks of January, when the low reached 10 degrees. There seemed to be no adverse effect on wheat or oats from these low temperatures. Spring growing conditions were favorable for a good wheat and oat grain yield.

Location 2 - Black Belt Branch, Brooksville. Wheat and oats were planted into a dry seedbed, but timely rain 2 days after planting resulted in good emergence. The growing season yielded sufficient rainfall, and temperatures were above normal for the most part. Harvest was delayed slightly because of rainfall.

Location 3 - Hawks Farming, Hernando. Growing conditions were favorable with adequate soil moisture and very warm growing conditions. Timely rainfall coincided with beginning grain fill in April. Dry conditions in May minimized scab. Near-perfect harvest conditions were seen throughout harvest.

Location 4 - Todd Heigle Farm, Issaquena County. The 1998-99 wheat growing season was without a major weather incident during critical growing periods. Rainfall was adequate throughout the season. Temperatures were favorable without being extremely cold during the boot and heading stages.

Location 5 - Paul Mullins Farm, Merigold. This location had good weather for producing wheat in 1998-99. The winter was mild, and there was not an excessive amount of rainfall in the spring. Although the variety trial was planted somewhat late, a good stand developed and disease pressure was minimal.

Location 6 - Brown Loam Branch, Raymond. Sufficient rainfall immediately after planting resulted in good emergence of wheat and oat seedlings. Mild weather throughout the growing season resulted in good plant growth. Overall, the crop appeared to develop earlier than usual. Leaf rust was observed at later stages of crop development and only in small quantities. Septoria leaf blotch was observed but was not severe. The crop was harvested in a timely manner and yields were good.

Location 7 - Coastal Plain Branch, Newton. This wheat and oat growing season saw above-normal temperatures and below-normal rainfall. Adequate moisture and soil temperatures resulted in good emergence and early growth. February, April, and May were very dry compared with the norm, resulting in very little disease. Dry conditions in May allowed the crop to mature and be harvested in a timely manner. Based on observations of the crop, yields seemed to be superior. Birds caused only minimal damage this year, mainly to oats.

Location 8 - Ricky Belk Farm, Minter City. Soil was dry at planting time. The plots got a light rain 2 days after planting, which altered wheat emergence due to slight variation in soil type. After the next rain, all the wheat emerged with a good uniform stand. Winter weather consisted of normal rainfall and mild temperatures. Spring weather consisted of normal rainfall and average temperatures. During this wheat season, there was no long period when the soil was waterlogged.

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- Table 15. 1998-99 oat yields at location 6, MAFES Brown Loam Branch in Raymond (Loring silty loam soil).
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- Table 17. Summary of 1998-99 yields for oat variety trials in Mississippi.
- Table 18. Two-year Summary of 1998-99 yields for oat variety trials in Mississippi

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Commercial Wheat Brands/varieties Entered	
AgriPro Seeds, Incorporated P. O. Box 2365 Jonesboro, AR 72402	AgriPro Mallard AgriPro Mason AgriPro Shelby AgriPro Shiloh AgriPro Marion (was D93*7163) AgriPro Patton
Delta King Seed Co. P. O. Box 970 McCrory, AR 72101	Delta King 9027 Delta King 9051 Delta King 9121 (was XP9121) Delta King 1551W
FFR Seed 969 Cloverleaf Drive Southaven, MS 38671	FFR 522W
ERWIN-KEITH, INC. Route 2, Box 275A McCrory, AR 72101	EK 114 EK 103 (was EK X78753) EK X156 (Exp.)
Genesis Brand Seed P. O. Box 21085 Lansing, MI 48909	Genesis 9939
Novartis Seeds, Inc. P. O. Box 729 Bay, AR 72411	NK Coker 9543 NK Coker 9663 NK Coker 9704 NK Coker 9835
Pioneer Hi-Bred International 6767 Old Madison Pike, #110 Huntsville, AL 35806	Pioneer variety 2643 Pioneer variety 2684 Pioneer variety 2691 Pioneer variety 26R46 (was XW662) Pioneer variety 26R61 (was XW663)
Terral Seed Company, Inc. P. O. Box 826 Lake Providence, LA 71254	Terral LA422 Terral TV 8555 Terral TV 8768 Terral TVX8670 (Exp.)
UniSouth Genetics, Inc	USG 3209

2640-C Nolensville Rd Nashville, TN 37211	(was VA94-54-479) USG 3408 USG 97-41 (Exp.)

Public Wheat Varieties Entered	
University of Arkansas 115 Plant Science Building Fayetteville, AR 72701	Jaypee
Clemson University Crop & Soil Environmental Science Box 340359 Clemson, SC 29634	Clemson 201
North Florida Research and Education Center University of Florida Route 3, Box 4370 Quincy, FL 32351	FL8868 (Exp.)
University of Georgia Georgia Station Griffin, GA 30223	Roberts GA Fleming Moss
Louisiana State University Agronomy Department Baton Rouge, LA 70803	LA85411D4-6-3-1 (Exp.) LA87167D8-10-2 (Exp.)
VCIA Foundation Seed Farm P. O. Box 78 Mt. Holly, VA 22524	Jackson Pocahontas Roane

Public and Commercial Oat Brands/varieties Entered

University of Arkansas 115 Plant Science Building Fayetteville, AR 72701	Bob Ozark
Clemson University Crop & Soil Environmental Science Box 340359 Clemson, SC 29634-0359	Simpson
North Florida Research and Education Center University of Florida Route 3, Box 4320 Quincy, FL 32351	Chapman FL920HR31,314 (Exp.) FL920HR26,763-W1 (Exp.) FLX502-1-B-Q1 (Exp.)
Louisiana State University Agronomy Department Baton Rouge, LA 70803	LA90104C22-7-4-1 (Exp.) LA90113C9-3-3-2 (Exp.)
Terral Seed, Inc. P. O. Box 826 Lake Providence, LA 71254	Secretariat LA495

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