



## RESEARCH UPDATE 1993

# G R A I N

### A New Way for Determining the Nitrogen Requirement of Wheat?

Applying too little nitrogen (N) to wheat results in reduced grain yield, yet applying too much N is not economical and poses an environmental threat to groundwater. Researchers are testing a new method for determining the N status of wheat at critical growth stages, which may help producers calculate N status more rapidly and accurately.

Recently, hand-held meters that correlate leaf greenness to chlorophyll concentration in the plant have become available in the United States. Because chlorophyll is comprised largely of N, the readings from these meters may be useful for determining the N status of crops, such as wheat. Though most methods of determining N status of crops require that plant samples be sent

to a laboratory for analysis, chlorophyll meter measurements are easily made in the field.

A field study at the E.V. Smith Research Center recently evaluated the effectiveness of these meters under different management conditions. The study was a cooperative effort by the Alabama Agricultural Experiment Station and the USDA Agricultural Research Service and was supported in part by the Alabama Wheat and Feed Grain check-off program.

Saluda wheat was sown following disk harrowing with and without deep tillage using a paraplow. Nitrogen rates are shown in the table. Half the plots received an application of Tilt<sup>®</sup> fungicide when the flag leaf first emerged. Whole plant samples were

collected at the late tillering stage and just prior to jointing for determination of dry weight and nitrogen. At flowering, flag leaf samples were taken for nitrogen analysis. In 1991, at these three sampling times, leaf greenness also was measured

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### Tropical Corn Performs Well Under Reduced Tillage

Tropical corn, because of its late planting date, may fit well in a double cropping system with winter wheat using a no-tillage or reduced tillage system. However, limited data are available to describe tropical corn response to various aspects of reduced tillage production.

An Alabama Agricultural Experiment Station study was conducted in 1992 at the E.V. Smith Research Center, Shorter, and at the Sand Mountain Substation, Crossville, to evaluate the performance of tropical corn when grown in a strip-tillage system. A secondary objective was to determine the response of tropical corn to starter fertilizer.

Pioneer 3072 corn was planted at both locations following an in-row subsoiling (strip tillage) of wheat stubble. Thirteen starter fertilizer treatments were applied at each location, consisting of various combinations of nitrogen (N), phosphorous (P), potassium (K), and sulfur (S). Nitrogen was applied at a constant rate of 150 pounds per acre. Corn was planted on June 1

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EFFECT OF MANAGEMENT PRACTICES ON WHEAT GRAIN YIELD AT E.V. SMITH RESEARCH CENTER, 1990-1991

Treatments	Nitrogen, lb./a									
	1990					1991				
	0	40	80	120	160	0	40	80	120	160
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.
Paraplow										
Tilt	11	22	40	43	44	7	18	23	27	24
No fungicide	10	20	37	40	35	6	14	17	16	16
Disk										
Tilt	10	21	38	47	45	7	12	18	22	22
No fungicide	8	19	36	37	41	2	10	12	13	13



## Nitrogen Requirement of Wheat, continued

with a Minolta SPAD-502<sup>®</sup> chlorophyll meter.

In 1990, there was little response to paraplowing, but application of Tilt did increase yields. Maximum yields were obtained with 120 pounds of N per acre, as shown in the table. At the 160 pounds N per acre rate, paraplowing without Tilt application actually reduced yields. Wheat yields throughout the State were poor in 1991 due to scab head blight. In 1991, the highest yields were obtained with 120 pounds of N per acre in conjunction with paraplowing and Tilt application.

Of all the measurements taken, the best predictor of yield was plant nitrogen uptake just prior to jointing. Plant N uptake at this time explained 85 percent of the differences in yield among the treatments. Dry matter measurements and chlorophyll meter

readings taken just prior to jointing were nearly equal to plant N uptake measurements in predicting wheat yield. These two measurements together explained 81 percent of the differences in yield.

Because dry matter weights and chlorophyll meter readings accounted for such a significant amount of the variation in yield in this experiment, these two measurements might be used to predict the amount of N fertilizer needed by wheat at this growth stage. Since this is the growth stage of wheat when the bulk of the N fertilizer is applied, and since both of these measurements can be conducted easily on the farm, this technology appears practical. Additional research is underway to fully test this procedure.

D.W. Reeves, R.C. Kingery, P.L. Mask,  
and C.W. Wood

## Soilborne Virus Widespread in Wheat

Soilborne wheat mosaic virus (SBWMV) was found for the first time in Alabama in 1989 in two wheat fields in Autauga County. Research conducted during the past 3 years has shown that the virus is widespread in the State.

SBWMV persists in the soil in association with the plant parasitic fungus *Polymyxa graminis*. Wheat plants become infected with SBWMV when spores of the fungus penetrate wheat roots. Chlorotic striping and mosaic symptoms develop on the leaves during late winter and early spring following infection.

Results from serological tests of leaves and roots collected from randomly selected wheat fields during February-May, 1990-1992, showed that the virus occurred in at least one field in 30 counties, including all of those on the Florida and Tennessee borders and several throughout central Alabama. This widespread occurrence indicates that the virus likely has been present for many years in Alabama, but any effects on the wheat crop previously went undetected or were attributed to other causes.

Effects of SBWMV on performance and yields of wheat in Alabama are not known. However, evaluations of more than 70 wheat cultivars in on-farm tests and in regular small grain variety trials during the past 3 years indicate that there are differences in susceptibility to the virus. SBWMV ratings of these cultivars were included in the Small Grain Variety Report, which was issued by the Alabama Agricultural Experiment Station in late 1992. Copies of the Small Grain Variety Report are available from: Research Information, 110 Comer Hall, Auburn University, AL 36849.

R.T. Gudauskas, P. Jin, D.J. Collins,  
and P.L. Mask

## Urea Best Choice of N for Aerial Application to Corn

Every 2 to 3 years, areas of Alabama experience excessive spring rainfall that leaches or denitrifies the nitrogen (N) applied at planting. When the crop is at or near tasseling, many producers will see the damaging effect that wet soil has had on the crop and resort to expensive aerial applications of N.

Will application this late save the crop? Should N be applied at greater rates than a producer would normally sidedress with ground equipment? What forms of N are the best for this application method? Will fertilizer burn offset the benefits of aerial application?

These questions were addressed in a 1992 test at E.V. Smith Research Center, Shorter. The experiment used three rates of N as urea, ammonium nitrate, and a 30 percent urea-ammonium nitrate (UAN) solution applied over the top of the corn at normal topdressing (V10 stage) and at early silking. Soil was kept extremely moist with irrigation water. Plant damage from fertilizer burn was measured 2 days after each application.

Delaying N application until silking resulted in an average loss of 35 bushels per acre compared to what could have been made if the same rate was applied at the V10 stage. However, the silking application resulted in about 30 bushels per acre more than would have been made if no N was applied.

Results of this study show that urea is the material of choice if an aerial application is necessary because it is the most concentrated dry N source available and would be the least expensive to apply. Results also suggest that ammonium nitrate could be used if it is the only material available. Nitrogen solutions should be avoided because of foliar burn indicated in the study, particularly if the application is made late in the growing season. There seems to be a slight yield advantage to using higher rates of urea but, if ammonium nitrate is used, a total N application of 120 pounds N per acre, the standard rate, appears adequate.

C.C. Mitchell



## Tropical Corn, continued

at E.V. Smith and on June 17 at Sand Mountain.

During the 1992 growing season, substantial silage yields were obtained at both locations. Silage yields averaged 16.9 and 16.5 tons per acre at E.V. Smith and Sand Mountain, respectively. These yields were not affected by any of

the starter fertilizer treatments.

Grain yields during 1992 averaged 111 and 104 bushels per acre at E.V. Smith and Sand Mountain, respectively. A response to starter fertilizer was obtained at both locations. The data indicate that higher yields were obtained from those starters that contained N.

Initial results of this study demonstrate that tropical corn performs well in a reduced tillage system and that it may be a suitable alternative crop for Alabama.

S.E. Alley,  
G.L. Mullins, and  
D.W. Reeves

TROPICAL CORN SILAGE AND GRAIN YIELDS FOR SELECTED FERTILIZER TREATMENTS, 1992

Starter treatment		E.V. Smith		Sand Mountain	
Nitrogen, lb./acre	Phosphorus, lb./acre	Silage yield/acre	Grain yield/acre	Silage yield/acre	Grain yield/acre
		Tons	Bu.	Tons	Bu.
0	0	15.9	106	17.3	96
10	0	15.8	108	15.3	104
20	0	17.7	118	16.5	111
20	10	18.0	113	17.1	109
20	20	18.1	113	16.0	104

## Ratings Indicate Reactions to Various Diseases

Disease ratings of entries in regular variety tests have been reported in the 1992 grain crop variety reports. The following is a brief summary of those findings.

Levels of virus diseases maize chlorotic dwarf (MCD) and maize dwarf mosaic (MDM) were extremely low in the 1992 regular corn variety tests. In tests of 44 hybrids at the Black Belt Substation at Marion Junction, Prattville Experiment Field at Prattville, Sand Mountain Substation at Crossville, and the Upper Coastal Plain Substation at Winfield, incidence of MCD ranged from 0 to 4.8 percent, and averaged 0.94 percent. Levels of MDM ranged from 0 to 2.8 percent, and averaged 0.29 percent. Several hybrids at all locations showed no symptoms of either disease.

With some notable exceptions, disease incidence and severity were generally light in the small grain variety tests. Leaf rust was severe on most wheat entries at the Gulf Coast Substation, Fairhope, and the Monroeville Experiment Field, Monroeville. Leaf rust was

moderate to severe on many entries in the tests at Brewton and Prattville Experiment Fields, Wiregrass Substation at Headland, and the Tennessee Valley Substation at Belle Mina.

Septoria blotch also was extremely severe on most wheats in the Gulf Coast and Prattville tests, on many in the Tennessee Valley and Upper Coastal Plain tests, and on some in the Black Belt, Wiregrass, and E.V. Smith tests.

Incidence of the virus disease barley yellow dwarf generally was much greater than last year, particularly in the tests in north Alabama. Soilborne mosaic, another virus disease, was found on a few wheats in most tests in central and south Alabama. Powdery mildew developed to significant levels at most locations in south Alabama and in the Prattville and Sand Mountain tests.

On oats, disease incidence was generally modest at all locations except the Gulf Coast Substation where leaf rust and Septoria blotch were prevalent on most entries. Septoria blotch commonly occurred on triticales, but

## Effects of Soil Solarization on Southern Blight of Lupins

Lupins are being evaluated as an alternative grain/silage crop in Alabama. Southern blight, a soilborne fungal disease caused by *Sclerotium rolfsii*, has been identified as a potential hazard to lupin production.

Symptoms of the disease include a canker that is formed near the surface of the soil that may girdle the entire stem. Diseased plants are stunted, and they later wilt and die. White mycelium often is seen growing on the soil surface around the plant's base.

Currently, several methods for management of this pathogen are being evaluated, including soil solarization. Soil solarization involves covering the soil with clear plastic to trap sunlight. The sunlight heats the soil, increasing soil temperature enough to reduce pathogen populations.

Soil solarization significantly reduced the incidence of southern blight in the white lupin cultivar Ultra as compared to the bare soil control. Numbers of pods per plant and numbers of plants per plot were greater in the solarized plots than in bare soil. Solarized plots yielded 36 bushels per acre of grain compared to 4 bushels per acre for the bare soil plot.

These results indicate that soil solarization is a viable option for managing southern blight in lupins.

D.J. Collins, C. Stevens, and V.A. Khan

## Disease Ratings, continued

reached apparently damaging levels at only a few locations.

More information on the incidence of these diseases can be found in the Corn Variety and the Small Grain Variety reports, which were published by the Alabama Agricultural Experiment Station in late 1992.

R.T. Gudauskas and D.J. Collins



## Organic Wastes Tested on Corn

In an effort to find new uses for organic waste products, studies conducted through the Alabama Agricultural Experiment Station and the USDA Agricultural Research Service have been evaluating the effects of various waste products on production of row crops. Results have revealed some interesting benefits and differences among crops and treatments.

An earlier study demonstrated that various organic waste products, such as newspaper, wood products, cotton

gin trash, and yard waste, used as soil amendments can improve cotton yields. In this study, broiler litter as an organic and inorganic nitrogen (N) source provided greater yields than commercial nitrogen sources. In addition, shredded newspaper appeared to have a herbicidal effect on grasses in cotton.

A similar test was initiated in 1992 at the Upper Coastal Plain Substation, Winfield, to evaluate the use of various wastes on corn. This study also indicates that broiler litter is a better source

SPRING APPLICATION OF WASTE		
	Source	Corn yield Bu./acre
Newsprint	Litter	86
	No litter	82
Urban waste	Litter	138
	No litter	103
Wood products	Litter	129
	No litter	126
Check		109

of N for the crop, as demonstrated by data in the table. However, plots treated with newsprint produced stunted plants and yields were significantly reduced.

The preliminary results of the corn study suggest that some organic waste products may be ideal for use with corn, while others maybe unsuitable. Additional research on time of application and carbon:nitrogen ratios is needed to learn more about the interaction between newsprint and corn.

J.H. Edwards, R.H. Walker, and R.P. Rawls

## PSNT May Be Useful in the Southeast

The presidedress soil nitrate test (PSNT) is a test that involves sampling soil to a 1- to 2-foot depth for nitrate-nitrogen (N) before applying sidedress N. This test has been used successfully for several years in the Northeast to predict nitrogen needs of corn and is showing potential for use in the Southeast.

Soil nitrate tests in the warm, humid Southeast are difficult to interpret. PSNT, which is used as an index of N availability rather than as an absolute measure of carryover N, could provide farmers a rapid, accurate way to test nitrate concentrations. To evaluate its use, an on-farm test was conducted in Marshall County in a corn field that had been fertilized the previous fall with poultry litter.

The PSNT accurately predicted the need for sidedress N, but the test failed to indicate that the field had been heavily fertilized with poultry litter the

previous fall. Undoubtedly, considerable N mineralization and leaching had occurred during the winter months. However, ear leaf N concentrations, chlorophyll measurements at silking, and yields suggested that plants were getting considerable N from

the soil that was not predicted by the PSNT.

Further evaluation of the PSNT is needed on soils testing higher in nitrates to accurately assess its usefulness in the Southeast.

C.C. Mitchell

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