k-state extension AGRONOMY e-Updates

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1. Nitrogen recommendation controversy: Implications for Kansas

This fall, there were some articles in the national farm press about a "revolution" in the practice of making nitrogen (N) recommendations for corn. This was based on research by some soil scientists at the University of Illinois.

Basically, these University of Illinois agronomists contend that basing N rates for corn on a combination of yield goal (or "proven yields") and soybean credits results in inaccurate recommendations. They say that N recommendations for corn should be based instead on a measure of how much N the soil can provide during the growing season, which is a function primarily of organic matter amounts, carryover N, previous crop residue levels, plant population, soil pH, and soil P and K levels. They have been correlating corn yields and N rates, using these factors, in trials throughout Illinois in 102 on-farm studies from 1990 to 2003, and compared the results with yields and N rates based on the "proven yield" method.

This raises the question of whether N recommendations used in Kansas and elsewhere are inaccurate and need to be revised. The answer is "no."

The new lab procedure evaluated by the Illinois team to develop N recommendations for corn have been tested extensively by other universities, including Iowa State University, the University of Wisconsin, and the University of Minnesota. Unfortunately, none of these universities have been able to reproduce the results reported by the University of Illinois.

At K-State – and at most other Great Plains universities, N recommendations are based on historical information relating yield goal, soil organic matter content, 2 foot profile N soil test level, the amount of manure applied, the tillage system employed and the previous crop. A default value is assigned for organic matter content and profile N soil

test level if no soil sample is available. Soil pH, soil P and K level, and plant population are not used in K-State N recommendations. The price of N and price of corn are other possible factors that theoretically could be used in making N recommendations, but are not included in the K-State approach because of wide year-to-year and field-to-field variability.

It is true that high corn yields are sometimes not related to N rates, but are instead the result of greater than expected mineralization of soil organic matter, residual nitrate-N in the soil profile, manure applications, and other sources of soil nitrogen. The University of Illinois research also found N mineralization from soil organic matter and manure applications to affect required N application rates for various yield levels. But the new University of Illinois nitrogen soil test was not as effective in predicting the optimal N rate before the season begins as was hoped.

Nitrogen recommendations are basically predictions and are subject to all the uncertainties that are associated with making predictions. We do not know in advance how warm and moist the soil will be late into the fall, early in the spring or during the growing season. All of these are factors involved in soil organic matter N mineralization rates. Therefore, N recommendation rates are based on an average of many yield correlation tests conducted over many years throughout the state, on many soil types with various organic matter levels, soil N levels, crop rotations, and tillage systems.

When these research results are pooled, it is possible to offer a best estimate of the optimal N rate based on yield goals and the other factors mentioned previously. If unusually wet and warm conditions occur before and during the growing season then the amount of N the soil provides may be unusually high and crop response to applied nitrogen may be less than expected. Conversely, if the growing season is unusually cool and/or dry, the amount of N the soil provides may be less than normal for a given organic matter content, and the resulting N recommendations may be too low.

Overall, the N recommendation model used by K-State and other universities provides an average of research results over many years and locations, and has proven to be as good as possible as a predictor. New correlation research for adjusting the N recommendation is conducted on an ongoing basis. But K-State and other land grant universities believe there is no reason at this point to think that the N recommendation process should be completely overhauled, as indicated by the University of Illinois work.

-- Dale Leikam, Nutrient management specialist
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2. Evaluating soil amendments and other “non-traditional” products

With the high price of nitrogen and other fertilizer nutrients, there is an increased amount of sales activity on “non-traditional” products, as expected. There are many non-

traditional products on the market in any given year, but interest in these products seems to increase in times of unusually high fertilizer prices.

Non-traditional products are either: (1) any non-fertilizer material applied to soil or plants claiming to improve physical, chemical, or other characteristics of the soil, or to improve crop production, vigor, growth, or quality; or (2) a guaranteed fertilizer material that is used in an unconventional manner, such as in very small amounts. There are six primary categories of these products, as established by the North Central Regional Committee of university experiment station scientists.

* Soil conditioners
* Wetting agents and surfactants
* Biological inoculants and activators
* Plant stimulants and growth regulators
* Mineral nutrient sources used in non-conventional manners
* Non-conventional fertility concepts

It is difficult to know whether any non-traditional product is effective unless it has been tested under standard scientific conditions by a university or other independent source. There are laws controlling fertilizer products for analysis guarantee and advertising. For non-traditional products, most states have registration requirements that include labeling laws. In Kansas, and a few other states, there are also laws that require non-traditional products provide data that shows they are effective in order to become registered.

Proof of efficacy is defined in the Kansas law as "satisfactory supportive data is provided to the secretary of the Kansas Department of Agriculture (KDA) to substantiate the value and usefulness of the active ingredient." This data must come from reputable research organizations. Producer testimonials and in-house demonstration results are not considered as reliable research. Research results from three soil types common to Kansas for a period of two years at each location is considered as a minimum research base. The research must be on agricultural crops common to Kansas.

If a non-traditional product has sufficient data to become registered in Kansas, that does not guarantee that the product will be profitable to the user. If a non-traditional product is not registered in Kansas, that implies that the products does not have adequate research to support its claims. There currently are only a few non-traditional products registered in Kansas, and most of these are gypsum products.

To sell non-traditional products, a classic approach is to attack the fertilizer industry as hard on the environment or overpriced. There are also certain words or phrases in advertising that should raise a red flag, including: equivalent to, replacement for, substitute for, activator, homogenized, trust us, too new to have research information, loosens soil texture, unknown or secret ingredients, 100 percent usable, costs no more than, and so forth. As with so many things, if the claims sound too good to believe, they probably are.

To evaluate whether a non-traditional product is worth considering, there are six actions producers can take:

1. Check to see if the product is registered with the KDA. Registration does not guarantee that the product will be cost-effective, but it's a start. The phone number for the KDA's Agricultural Commodities Assurance Program is 785-296-3511.

2. Obtain copies of independent research results on the product. Be sure to separate research from company testimonials and demonstrations.

3. Get as much information as possible from the sales person about how the product works. If the sales person doesn't know, see if he or she can get that information from the company. Look for active ingredients, application rates, method of application, crops that can be treated, and purposes of the products. Be suspicious if the concentration of active ingredients is not specifically stated.

4. Once you know the active ingredients and their concentrations, ask yourself whether it seems reasonable that the product can produce the benefits claimed.

5. If possible, get opinions from people not associated with the sale of the products. Watch out for claims that a small amount of a product is "equivalent to" or "replacement for" your normal fertilizer program.

6. If you are satisfied after going through all the steps above, and believe the product claims are reasonable, start the first year by trying the non-traditional product on a strip so that you can make a direct comparison to your normal fertility program.

-- Dave Whitney, Soil fertility specialist
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3. Winter applications of herbicides in wheat

Cheat herbicides (Finesse Grass and Broadleaf, Maverick, Olympus, and Olympus Flex) are normally applied to wheat in fall or early spring. But with unusually warm temperatures, these herbicides can also be effective when applied in mid-winter.

As daytime high temperatures get over 60 degrees in January, winter annual grasses can have viable foliage and begin actively growing. As long as these plants have viable foliage and are not severely stressed, the cheat herbicides can control them effectively when applied during these warm periods in mid-winter.

Often, producers will use liquid N as a carrier for herbicide applications in cooler weather. Where N is used with the herbicides, a mid-winter application of cheat herbicides may actually be preferable to an early-spring application. There would be less

concern about foliar burn when liquid N is applied at this time of year. Also, earlier application results in earlier weed control and N availability to the wheat crop.

Research at K-State indicates that Olympus may be more consistent than Maverick for control of cheat when applied during the mid-winter period. Research comparing the effectiveness of Finesse Grass and Broadleaf to Olympus and Maverick in mid-winter applications is limited.

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(Editor's note: Articles on strip-till research results in central and eastern Kansas are still in the works and will appear in upcoming issues of the Agronomy e-Update. – Steve Watson)

These e-Updates are a regular weekly item from K-State Extension Agronomy. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader
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