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Mississippi Agricultural and Forestry Experiment Station

Mississippi Wheat and Oats Variety Trials, 1998

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INTRODUCTION

Procedures

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 1997-98. 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.

- **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 insure 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.** Seed of all private entries were supplied by participating companies. Public varieties were selected by the Technical Advisory Committee. Seed of all public varieties were breeder or foundation seed contributed 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 percent 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 percent of plants down; 4 = all plants leaning considerably, or 50-80 percent 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 poorly drained, heavy soils of the Delta and bottom land areas of East Mississippi.
- **Seeding Methods.** Proper seedbed preparation ensures good establishment of small grains. Planting into a moist, weed-free seedbed with a grain drill is the preferred seeding method for small grains. The optimum seeding depth is 1-2 inches, depending upon soil moisture status and soil type. Farmers who do not have grain drills may "rough in" small grains by broadcast sowing on recently tilled soil and lightly covering the seed with a disk, harrow, or field cultivator. Seeding rates should be increased about 25 percent when using 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 operation, small grains may be aerially broadcast seeded. Seeding rates should be increased about 75 percent, compared to drill 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 late in the fall and little time remains to seed using normal 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 seed is 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 weather (less than 40 °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 this State 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 little or no seed-head production. Normally these varieties have late heading dates at South Mississippi locations. Check adaptation of unfamiliar varieties with a MSU Extension Service agent or seed company representative.
- **Planting Dates.** Planting before the recommended 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. 15
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 leach away. Wheat requires about 2 pounds

of nitrogen for each bushel of grain it produces. Apply approximately 25 percent 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.** Mississippi State University Extension Service Publication 1532, *Weed Control Guidelines for Mississippi*, provides detailed information for controlling weeds in wheat and oats. For additional information, also refer to Extension Service 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 estimation 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 by pure 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. In general, the higher the CV, the lower the precision in a given trial.

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

Weather Summary by Location

- **Location 1 - Prairie Research Unit, Prairie.** Rainfall and temperature were above normal for the growth stages of wheat and oats in 1997-98. Conditions were ideal for harvest of wheat. The last couple of weeks before harvest, rainfall was below normal.
- **Location 2 - Black Belt Branch, Brooksville.** A 3-inch rainfall within 5 days of planting greatly reduced stands in the wheat and oat trials, sometimes completely reducing the stands. Above-average rainfall and temperatures defined much of the growing season. By May, temperatures were still above normal, but rainfall was slightly below normal.
- **Location 3 - Hawks Farming, Hernando.** The growing season was wetter than normal through February. Higher temperatures and reduced rainfall allowed normal crop development through the middle of April. Unusually dry and hot conditions during May hastened development, reduced disease pressure, and enhanced grain quality. Harvest went quickly with few weather interruptions.
- **Location 4 - B&R Farms, Mayersville.** The 1997-98 winter wheat-growing season was mild. Winter temperatures were above normal until late March, when several days of below-freezing temperatures were experienced. These temperatures affected early-heading wheat varieties to some extent. The growing season was above normal for rainfall until wheat began to head. It then turned dry and remained so until after maturity.
- **Location 5 - Dulaney Farms, Clarksdale.** Above-average rainfall and temperatures occurred from planting until the end of February. Spring had warmer temperatures and low rainfall through harvest. These conditions helped make up for a somewhat thin stand and produced some fairly good yields.
- **Location 6 - Brown Loam Branch, Raymond.** About one-third of an inch of rain the day after planting resulted in good moisture for germination. Soil temperatures ranged in the mid 50's and slowed emergence of some wheat. A good stand was eventually established. A mild winter resulted in good plant development. Warm spring temperatures aided good grain development. Plots were harvested in a timely manner, and yields were good. No diseases or insects were observed in the plots.
- **Location 7 - Coastal Plain Branch, Newton.** Warm soil and good soil moisture resulted in quick emergence after planting. Rainfall for November and December was average. However, January was very wet, with 12.27 inches of rainfall. Water-logged soils began drying out around mid-February, when nitrogen was applied. Temperatures remained cool all spring but were never excessively cold. Rainfall in April was about 2.5 inches above normal. This rainfall caused only minimal disease pressure, which was depressed in May by very dry conditions (0.27 inches of rainfall). Birds were not a problem this year, and harvest was accomplished on time.
- **Location 8 - South Mississippi Branch, Poplarville.** Rainfall during October and November was above the 30-year average, while temperature was below this average. December rainfall and average maximum and minimum temperatures were lower than normal. January rainfall was more than 9 inches greater than average, and the maximum temperatures were nearly 3 degrees higher. February and March were wetter and cooler than normal. April was cooler and dryer than normal. May was significantly warmer and dryer than normal.

List of Tables

Public Wheat Varieties Entered

University of Arkansas 115 Plant Science Building Fayetteville, AR 72701	Jaypee AR 494B-2-2 (Exp.) AR 584A-3-1 (Exp.)
North Florida Research and Education Center University of Florida Route 3, Box 4370 Quincy, FL 32351	Florida 304
University of Georgia Georgia Station Griffin, GA 30223	GA Dozier Morey GA Stuckey Roberts (was GA 871339, Exp.) FFR 518W (was UGA 87467) Fleming (was UGA-90078)
Louisiana State University Agronomy Department Baton Rouge, LA 70803	LA8952B7-3-1 (Exp.) LA87167D8-10-2 (Exp.)
South Carolina Agricultural Experiment Station Department of Crop and Environmental Sciences Box 340359 Clemson, SC 29634	Clemson 201
Virginia Tech CSES Department, 334-A Smyth Blacksburg, VA 24061	Jackson Pocahontas Wakefield Roane (was VA 93-54-429) VA 94-54-479 (Exp.)

Commercial Wheat Brands/Varieties Entered

Agripro Seeds, Incorporated P.O. Box 2365 Jonesboro, AR 72402	Agripro Mallard Agripro Mason Agripro Shelby (was 92D*4413) Agripro Shiloh Agripro D93*7163 (Exp.)
Delta King Seed Co. P.O. Box 970 McCrory, AR 72101	Delta King 9027 Delta King 9051 Delta King XP9121 (Exp.) Delta King 1551 (was H1551 W)
Elite Seed Inc. 969 Cloverleaf Drive Southaven, MS 38671	FFR 522W
Erwin-Keith, Inc. Route 2, Box 275A McCrory, AR 72101	EK 102 EK X78912 (Exp.) EK X78753 (Exp.)
Novartis Seeds, Inc. P.O. Box 729 Bay, AR 72411	NK Coker 9134 NK Coker 9543 NK Coker 9663 NK Coker 9704 NK Coker 9803 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 XW 662 (Exp.) Pioneer variety XW 663 (Exp.)
Terral Seed Company, Inc. P.O. Box 826 Lake Providence, LA 71254	Terral LA422 (was LA 85422C13-1-4-2, Exp.) Terral TV 8555 Terral TV 8557 Terral TV 8768 Terral TV 8825

Public and Commercial Oat Brands/Varieties

University of Arkansas 115 Plant Science Building Fayetteville, AR 72701	Ozark
North Florida Research and Education Center University of Florida Route 3, Box 4320 Quincy, FL 32351	Chapman
Louisiana State University	LA 90113C1-B-7-B-2 (Exp.)

Agronomy Department Baton Rouge, LA 70803	LA 90117C3-1-AB2 (Exp.) LA 90120C2-3-AB1 (Exp.) LA 90120C2-3-AB2 (Exp.) LA 90325-1-B3-6-3-2 (Exp.) LA 90151C11-2-1 (Exp.)
South Carolina Agricultural Experiment Station Department of Crop and Environmental Science Box 340359 Clemson, SC 29634-0359	Simpson
Terral Seed, Inc. P.O. Box 826 Lake Providence, LA 71254	Secretariat LA495 (was LA 85495-1-B2-AB2)

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