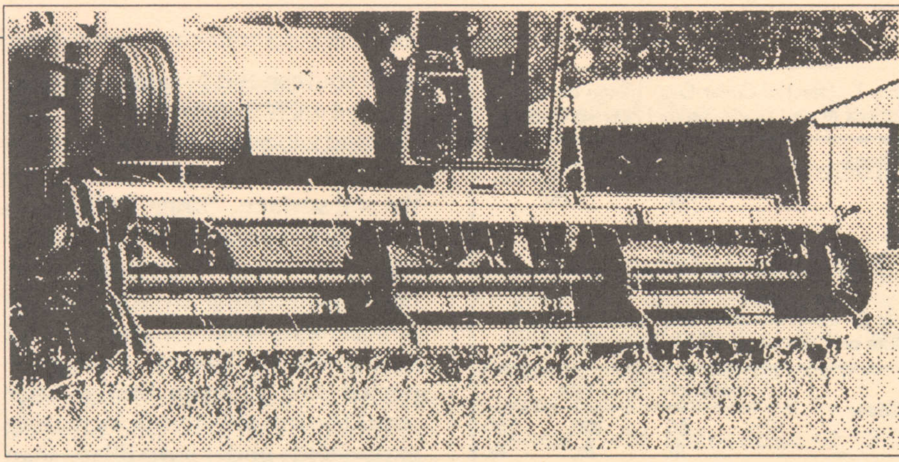

Research Update 1991 Grain Crops

Several Herbicides Tested for Wild Radish Control in Wheat

Wild radish, a member of the mustard family, is a troublesome weed in grain crops in Alabama. It has been reported that wild radish is toxic, particularly the seeds, to farm animals and reduces their performance. The seed are difficult to clean from grain due to similarity in size and shape.

Results of field experiments in 1988-89 and 1989-90 at the Plant Breeding Unit, Tallassee, illustrate the competitiveness of wild radish with wheat. With a single wild radish plant per 10 square feet (4,356 plants per acre), a loss equation indicated wheat yield loss of 17.8 percent for 1988-89 and a 1.4 percent loss for 1989-90. The difference reflected the difference in growth of the wild radish.

Research since 1987 indicates the potential for herbicidal control. First-year findings with Harmony Extra® indicate that a surfactant was needed for best wild radish control and that tank mixing Harmony Extra, X-77 nonionic surfactant, and liquid nitrogen increased wheat injury but degree of injury was acceptable and yield was not affected. Wild radish control in this experiment was good to excellent with the early March application.

Comparisons of fall versus spring application of Harmony Extra as well as fall/spring sequential applications show excellent control with fall application and poor control with spring application. Excellent control was also achieved with the fall/spring sequential application of Harmony Extra and the spring application of Harmony Extra plus 2,4-D.

In another test, Amber® (0.026 and 0.013 pound), Harmony Extra (0.042 and 0.021 pound), Express® (0.012 and 0.008 pound), Buctril® (0.75 and 0.50 pound), MCPA (0.75 and 0.50 pound), and 2,4-D (0.75 and 0.50 pound) provided 95 percent or greater control at an Opelika location when applied alone to weeds no larger than 6-inch rosettes. However, Buctril, Harmony Extra, and Express applied alone at Headland provided less control because weeds were larger at application. Tank mixing Buctril, Express, or Harmony Extra with either MCPA or 2,4-D improved control of the larger wild radish.

Results indicate the need to apply herbicides in November or December for effective wild radish control. Only Buctril, Harmony Extra, and MCPA were labelled for use in 1990.

R.H. Walker, D.R. Wyatt, and J.S. Richburg IIII

Tillage and Cover Crops Affect Corn N Fertilizer Efficiency

An AAES study at the E. V. Smith Research Center was designed to determine if cover crops could, alone or in combination with fall deep tillage (paraplowing), ameliorate soil compaction and increase crop growth and yield potential. The ultimate aim was to improve N use efficiency of a subsequent corn crop.

Winter cover crops of crimson clover, rye, and Tifwhite-78 white lupin were planted following either disking or disking plus paraplowing. A winter fallow treatment was also included.

Tifwhite-78 lupin, a winter hardy

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Alabama Agricultural Experiment Station Auburn University
Lowell T. Frobish, Director Auburn University, Alabama

Tillage and Cover Crops, continued

legume that has potential as a feed grain, was included because research in Australia has shown that another species of lupin, blue lupin, has the capacity to act as a "biological plow" to improve soil structure on compacted soils.

The paraplow is a conservation tillage implement with an offset blade at the end of a straight shank. It effectively disrupts the soil to a depth of 17 inches with a minimum of surface soil disruption.

Prior to planting corn, the cover crops were killed with a burndown herbicide and disked into the soil to a depth of 4 to 5 inches. The corn was then fertilized with 0, 50, 100, or 150 pounds N per acre.

None of the cover crops appeared to work as "biological plows" to improve soil structure. The rye and clover slightly increased soil compaction in the disked zone.

Paraplowing had a strong residual effect in alleviating soil compaction for the subsequent corn crop, but tended to reduce yields, table 1. This effect was greatest during the extremely wet growing season of 1989. Paraplowing reduced earleaf N, table 1, and increased soil water content following rainfall.

Table 1. Effect of Cover Crop Tillage on Corn Earleaf N and Grain Yield, 1988-90 Average

Tillage	Earleaf N	Grain/acre
	Pct.	*Bu.*
Disk	2.56	89
Paraplow	2.50	83

Table 2. Effect of Cover Crop and Fertilizer N Rate on Corn Grain Yield, 1988-90 Average

Cover	Yield/acre, by N rate			
	0	50 lb.	100 lb.	150 lb.
	Bu.	*Bu.*	*Bu.*	*Bu.*
Clover	87	95	111	110
Fallow	42	71	88	101
Rye	23	47	76	96
Lupin	83	108	109	114

These results suggest that paraplowing prior to planting the cover crop increased water infiltration and N leaching.

Yields peaked with 50 to 100 pounds N per acre following clover and lupin and with 150 pounds N following rye and fallow, table 2. White lupin compared favorably to clover in N production and resultant benefit to a corn crop. Lupin winter killed in areas that were poorly drained, but otherwise showed potential as an alternative winter crop for grain.

D.W. Reeves and J.T. Touchton

Broiler Litter and Tillage Systems for Corn

A study at the Wiregrass Substation, Headland, in 1990 investigated utilization of N from broiler litter by corn under strip and conventional tillage systems.

The strip tillage system employed a planter with a leading parabolic subsoiler matched to the planter row width (36 inches) so that tillage only occurred in a narrow band centered on the seed row. Conventional tillage consisted of chisel plowing one day prior to planting and two diskings on the day corn was planted.

Broiler litter rates included 2, 4, and 8 tons per acre, (67, 133, and 267 pounds N per acre). For comparison, matching rates of N as ammonium nitrate were applied. The N sources were broadcast before planting and were incorporated with the second disking in conventional tillage. For strip tillage, only that portion of broiler litter or ammonium nitrate within the tilled zone was incorporated.

Strip tillage resulted in higher grain yields across all N sources and N rates, see table. A 2- to 4-inch-thick hardpan exists at the study location at a depth of approximately 10 to 15 inches below the soil surface. Since 1990 was a drought year at Headland, disruption of the hardpan via parabolic subsoiling in strip tillage apparently increased corn rooting and water availability. It was expected that N from broiler litter would be less effective in increasing grain yields under strip tillage than under conventional tillage management because of N volatilization losses from broiler litter remaining on the soil surface. This was not the case in 1990, a drought year, when water availability appeared to be much more important than N availability.

The ammonium nitrate source produced greater corn grain yields than broiler litter, and the optimum N source/N rate combination was ammonium nitrate at 133 pounds nitrogen per acre. Eight tons of broiler litter per acre (267 pounds nitrogen) were required to approach the yield obtained with 133 pounds nitrogen from ammonium nitrate.

Leaching of broiler litter N below the root zone during the 1990 growing season was not likely because: (1) water demand by corn exceeded rainfall throughout the growing season, and (2) N from ammonium

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Corn Grain Yields and Excess N as Affected by N Source and Tillage System, 1990

N source and rate[2]	Grain yield/acre			Excess N/acre[1]		
	ST[3]	CT	Av.	ST	CT	Av.
	Bu.	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Lb.*
No N	25	14	20	0	0	0
Broiler litter						
67 lb.	66	48	57	39	47	43
133 lb.	65	39	52	110	118	114
267 lb.	104	78	91	215	228	222
Ammonium nitrate						
67 lb.	84	43	64	31	47	39
133 lb.	125	83	104	76	88	82
267 lb.	113	78	96	206	222	214
Average	106	62	84	104	119	112

[1] Excess N = N not found in corn grain.
[2] Broiler litter contained 33.5 pounds N/ton.
[3] ST = strip till, CT = conventional till.

Broiler Litter, continued

nitrate was more subject to leaching than that from broiler litter because most broiler litter N was in the organic form.

Excess N (that not taken up by the crop) can lead to groundwater contamination with nitrate. Because of less available water and lower yields, use of conventional tillage resulted in more excess N than strip tillage. The 133-pound N rate that gave best corn grain production had relatively low amounts of excess N. The broiler litter rate required to produce nearly comparable grain yields (8 tons) left sizable quantities of N in the environmental system. Some of this N is nitrate or will be converted to nitrate and may be leached out of the rooting zone with winter rains. Thus, the potential for groundwater contamination with N exists when high rates of broiler litter are land applied. Winter cover crops such as cereal rye could be used to capture some of this excess N.

Based on one year's data, it appears that strip tillage is superior to conventional tillage with respect to grain yield and N utilization in the Wiregrass region regardless of N source or N rate. It also appears that broiler litter is a less efficient source of N for corn than ammonium nitrate.

C.W. Wood, C.D. Cotton, and J.H. Edwards

Tropical Corn Disappointing In 1989-90 Tests

AAES research in 1989-90 evaluated tropical corn (Pioneer 304C) production systems and measured the crop's response to rates of fertilizer nitrogen, residual levels of soil phosphorus and potassium, and soil pH. The 1989 tests were an intensive small grain-corn-soybean rotation at six locations. In 1990 the study was expanded to add a continuous small grain-tropical corn double-cropping system at seven locations. Plantings were made in mid- to late June following small grain harvest.

Corn grain yields were disappointing in both 1989 and 1990 because of mid-summer insect damage (armyworms and corn earworms) and late summer-early fall drought. Surprisingly, yields were higher in north Alabama than south Alabama where tropical varieties are expected to be better adapted. Worms destroyed the total crop both years at Brewton and Monroeville Experiment Fields despite repeated attempts to control the pests.

Grain harvests in north Alabama were late (November/December) in 1989 and grain moisture was high (approximately 30 percent). In 1990, the crop was harvested only for silage because of a poor grain crop.

Tropical corn appears to respond to nitrogen rates and residual soil nutrients (P, K, and Mg) similar to temperate varieties which were planted on some of these plots in 1968-81.

C.C. Mitchell and P.L. Mask

Tropical Corn Yields[1] Following a Small Grain Crop

Location	Yield per acre: Tropical corn, grain 1989	Small grain[2] 1990	Tropical corn, silage[3] 1990
	Bu.	*Bu.*	*Tons*
Brewton	0	59	0
Monroeville	0	64	0
Wiregrass	36	32	0
Prattville	42	70	0
Upper Coastal Plain	52	29	11.1
Sand Mountain	65 (17.2 tons silage)	46	10.0
Tennessee Valley	35	59	9.5

[1]Yields are an average of plots at seven locations receiving a standard application of N-P-K fertilizer and no irrigaton.
[2]Triticale at Brewton and Monroeville; wheat at other locations.
[3]All silage yields adjusted to 65 percent moisture.

Fungicides Increase Wheat Yields at Some Locations

Results from experiments conducted during 1989-90 again showed that diseases can have a significant impact on wheat yields in some areas of Alabama. Various rates of several labeled and experimental fungicides were sprayed onto plots of McNair 1003 wheat at three substations. Fungicides included were ASC 66811 100E, Bayleton 50W, Dithane M-45, DPX H6573, Folicur 3.6F, RH-7592 2F, Spotless 25W, and Tilt 3.6E. Initial applications of each were made around the time of flag leaf emergence; if needed, a second application was made when the grain heads were beginning to emerge.

At the Gulf Coast Substation, all fungicides tested gave good to excellent control of Septoria glume blotch and leaf rust, and increased yield. Yields from plots sprayed with fungicides averaged 46 to 65 bushels per acre, as compared to 34 bushels from the unsprayed plots. Only leaf rust occurred in the tests at the Wiregrass Substation, and then at relatively low levels. All fungicides reduced the disease, but yield

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Fungicides, continued

responses were not as marked as at the Gulf Coast Substation. Yields from fungicide-treated plots ranged from 40 to 61 bushels per acre; those from unsprayed plots averaged 45 bushels. At the Sand Mountain Substation, most of the fungicides tested reduced the levels of Septoria leaf blotch, the only disease that developed in this test, but there were no significant yield increases from any fungicide treatment.

R.T. Gudauskas and D.J. Collins

Hand-held Meter Predicts Corn N Needs

Methods of predicting nitrogen (N) needs by corn have not been reliable for Southeastern conditions. Soil tests have shown little success. Corn leaf tissue tests for N have shown promise, but time involved with sampling and laboratory analyses may prevent timely producer response to corn N needs.

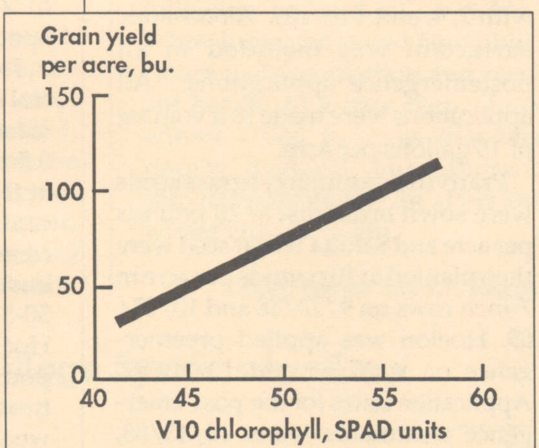
Measuring corn leaf tissue chlorophyll, which is directly related to corn leaf tissue N, may be an equivalent means of determining the need for supplemental fertilization. In a field study in 1990 at the E. V. Smith Research Center, use of a newly developed chlorophyll meter to predict supplemental N needs in corn showed promise. The meter is lightweight (less than 1/2 pound), is powered by batteries, provides instantaneous readings (SPAD units), and can store up to 30 readings.

Irrigated corn (Dekalb 689) was grown at the site and was fertilized with broadcast-applied ammonium nitrate at rates of 0, 50, 100, 150, 200, 250, and 300 pounds N per acre to establish a range of grain yield and chlorophyll tissue levels. Chlorophyll was measured at the 10-leaf stage (V10) because this stage of growth would allow supplemental N applications to the corn crop.

Corn grain yields increased with increasing rates of N fertilizer, with peak yields at approximately 150 to 200 pounds nitrogen.

Chlorophyll measurements at V10 did an excellent job of predicting corn grain yields, as illustrated by the graph. Chlorophyll measurements for the N rate that produced top yields (150 to 200 pounds N) were between 55.5 and 56.7 SPAD units. This suggests that supplemental N may be needed if chlorophyll readings are below 55.5 SPAD units at the V10 stage of growth.

C.W. Wood and D.W. Reeves



Boron Fertilizer Not Necessary for Irrigated Corn

Coastal Plain soils of Alabama are low in extractable boron and it is often assumed that irrigated corn needs boron applications for maximum yields. However, this was not

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Disease Problems Reduced in 1990 Corn and Small Grains

Incidence and severity of diseases in grain crops were low in 1990 (in some cases lower than in 1989). Detailed results have been reported in the Corn Variety Report and Small Grain Variety Report, which were issued by the AAES in late 1990.

Corn. Levels of the virus diseases maize chlorotic dwarf (MCD) and maize dwarf mosaic (MDM) were unusually low in regular corn variety tests and in the general crop statewide. Low incidence of both precluded meaningful comparisons of hybrid performances at the Black Belt Substation, Marion Junction, and the Prattville Experiment Field. In tests of 49 hybrids at the Tennessee Valley Substation, Belle Mina, and the Upper Coastal Plain Substation, Winfield, incidence of MCD ranged from 0 to 10.5 percent, and averaged 0.9 percent; MDM levels ranged from 0 to 11.6 percent, and averaged 0.5 percent. Several hybrids at both locations showed no symptoms of either disease.

Small Grains. Most of the common diseases occurred in the small grain variety tests planted at 12 substations and experiment fields throughout the State. However, the incidence and severity were generally lower than in 1989. Leaf rust was light to severe and Septoria blotch was moderate to severe on wheat entries at most locations. Outbreaks of powdery mildew occurred in tests at the Sand Mountain Substation, Crossville, and the Wiregrass Substation, Headland; otherwise, its incidence was generally light. With few exceptions, only trace levels of barley yellow dwarf were noted in

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Boron Fertililzer, continued

true in an AAES field test at the E. V. Smith Research Center on Goldsboro soil.

Boron treatments of 0, 2, and 4 pounds per acre were applied as four split applications each year. Nitrogen and sulfur fertilizers were applied at the same times. All phosphorus, potassium, and zinc fertilizers and lime were incorporated before planting each year. Irrigation treatments were: (1) no irrigation, (2) drip irrigation with control tensiometers at a depth of 6 inches, and (3) drip irrigation with control tensiometers at a depth of 13 inches.

Three-year average yields for the treatments were:

No irrigation
No boron .... 100 bu.
2 lb. boron .... 107 bu.
4 lb. boron .... 106 bu.

Drip irrigation, 13-in. control
No boron .... 205 bu.
2 lb. boron .... 206 bu.
4 lb. boron .... 187 bu.

Drip irrigation, 6-in. control
No boron .... 214 bu.
2 lb. boron .... 207 bu.
4 lb. boron .... 212 bu.

Although boron applications did not increase grain yields, they did increase the earleaf boron concentration at silking from 14 to 26 parts per million. Thus, boron from the fertilizer was available to the crop.

J. W. Odom

Disease Problems, continued

wheat. Incidence of loose smut was low everywhere, and stem rust was not seen in any test in 1990. On oats, crown rust was moderate to severe on most entries at the Gulf Coast Substation, Fairhope, and the Wiregrass Substation, as was leafspot at the Piedmont Substation, Camp Hill, and barley yellow dwarf at the Tennessee Valley Substation. Septoria blotch was prevalent on triticale entries at all locations.

R.T. Gudauskas

Annual Ryegrass Controlled in Wheat with Postemergence Hoelon Application

Annual ryegrass is a common and pernicious weed species that is a problem in wheat production. Forty annual ryegrass plants per square yard have been shown to cause wheat yield reductions of 19-26 percent. Reduced grain quality is also caused by ryegrass seeds.

Ryegrass control experiments were conducted in 1988-89 at Prattville and Tallassee and at Prattville, Tallassee, and Marion Junction in 1989-90. Two rates and four application timings of Hoelon® herbicide were compared. Hoelon was applied at 0.5 and 1.0 pound ai (active) per acre preemergence and postemergence to ryegrass with 2, 4, and 8 leaves. A non-ionic surfactant was included in all postemergence applications. All applications were made in a volume of 15 gallons per acre.

Prattville. Annual ryegrass seeds were sown broadcast at 20 pounds per acre and Saluda wheat seed were then planted at 70 pounds per acre in 7-inch rows on 9/22/88 and 10/22/89. Hoelon was applied preemergence on 9/23/88 and 10/22/89. Application dates for the post-emergence treatments were: 10/13/88, 10/26/88, 11/11/88, 12/4/89, 1/3/90, and 2/6/90, which corresponded to ryegrass growth stages of 2, 4, and 8 leaves for the respective years.

Two-year average ryegrass control at harvest was good to excellent (80 to 98 percent) with all Hoelon applications. Slightly less control was evident when Hoelon was applied at 0.5 pound ai per acre at the 4-leaf stage (85 percent) and both rates at the 8-leaf stage (80 to 82 percent), but this did not translate into lower wheat yields.

Wheat yield with all Hoelon treatments ranged from 58 to 70 bushels per acre. Yield averaged 68 and 58 bushels, respectively, for the hand-weeded and non-weeded treatment. Test weight for all Hoelon treatments ranged from 56 to 57 pounds per bushel, compared to 56 pounds for the non-treated and 57 pounds for the hand-weeded treatment.

Tallassee. Planting was identical to that at Prattville except wheat and ryegrass seeds were planted 10/28/88 and 10/25/89. Preemergence treatments were applied 11/1/88 and 10/25/89. Postemergence treatments were applied 11/22/88, 12/8/88, 1/12/89, 11/24/89, 1/22/90, and 2/26/90, which corresponded to ryegrass growth stages of 2, 4, and 8 leaves for the respective years.

Two-year average ryegrass control at harvest was 86 to 98 percent for all Hoelon treatments, except the 0.5-pound rate applied to ryegrass at the 8-leaf stage averaged 76 percent control. Wheat yield for Hoelon treatments ranged from 50 to 62 bushels per acre. Test weight was 50-51 pounds per bushel for all Hoelon treatments, and 49 and 50 pounds, respectively, for the non-treated control and for the hand-weeded treatment.

Marion Junction. This location was not included in 1988. Planting was identical to the above except wheat and ryegrass seeds were planted 10/30/89. Preemergence treatments were applied 10/30/89. Postemergence treatments were applied 12/5/89, 2/28/90, and 3/13/90, which corresponded to the three growth stages.

Ryegrass control at harvest was good to excellent (83 to 95 percent) for all Hoelon treatments, except for both rates applied to ryegrass with 8 leaves. The 0.5-pound rate

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Annual Ryegrass, continued

provided only 63 percent control, while the 1.0-pound rate averaged 75 percent. There was a trend for wheat yield to be higher for Hoelon applied at either rate to ryegrass with 2 leaves and the 0.5-pound rate applied at the 4-leaf stage. Also, the 1.0-pound rate applied preemergence produced good ryegrass control and high wheat yield.

Hoelon offers the grower a good chemical tool for control of annual ryegrass in wheat. Postemergence application at 0.5 pound ai per acre to ryegrass with 2 to 4 leaves appears to be the optimum rate and time of application. On heavy clay soils, preemergence application of Hoelon at 1.0 pound ai per acre may be advantageous if problems with postemergence applications are likely due to wet soils.

R.H. Walker, D.R. Wyatt, and J.S. Richburg III

CONTRIBUTORS TO GRAIN CROPS RESEARCH PROGRAM, 1990

Wheat and Feed Grains Producers
E.I. DuPont de Nemours and Co.
Fermenta ASC Corporation
Gustafson, Inc.
Mobay Corporation
Rohm and Haas, Inc.

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February 1991 9M

Composted Broiler Litter Good as Corn Fertilizer

Broiler litter has long been recognized as a good source of nitrogen (N) for corn production. However, it is known that too much litter can reduce yields of corn and lead to a loss of N that could otherwise be used for plant growth. Much of the N present in fresh litter is readily available for plant use or lost to the atmosphere as a gas. Composting litter converts N to forms that are not as readily lost to the environment.

Tests at the Sand Mountain Substation, Crossville, compared corn yield response to ammonium nitrate, fresh broiler litter, and composted litter at several rates. Despite a dry, hot growing season, corn responded equally well to all three sources of N. Grain yield data indicate that rates of fertilizer exceeding 80 pounds of N per acre had no benefit. This corresponded to 2,080 dry pounds of fresh litter, 3,600 dry pounds of compost, and 235 pounds of ammonium nitrate per acre applied at planting.

R.P. Flynn and C.W. Wood

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