Research Update 1990

Grain Crops

First in Grain Crops Research Update Series

This is the first grain crops research report published in a new series. "Research Update," inaugurated in 1989 by the Alabama Agricultural Experiment Station (AAES). This new series is meant to promote timely reporting of research dealing with a specific crop or commodity, with distribution to all producers of that particular commodity. In this case, the target audience is all Alabama grain crops producers.

For more information about grain crops production and the latest recommendations, please contact your county Extension Service office.

Grain Disease Ratings Available in Variety Reports

Corn

Incidence of virus diseases, maize chlorotic dwarf (MCD) and maize dwarf mosaic (MDM), was determined in corn variety tests at four locations in central and northern Alabama. Levels of MDM were 1 to 3 percent in all tests, which was unusually low. Incidence of MCD was about 0.5 percent in two tests in central Alabama and ranged from 4 to 6 percent at the two northern locations. Several hybrids showing no symptoms of either disease were found at all locations. All virus disease ratings were included in the 1989 Corn Variety Report, which is available upon request from the Department of Research Information, 110 Comer Hall, Auburn University, Alabama 36849.

Wheat

Several fungicides were evaluated for control of foliar diseases on wheat at three locations in the State. Generally, one or two applications of each fungicide were made between the time of flag leaf appearance and emergence of the grain heads. At the Gulf Coast Substation in Fairhope, most of the 30 fungicidal treatments tested gave good to excellent control of leaf rust on susceptible cultivars.

Yield increases associated with fungicidal treatments ranged from 0 to 24 bushels per acre. Similarly, several of the 15 fungicides evaluated at the Sand Mountain Substation in Crossville gave good control of Septoria blotch. No yield increases were associated with any treatment at this location, presumably because the disease did not appear until late in the season.

In additional tests at Fairhope and at the Wiregrass Substation in Headland, initial applications of fungicides were made just after wheat began to tiller, followed by applications at flag leaf or head emergence in an effort to control powdery mildew. The lack of continued development of the disease obviated any evaluation of fungicidal control; however, most of the fungicides controlled leaf rust. Meaningful evaluations of disease control and yield responses in these tests were confounded by heavy infestations of Hessian fly at both locations.

Entries in small grain variety tests at 12 substations and experiment fields throughout the State were

Alabama Agricultural Experiment Station Auburn University
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rated for disease reactions. Generally, disease incidence and severity were higher at most locations than in recent years. Powdery mildew was severe on wheat in most tests during winter and early spring but often did not progress beyond the lower leaves. Leaf rust and Septoria blotch were severe on some wheat entries at many locations. Stem rust occurred on some wheats in south Alabama, but usually at low levels. Downy mildew, an unusual and apparently insignificant disease, occurred sporadically in some wheat entries at one location in north Alabama. All disease ratings were included in the 1989 Small Grain Variety Report, which also is available upon request from the Department of Research Information.

R.T. Gudauskas, A.K. Hagan, and J.M. Mullen

Reseeding Clover Provides Corn Nitrogen Requirements

Nitrogen fertilizers make up the single largest portion of the total synthetic energy required to produce an acre of corn in the United States. One alternative is growing legumes to offset the N needs of subsequent corn crops, but the cost of establishing legume cover crops has been too high and yields of these crops too low to be economically feasible.

This need for reduced N fertilizer and increased legume production led to a series of tests at the Sand Mountain Substation at Crossville and the Wiregrass Substation at Headland. Crimson clover was selected as a legume crop because of its reseeding ability and potentially high yields. Treatments included continuous corn with no winter crops, soybean-corn rotation with no winter crops, continuous corn with fall-planted crimson clover, and soybeans with reseeding crimson clover. Subplots were treated with varying rates of commercial N fertilizer.

At Crossville, soybeans were more effective in providing early-season N, and clover was more effective in providing late-season N. When combined, the system resulted in an even more effective contribution to corn grain yield than that of continuous corn, regardless of N fertilizer rate.

At Headland, the benefits of cropping systems were not as pronounced, and the responses were eliminated by N fertilizer. This suggested that increased yields were due to N and not to a rotation effect. However, the clover and soybean systems combined had an additive effect on corn yield.

At both locations, reseeding crimson clover, in combination with a soybean-corn rotation, consistently produced the highest yields of the systems studied. The two-year test was conducted under both optimal and inadequate rainfall conditions, and inclusion of reseeding clover in the rotation produced the highest yields in both circumstances. By adding reseeding crimson clover to the soybean-corn rotation, researchers were able to provide from 60 to 140 pounds of N per acre for corn.

Under inadequate rainfall conditions, reseeded clover behind soybeans produced 33 percent more dry matter and 31 percent more total N than planted clover at the two locations. Under optimal rainfall conditions, reseeded clover produced 73 percent more dry matter and 72 percent more total N. At Headland, reseeded clover produced up to 140 percent more total N than planted clover. When reseeding clover was first established after corn, there were no significant differences in either whole-plant dry weights or N production, which indicates the differences in subsequent years were due to reseeded versus planted corn, and not to the previous summer crop.

L.J. Oyer and J.T. Touchton

Tropical Corn

A Late Season Option

Tropical corn has been grown in Florida for grain and silage for several years. In north Florida, optimum planting date is from June 10 to July 10. AAES research is looking at how tropical corn can fit into cropping systems in Alabama.

A study at the Sand Mountain Substation in Crossville was designed to determine the optimum nitrogen rate and application time for tropical corn in a fallow system and a system with reseeding crimson clover. The late planting date of tropical corn allows clover to naturally reseed, eliminating the cost of annual seeding.

Tropical Corn Grain Yiel
Clover and Fallow Syste

System	Yield/acre. by I	
	0	45
	Bu.	*Bu.*
Clover...............	45	59
Fallow...............	11	39

Two hybrids, Dekalb X678C and Pioneer X304C, were planted with a no-till planter with in-row subsoilers on June 28 at a seeding rate of 23,000 seed per acre. Yields were reduced due to drought in July and September, and to an early frost (the earliest ever recorded). Grain yields averaged 57 bushels per acre for the Dekalb hybrid, regardless of N application time. The Pioneer hybrid averaged 50 bushels per acre when all N was applied at planting, and 57 bushels per acre when N was split applied (one-third at planting and two-thirds when corn was 12 inches tall).

In the clover system, N application time was not critical. Tropical corn averaged 60 and 62 bushels per acre, respectively, when N was applied at planting versus applied in split applications. In the fallow system, yields were reduced from 53 to 46 bushels per acre when N was applied at planting rather than as a split application. The beneficial effect of the clover mulch is shown in the table.

The benefits of the clover mulch are more striking considering the system eliminates seed costs after initial establishment. Preliminary test results indicate that June 7-20 would be a good "window" for planting tropical corn in north Alabama, and 7 to 14 days later for central and south Alabama, respectively.

Based on the Auburn test, it appears that other nonreleased varieties of tropical corn may perform better than the only variety currently available (Pioneer X304C). Planting depth of Pioneer X304C is critical. In the Auburn tests, plant stands were erratic when seed were planted deeper than 1 inch.

d in
ems

N rate	
90	180
Bu.	*Bu.*
60	64
51	59

D.W. Reeves, P.L. Mask, and J.T. Touchton

Managing N Fertilizer On Winter Wheat

Nitrogen (N) is the most limiting factor in the production of winter wheat in the Southeast. Winter wheat is planted in Alabama in late October to mid-December. About one-third of the fertilizer is applied at planting and the remainder in late win-ter or early spring, when rapid plant growth starts. Winter rains will often delay the application of N and this can result in reduced yields, therefore it would be advantageous to apply all of the N in the fall. Unfortunately, fall-applied N can be lost in some winters through leaching and denitrification.

If nitrification inhibitors could be used to prevent the loss of fall-applied nitrogen, all of the N could be applied at planting and delayed spring application due to wet fields would not be a yield-reducing variable. The objective of this study was to determine if nitrification inhibitors (N-Serve and DCD) would permit fall-only N application.

Wheat was planted in late autumn with N rates ranging from 60 to 150 pounds per acre. N treatments included fall-spring split application and fall application only with no inhibitor (None), N-Serve (NS), and DCD.

Wheat yields given in the table indicate that the standard fall-spring split application of N is superior to fall-applied N, with or without an inhibitor. With fall-spring split applications, yields peaked with 120 pounds per acre N at Brewton and 90 pounds per acre at Monroeville. At these optimum N rates, the inhibitors improved yields when compared to the fall-only N application at Brewton, but they resulted in inferior yields when compared to the fall-spring split application.

R.R. Sharpe and J.T. Touchton

Wheat Yields as Affected by Nitrogen Treatments and Nitrification Inhibitors, 4-year Average

Nitrogen applied, lb./acre	Yield/acre, by N treatment			
	Fall-spring[1]	Fall none[2]	Fall, NS	Fall, DCD
	Bu.	*Bu.*	*Bu.*	*Bu.*
Brewton				
60	34	30	30	34
90	42	31	36	36
120	48	32	39	42
150	49	42	42	44
Monroeville				
60	49	47	49	48
90	56	55	44	52
120	56	53	56	55
150	54	54	53	52

[1]30 pounds per acre applied at planting and the remainder applied in spring.
[2]All nitrogen applied at planting.

Monitoring Nitrogen in Wheat

Some states and private consultants advocate intensive monitoring of wheat during late winter and spring growth to determine whether supplemental nitrogen applications are needed. However, interpretation of plant nitrogen concentrations in wheat is difficult during this period of rapid growth.

Tests at four locations in 1986 showed that conventional N fertilization in late winter resulted in slightly higher N concentrations but considerably higher grain yields than when fertilization was based on weekly monitoring of plant N concentrations. Experiments at the E. V. Smith Research Center in Shorter since 1987 and at the Tennessee Valley Substation in Belle Mina in 1989 have attempted to correlate grain yield with plant N concentration during Feeke's growth stage (GS) 6 to 10.1 (early jointing to grain fill).

Regardless of the time or amount of topdress N applied, N concentration in wheat plants increased rapidly in mid-February (GS4) to mid-March (GS8). Highest grain yields were associated with maximum plant N concentrations above 4.0 percent during GS 6 through GS 10.1. Although plant nitrogen analyses can indicate severe deficiencies, they are of little value in making supplemental N recommendations. These tests indicate that applying all of the topdress nitrogen at or before rapid spring growth begins (GS4), which is the conventional way of topdressing nitrogen on wheat in Alabama, gives best results.

C.C. Mitchell and P.L. Mask

Maximum Wheat Yields Require Sulfur Fertilization

A study to determine sources, rates, and time of sulfur application was conducted at the Brewton Experiment Field and at the Wiregrass Substation in Headland to investigate ways of preventing and/or correcting sulfur deficiencies on wheat.

Although grain yields were low on the sandy soils at both locations, sulfur deficiencies were observed in 2 of the 3 years the test was conducted. At least 20 pounds per acre of topdress sulfate sulfur, such as ammonium sulfate or gypsum, was necessary to consistently prevent yield losses from sulfur deficiencies. Fall-applied sulfate sulfur may be leached out of the rooting zone by the time rapid late-winter and spring growth begins.

Elemental sulfur, such as wettable sulfur powder, is not effective when topdressed in late winter, but may be applied at planting. Elemental sulfur must be oxidized to the sulfate form by soil bacteria before it can be taken up by plants, and bacterial activity in soils is low in cool, winter weather.

Sulfur deficiency is difficult to correct once symptoms are observed. Ammonium sulfate and gypsum always resulted in near maximum yields when topdressed at Feeke's growth stage GS 4 (late tillering). When application was delayed until GS8 (late jointing), yields were about the same as the check, where no sulfur was applied. Deficiencies were easily diagnosed with plant analysis, but soil tests for sulfur were difficult to interpret because of sulfur's mobility in the soil.

C.C. Mitchell and P.L. Mask

Hessian Fly Damage to Wheat

Hessian fly damage has been associated with poor wheat yields over the past 10 years in Alabama. Prior to 1980, outbreaks of Hessian fly occurred only every 7 or 8 years, but during the last decade this species has been a regular pest of small grains.

Extensive field collections of Hessian fly in many different wheat varieties were taken during April and May 1989. Most of the damaging infestations of Hessian fly occurred in central and south Alabama. In wheat examined at several locations in the Tennessee Valley, infestations were low or absent in both susceptible and resistant cultivars. Wheat samples taken from Tallassee, Camden, Dothan, and Fairhope were heavily infested. Commonly planted varieties such as FL 301, FL 302, and Hunter had 80 percent to 93 percent of the stems infested, table 1. In many instances the wheat was a total loss.

A Hessian fly rearing and testing procedure has now been developed and Hessian fly taken from the variety collections are being tested in the laboratory for biotype. Heavy parasite infestation of Hessian fly reduced the efficiency of biotype determination during the winter of 1989. Spring (1990) fly collections will be tested in the laboratory for biotype.

Results of insecticide screening are shown in Table 2.

P.M. Estes

Table 1. Hessian Fly Infestation of Selected Cultivars, 1989

Cultivar	Requests, by region of Alabama			
	Central		South	
	Stems infested	Flies/ stem	Stems infested	Flies/ stem
	Pct.	*No.*	*Pct.*	*No*
Auburn	20.0	0.3	53.3	1.0
Caldwell	26.7	0.7	80.0	2.6
Coker 916	86.7	3.9	46.7	2.9
Coker 9766	46.7	2.0	53.3	1.7
Compton	0.0	0.0	6.7	0.1
Fillmore	20.0	0.3	66.7	4.4
Florida 301	93.3	3.7	93.3	7.6
Florida 301H	--	--	20.0	0.3
Florida 302	80.0	3.2	86.7	5.5
Hunter	--	--	80.0	3.5
Massey	13.3	0.1	6.7	0.2
McNair 1003	53.3	1.3	46.7	0.9
Pioneer 2548	--	--	80.0	7.5
Pioneer 2550	0.0	0.0	6.7	0.1
Saluda	6.7	0.3	26.7	0.3
Stacy	0.0	0.0	0.0	0.0
Terral 817	66.7	3.9	--	--
Tyler	60.0	3.0	--	--

Table 2. Effects of Planting Date and Disulfoton Treatment on Wheat Grain Yield, 1987

Cultivar	Treatment[1]	Yield/acre, by planting date			
		Sept.	Oct.	Nov.	Av.
		Bu.	*Bu.*	*Bu.*	*Bu.*
Fl 3022	No	24	23	21	21
	Yes	30	42	21	31
Terral 8172	No	19	0	19	20
	Yes	19	29	24	24
Masseys	No	24	33	20	26
	Yes	23	35	21	26
Stacys	No	25	27	20	24
	Yes	21	30	21	24

[1]In-furrow treatment of disfuloton at 0.75 pound ai per acre
[2]Susceptible to Hessian fly.
[3]Some tolerance or resistance to Hessian fly.

Ryegrass Control in Wheat

Weed control is a primary concern in wheat production. Annual ryegrass is a common weed species known to reduce wheat yield and quality, and it infests some areas in almost every county in the State.

Two experiments were initiated in the fall of 1988 to evaluate two rates and four application timings of Hoelon® (diclofop) for annual ryegrass control. At the Prattville Field, annual ryegrass seeds were sown broadcast at 20 pounds per acre to the surface of a prepared Lucedale fine sandy loam soil. Saluda wheat seeds were then planted at 70 pounds per acre in 7-inch rows. Hoelon was applied preemergence on September 23, and postemergence on October 13, October 26, and November 11.

At Tallassee, planting was identical to that at Prattville except wheat and ryegrass seeds were planted October 28 into a Norfolk sandy loam soil. Preemergence treatments were applied November 1. Postemergence treatments were applied November 1 and December 8, 1988, and January 12, 1989.

Ryegrass control on May 5, 1989, with Hoelon was good to excellent (82 to 99 percent) with all applications. Wheat yield was good with all Hoelon treatments ranging from 38 to 41 bushels per acre, see the table. Where ryegrass was not controlled, wheat yield averaged 30 bushels per acre, see the table.

Tank mixing Hoelon with 2,4-D resulted in less ryegrass control, ranging from 53 to 87 percent. This antagonism was reduced some by increasing the Hoelon rate. Although ryegrass control with Hoelon plus 2,4-D was considerably less, wheat yield was only slightly less in some instances.

Ryegrass control on May 3, 1989, was excellent (93 to 99 percent) for all Hoelon treatments except for the 1.5 pints per acre rate applied post to ryegrass at the 8-leaf stage (83 percent). Wheat yield for treatments receiving only Hoelon ranged from 22 to 31 bushels per acre. Yield data indicate reduced yields three out of four times when the higher rate (3 pints per acre) was used. The best application rate for Hoelon alone was 1.5 pints per acre and the best time for this application was when the ryegrass had four leaves.

When Hoelon was tank mixed with 2,4-D, ryegrass control was generally reduced. Control was always better with the higher rate of Hoelon, and the larger the ryegrass was at time of application the less control. These data, like those from Prattville, show that adding 2,4-D to Hoelon causes antagonism. When 2,4-D was tank mixed with Hoelon, wheat yield was reduced by an average of 4 to 8 bushels per acre. This reduction was related to less ryegrass control and a moderate degree of 2,4-D injury.

Robert H. Walker

Wheat Yield as Affected by Hoelon and Hoelon + 2,4-D Time of Application and Rate, Prattville and Tallassee, 1988-89

Rate and time[1]	Prattville yield/acre: Hoelon alone[2]	Prattville yield/acre: Hoelon + 2,4-D[2]	Tallassee yield/acre: Hoelon alone[2]	Tallassee yield/acre: Hoelon + 2,4-D[2]
	Bu.	*Bu.*	*Bu.*	*Bu.*
1.5 pints, PRE	38	--	27	--
3.0 pints, PRE	38	--	24	--
1.5 pints, POT 2	39	35	27	23
3.0 pints, POT 2	40	38	29	22
1.5 pints, POT 4	41	38	31	20
3.0 pints, POT 4	40	37	22	22
1.5 pints, POT 8	41	38	29	27
3.0 pints, POT 8	40	38	23	30
Hand weeded	38	38	27	27
Nontreated	30	30	17	17

[1]POT 2 = postemergence to ryegrass with two leaves, etc.
[2]Hoelon 3 EC; 2,4-D amine 3.8.

Heavy Midge Infestation Causes Greatest Sorghum Damage

Sorghum midge is a frequent insect pest of grain sorghum in Alabama and causes serious yield reductions if plants are infested during critical growth periods. To determine the relationship among different population densities of sorghum midge and damage caused to the crop, sorghum bloom stage was monitored to better understand the critical period for midge attack.

Seventy-five percent of the plants (Northrup King Savanna 5 hybrid) grown in the field required 17-18 days to finish flowering when plant growth was uniform, and 65 percent to 69 percent of the plants required 22 days to finish flowering when crop growth was uneven or affected by low temperatures. Flower production was not affected by the insecticides (Lorsban or Sevin) used to control sorghum midge.

Midge infestation was estimated by sampling panicles throughout the period of greatest flower production (about 8 days for uniform sorghum plots and 12 days for uneven plots). Midge populations were not abundant through the bloom period in any of the four planting dates, but the greatest damage occurred in plots with the longest bloom period. Obviously those sorghum plantings were exposed to midge attack longer. Midge population densities varied markedly in the field from one day to another. The mean population densities per sorghum head were 1.8, 2.6, 0.9, and 1.4 adult females in the first, second, third, and fourth plantings, respectively. Midge sampling started 5 to 6 days after sorghum began to flower or when approximately 20-35 percent of the plants were in full bloom.

Yield losses of 3.8 percent, 36.0 percent, 12.1 percent, and 23.7 percent were apparently caused by 1.8, 2.6, 0.9, and 1.4 midges per panicle, respectively. No significant correlation was found between number of ovipositing midges and damage caused to sorghum in the field. However, all plantings except the first one exhibited the greatest yield losses with higher midge densities. Probably the great day-to-day difference in midge populations was responsible for the large variation in yield data.

A. Torres and P.M. Estes

Seeding Rates, Fertility For Grain Sorghum

Grain sorghum is often grown in Alabama as an alternative crop, and is frequently planted in situations in which environmental conditions delay corn planting. Wide ranges in seeding rates and N fertilizer rates are commonly used for sorghum, and research sought to determine if the N fertilizer requirements are related to seeding rates.

Pioneer B8516 grain sorghum was planted on June 26, 1989, at seeding rates ranging from 50,000 to 140,000 seed per acre. N fertilizer (prilled ammonium nitrate) was banded next to the row on July 24 at N rates ranging from 0 to 120 pounds per acre.

As shown in the table, grain yields were relatively low, but were in the expected range for late June-planted sorghum in south Alabama. Peak yields of 64 bushels per acre occurred with the 80 pounds per acre N rate, which is the recommended rate for grain sorghum. Seeding rates had no influence on yields or N fertilizer requirements.

M. Abdoulkadri and J.T. Touchton

Yield of Late Planted Grain Sorghum as Affected by Seeding Rate and N

N rate, lb./acre	Yield/acre, by seeding rate			
	50,000	80,000	110,000	140,000
	Bu.	*Bu.*	*Bu.*	*Bu.*
0	32	34	39	31
40	56	55	59	54
80	64	63	64	66
120	48	64	63	65

Support Grain Crop Research

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