

FLUID DIGEST®

Research Update from the Fluid Fertilizer Foundation

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Up to 40 bu/A

Sidedressing fluid N boosts corn yields

In one segment of a recently completed 4-year FFF study in Ohio, Eckert of Ohio State University produced up to 40-bu/A increases in no-till corn yields by sidedressing N on a tile-drained Hoytville silty clay soil (Figure 1). The study was multifaceted and drew a number of general conclusions.

Among the variables were:

Application. UAN was broadcast, banded at planting or split applied (banded) at rates varying from 0 to 200 lbs N per acre.

hybrids were used in the study.

Population. Plots were thinned in mid-June to approximate final populations of 20,000 and 28,000 plants/acre.

General conclusions were:

- Split applications offered management flexibility and almost always produced yields equal to or greater than those produced in plots where all the N was applied at planting.
- Positive responses to split applications were dependent on

interactions between hybrid, population, planting date and year of production.

- Split applications may allow farmers to reduce rates to compensate for yield limitations due to later planting.
- Hybrids respond differently to time of application under different conditions.
- Corn planted June 1 generally produced lower yields than that planted on May 1, but often required less N to produce maximum yield.

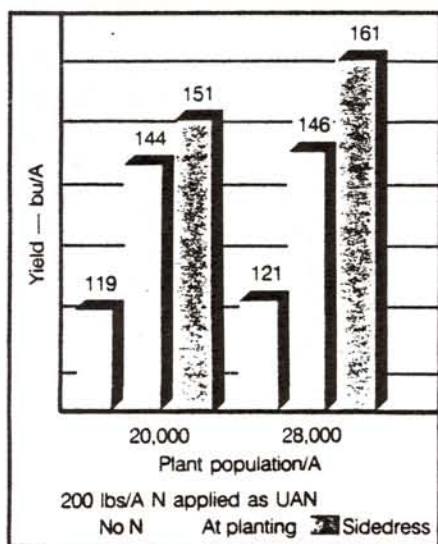


Figure 1. Effect of plant population and N timing on corn yield, using a long-term hybrid (Beck's 65X) planted on May 1 (Eckert, OSU, 1989).

Planting. Corn was planted on either May 1 or June 1 into undisturbed soybean residue at a rate of 33,000 seeds/A.

Hybrid. Both long-season (Beck's 65X) and short-season (Beck's 51X)

In sorghum

Higher yield produced via mixed UAN diet

It already has been demonstrated that combining various nitrogen sources into one fluid mix, using different ratios of ammonium and nitrate, can significantly enhance yield response in corn and wheat. Recent research by Barber and Maddux of Kansas State University now suggests that using such a fluid mix may also work equally well on grain sorghum.

In a 1989 study, the Kansas State researchers compared the yield response effects UAN, urea and calcium nitrate can produce in grain sorghum. The three different forms of fertilizer were applied to separate plots at an N rate of 250 lbs/A. As can be seen from the test results shown in Figure 2, the yield response from the

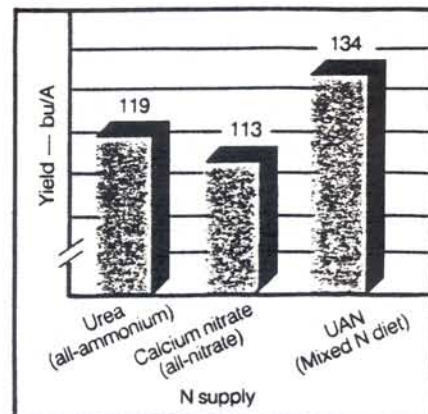


Figure 2. Influence of fertilizer N source on yield of grain sorghum (Barber and Maddux, Kansas State University, 1989).

all-ammonium (urea) or the all-nitrate (calcium nitrate) diet was clearly inferior (by as much as 21 bu/A) to the yield response produced from the UAN mixed diet of ammonium and nitrate.

DIRECT-DIAL HELP!

If you desire detailed information on studies reported in this issue, call Julian Smith:
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Foundation News from your Research Director, Julian Smith



This is always an exciting time of year. Not only is another crop year in prospect, but all the FFF reports are in and are making interesting reading. Much of the data presented in this issue of *Fluid Digest* is "hot from the plots" — cutting-edge fluid fertility research to help you grow crops more profitably.

Two things to think about.

A lot of the 1989 data is preliminary in nature and requires replication on a number of sites in different years. So, a degree of caution is required in interpreting data. However, information is information. An idea that works could be a money-maker with your crops. Try it!

This brings me to the second point.

A good friend of mine once put our business (agriculture) in perspective. As individuals, we probably get 40 opportunities (growing seasons) to get it right in a lifetime. Hotshots on Wall St. or in other businesses get maybe 40 chances an hour!

The point is: yes, we need credible data that are consistent and the FFF will make every effort to continue providing that. If an idea we present looks promising, why not try it? An opportunity missed is potential profit you'll never see again and one less growing season you'll never regain.

This issue covers a lot of nitrogen fertilization technology, which is something we must get right! Competition, economics and the environment dictate this. Remember, N efficiency is only as good as that old "timing, concentration, placement" concept. Same applies to P, K, S and lime. Scrimp on any of these essential inputs and you risk severely limiting the profitability of N applications!

The Foundation is committed to keeping you abreast of the latest in fluid technology. Our intention is to give you the best shots at the limited number of opportunities (growing seasons) you'll have in your lifetime.

J. Julian Smith, PhD.
Vice President, Research

Grain sorghum NP interactions enhance yields

Grain sorghum is a large N user. P is also essential for profitable grain sorghum production. However, most efficient use of these nutrients occurs when they are used in combination. Research by Herron of Kansas State has shown how a combination of N and P produced substantially higher grain sorghum yields in soils testing low in P and where moisture conditions were good, when compared with plots where N (120 lbs/A) and P (80 lbs/A) were used separately (Figure 3).

The practice of combining N and P not only promotes plant uptake but is also environmentally beneficial. Other Kansas studies have shown how fluid P in combination with N has increased nitrogen removal in the grain by 36 percent, minimizing or eliminating any net carryover of N in the soil.

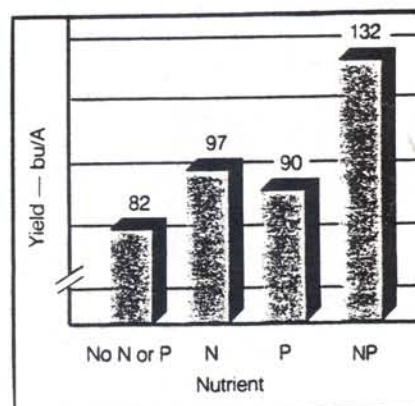


Figure 3. Effect of NP interaction on grain sorghum yield (Herron, Kansas State University).

UAN doubles rice yields

Researchers in Missouri and Arkansas are finding new options for use of fluids in their experimentation on some soils with furrow irrigation (versus conventional flood irrigation). In one study, UAN, broadcast prior to irrigation, more than doubled rice yields (Figure 4). UAN can also be added to the water in the furrows.

Furrow-irrigated rice is a new

technique of growing rice in 38-inch beds. Water is pumped down the furrows at 6- to 8-day intervals. The practice allows rice production on fields open to high water loss if flooded.

Advantages include: no levees required, possible use of beds for other crops, water savings as high as 50% and ground application of pesticides.

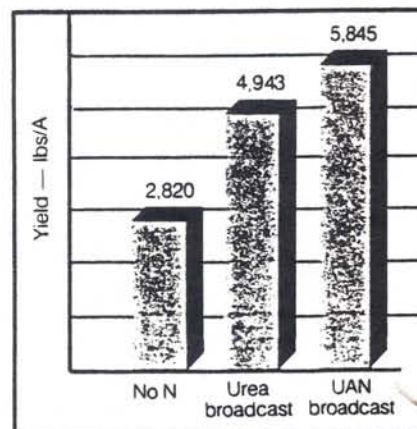


Figure 4. Effect of UAN application (120 lbs N/A) on furrow-irrigated Tebonnet rice yield (Wells, University of Arkansas, 1989).

Why fluid fertilizers make ideal match for optimum-yield wheat management programs

Most wheat growers know that topdressing nitrogen in the spring is an essential part of producing optimum wheat yields. They also know the importance of monitoring inputs to assure a safe environment. As the topdressing season approaches, a review is in order of best management practices and why fluids are ideally suited to successful spring wheat management programs that produce quality, top yields at harvesttime.

Best management

Timing. Splitting applications assures that N will be available at the exact time wheat plants can best use it. The practice can be extremely efficient, profitable and environmentally safe. Splitting N applications between mid-tillering and early stem extension generally produces the best results as research of Bandel at the University of Maryland shows in Figure 5. N rate varies according to site and region.

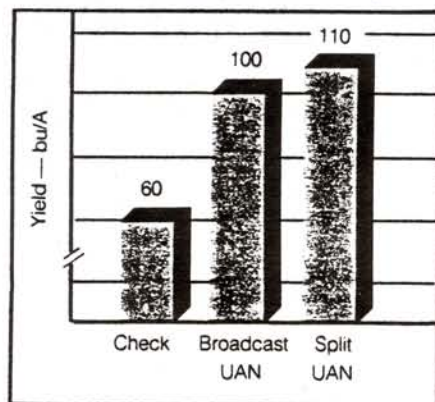


Figure 5. Effect of split-applied N on yield of winter wheat (Bandel, University of Maryland).

Placement. Method of N application in small grains is a crucial item agronomically.

Many N solutions are broadcast in the spring and this can be a perfectly acceptable form of application. Some foliar uptake may result (in addition to root uptake). However, leaf burn can result — especially if N is mixed with a herbicide. This early season burn is very rarely anything more than a cause of aesthetic concern. It can be exacerbated in frosty or extremely

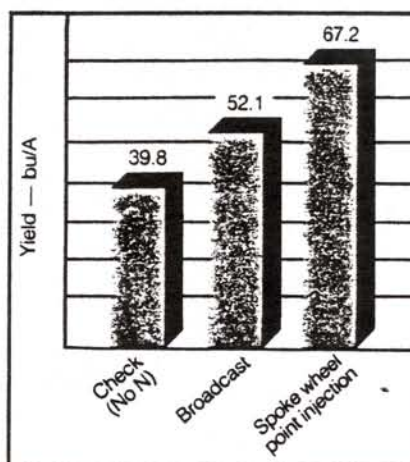


Figure 6. Effect of applying UAN through a spoke wheel (50 lbs N/A) on yield of irrigated wheat (Gallagher and Kushnak, Montana State University, 1989).

warm, dry conditions. Only severe, late-season (after flagleaf) burn can reduce yield.

An alternative method for reducing leaf burn in wheat is dribble banding UAN. This method of placement has also produced up to 10-bu/A yield increases in some studies.

Minimum tillage. Minimum soil disturbance is critical in preserving soil moisture and it is here where fluids are making possible a new technology that offers minimal soil disturbance while injecting N where it will give the greatest response. In a 1989 study by Gallagher and Kushnak of Montana State University, spoke wheel injection of UAN at 50 lbs N per acre improved yields by 15-bu/A over broadcasting (Figure 6). Recent Canadian studies also have shown that spoke wheel point injection maximizes N uptake and yields.

Why fluids

Accuracy. Study after study has shown that nitrogen solutions offer an accurate, efficient, quick, effective and environmentally safe way to topdress wheat.

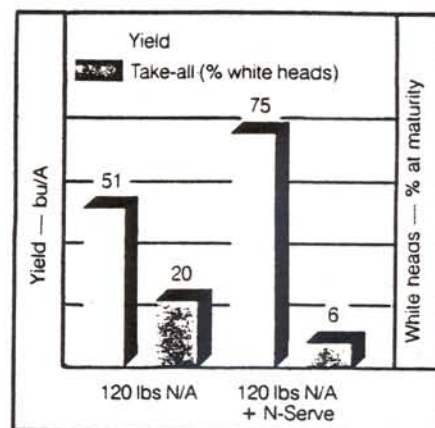


Figure 7. Effect of UAN + N-Serve on the yield of wheat and take-all disease incidence (Indiana, 1985).

Versatility. Sulfur is a required nutrient for early spring growth of wheat. UAN solutions offer a simple, cost-effective and convenient way to get this job done. Both N and S can be applied to wheat in one pass by combining UAN with ammonium thiosulfate (ATS) or ammonium sulfate.

Right diet. UAN solutions are essentially 75% ammonium-N, which, according to recent studies, may be as important in wheat nutrition as it is in the fertilization of corn and sorghum. Experiments by Bock of TVA in 1987 suggest that a predominantly ammonium diet, as found in UAN, can produce a 47% increase in wheat yield (Table 1). Interestingly, this preponderance of ammonium can also add to plant health. Indiana research in 1985 shows that preserving N in the ammonium form with a nitrification inhibitor reduced the incidence of take-all in wheat (Figure 7). The ammonium-N is especially effective because of its stability in the soil (doesn't leach like mobile nitrate-N).

Overall, N fertilization of wheat will enhance plant vigor and improve disease tolerance. The bottom line will be optimum yields, greater profits.

Table 1

Effect of nitrogen supply form on yield of spring wheat (Bock, TVA, 1987).

N source	Relative yield (%)		
	Grain	Straw	Root
Nitrate only	100	100	100
Nitrate + high ammonium	147	147	137
Yield increase	47%	47%	37%

Soybeans respond to post-planting fluid N applications

More documentation on soybean response to fluid N by Washburn of Twin-State and Cooper of Ohio.

A 1989 study by Washburn shows that soybean yields jumped as high as 7.8 bu/A after a post-planting application of fluid N in July (Figure 8). The N was applied with a knife applicator at a 2-inch depth or less and made later than normal due to drought conditions. "Generally, we encourage farmers to make this N application during second cultivation," Washburn explains. He adds that profit increase to growers from such a yield increase, assuming

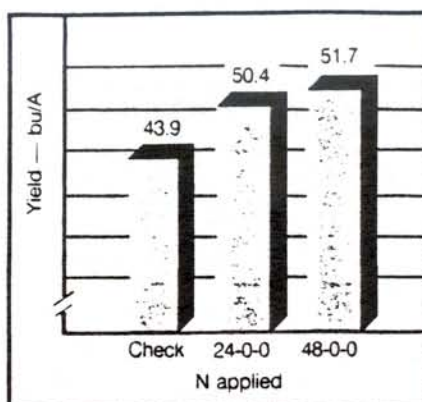


Figure 8. Effect of post-planting N application on soybean yields (Washburn, Twin-State, 1989).

\$6 soybeans and 20-cent/lb N, would be as high as \$37.20/A.

In another 1989 study, sponsored by the FFF and conducted by Cooper in Ohio, soybean yields increased 10

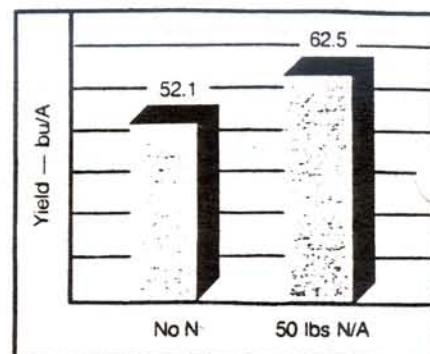


Figure 9. Yield response of Williams 82 soybean to 50 lbs N per acre applied as UAN dribble band at beginning of seed fill (Cooper, Ohio, 1989).

bu/A via a 50-lb/A band application of UAN at the beginning of seed fill (Figure 9). Similar responses to post-planting applications of N on soybeans were shown in additional studies funded by the FFF at the University of Wisconsin.

Up to 8 bu/A Stabilized UAN boosts corn yields

Research in 1989 by Ebelhar of the University of Illinois has produced up to 6-bu/A increases in yields by combining UAN with the nitrification inhibitor *N-Serve* and sidedressing on corn.

Additional research the same year by Varsa of Southern Illinois University has produced up to 8-bu/A increases in corn yields by combining N with ammonium thiosulfate (ATS) as shown in Figure 10. Note also the

importance of soil placement of nutrients in producing desired yield increases. Not only does ATS block the transformation of urea to ammonium-N, improving N efficiency and slowing nitrification, but it also supplies S to plants.

Nitrogen is an expensive input and therefore must be used wisely. Moreover, safeguarding the environment and achieving optimum crop production go hand in hand. Slowing conversion of ammonium to nitrate (nitrification) can prevent loss of N from the soil profile. In addition, a high-ammonium, mixed N regime appears to be more beneficial to crop growth.

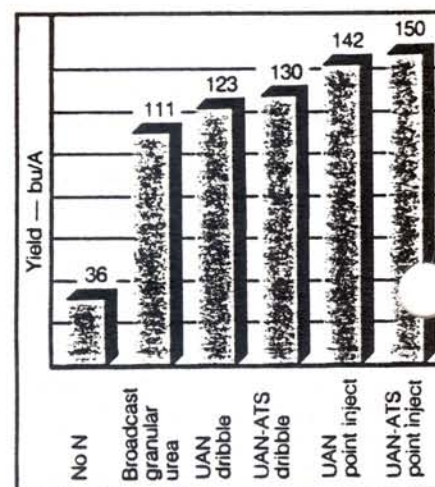


Figure 10. Influence of N source (150 lbs N/A) and the placement on corn yield (Varsa, Southern Illinois University, 1989).



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