Cooperative Extension
Colorado State University, Fort Collins, Colorado 80523

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CERTIFIED SEED NEWS

Western Slope Certified Bean Seed producers will use the unique advantages of their production area; that is, production of low pathogen seed and high seedling vigor to promote seed this year. West Slope wholesalers are also improving quality standards by increasing germination from 85% to 90% and purity from 98% to 99%.

The Western Colorado Bean seed growers have recently established the Western Colorado Premium Bean Seed committee. The committee logo will be used in ads, promotional items, and on each bag of seed sold. The promotion will cover bean growing areas of northern and eastern Colorado as well as other bean production areas. Inquiries on Western Colorado Premium Bean Seed can be made by calling the Colorado Seed Growers Association at 303/491-6202.

The Colorado Seed Growers Association is holding a Seed Conditioning Clinic on February 28 & March 1 in Fort Collins. Conditioning wheat, other small grains and dry beans will be emphasized at the Clinic. The meeting agenda will include seed testing and identification, equipment operation and plant design. Speakers are Dr. Edgar Cabrerra of the Mississippi State University Seed Tech Lab, seed equipment manufacturers and sales representatives, and CSU personnel.

Invitations are being sent to approved seed conditioners, certified seed producers, commercial bean representatives and county extension personnel. Extension agents are encouraged to publicize the clinic locally.

To increase efficiency and improve cooperation and awareness of the Colorado seed industry, the Colorado Seedsmans' Association office has joined with the Colorado Seed Growers Association. Some efficiencies in mailing and staffing will occur, but hopefully members of the seed industry will benefit the most. The first change will be a combined newsletter having information for seed growers and seedsmen. Extension agents who have news or information about the Colorado seed industry are encouraged to forward it to the CSGA office for newsletter publication.

Our mailing list was expanded to include county extension offices. If you still don't receive ***Siftings***, our newsletter, please contact us. (Stanelle)

NITROGEN SOLUTIONS

Research evaluating N sources in Colorado has been studied extensively. The data usually shows that our common N sources perform similarly when properly applied.

Most nitrogen solutions used today are nonpressure solutions; that is, they contain no free ammonia. An example of a pressure nitrogen solution would be aqua ammonia, a product used very little in Colorado. Aqua ammonia is made by simply mixing ammonia in water and is usually 20 to 25% N. Aqua ammonia should be injected or if broadcast, then incorporated immediately.

Nonpressure nitrogen solutions are usually produced from urea, ammonium nitrate and water, and are referred to as UAN solutions. During the last twenty years, UAN solutions usage has increased ranking second to anhydrous ammonia. Reasons for this rapid growth include ease and safety in handling, application and transportation, compatibility with many pesticides which allows one-pass "weed and feed" operation, application through various types of irrigation systems and an excellent nitrogen source in formulation of NPKS fluid mixtures.

Most UAN solutions are made by combining urea, ammonium nitrate, and water. Two common grades of UAN solutions (28% and 32% N) are given in Table 1.

Table 1. Composition of some nonpressure nitrogen solutions.

Solution Nomen-clature	% N from AN	% N from Urea	Salt-out Temp. F°	Specific Gravity lb/gal
28(0-39-31)	13.8	14.3	-1	10.66
28(0-40-30)	14.0	14.0	-1	10.70
32(0-44-35)	15.6	16.5	32	11.05
32(0-45-35)	15.8	16.3	32	11.06

AN=Ammonium nitrate

The number outside the parentheses in the first column of Table 1 is percent N of the solution. The first number inside the parenthesis is percent ammonia by weight; the second, percent ammonium nitrate by weight; and the third, percent urea by weight. For the first solution listed, it is 0% ammonia, 39% ammonium nitrate, and 31% urea by weight, respectively. For these UAN solutions, approximately one-half of the total N in the solution comes from ammonium nitrate and one-half from urea.

The solubility of ammonium nitrate mixed with urea is higher than either compound separately. This was discovered by granular applicators who inadvertently left contaminated material in spreaders. Slight contamination of these two products results in a hygroscopic mass. (Follett)

MAKING COMPARISONS AMONG TREATMENTS USING THE LSD

The objective of field experiments is to determine if differences occur between treatments of an experiment. There are many statistical procedures which enable one to determine if differences between means are due to random chance or are real. Some of the most common methods to compare differences among means are the Least Significant Difference method (LSD), Duncans Multiple Range test (DMR), Student Neuman-Keuls' (SNK), and Tukey's (TQ). Each method has advantages and disadvantages.

One method often used to compare means in agricultural data is the LSD. It is used most often because it is easy to calculate and apply.

The formula for LSD is:

$$LSD=t_{(.05)}*\sqrt{2*EMS/n}$$

Where: $t_{(.05)}$ is obtained from a t table at the 5% probability level, and the Error Mean Square is obtained from the Analysis

of Variance (ANOVA) table, and n is the number of replications.

The LSD is really a shortcut version of performing a series of t-tests on all pairwise comparisons among treatments. It controls the frequency of errors made among the comparisons (one yield level to another). However, if you make all pairwise comparisons in an experiment when there are many treatments, it is likely that you will make an error among the inferences in the experiment. Range tests such as DMR, Tukey's, and SNK have been developed to control the rate errors among experiments. Therefore, the LSD test should be limited to comparisons which are preplanned or for a limited subset of possible pairwise comparisons in the experiment. For example, if you conduct an experiment with 15 treatments, and you want to make several preplanned comparisons between treatments, the LSD is a good choice. However, if you have 15 treatments and you want to make comparisons among all possible combinations of treatments, the LSD is not a good choice. In experiments where all pairwise comparisons are desired, a range test will help to protect against errors. If there is a check treatment (or control) you can use a test such as the Dunnett's procedure. With that procedure, every treatment is compared to the control, and experimental error is controlled at the prechosen level of probability. Next month I'll discuss the use of the range tests, DMR, SNK and Tukey's. (Brick)

SOIL TESTING KITS

Soil testing kits are a convenient way to determine the approximate levels of nutrients in soils. Most kits are based on adding reagents to test tubes containing soils. The soil reagent mix is shaken and the soil is allowed to settle out. The color of the solution is then compared to a color chart to determine nutrient level in the soil. If the soil does not settle out, then the soil reagent mix must be filtered to remove the interference caused by soil particles suspended in the solution. Interpreting color charts for nitrate level depends on each individual's ability to match colors. Low levels of nitrate, for example, appear as yellowish-green to yellow, while higher levels of nitrate may appear as various shades or orange and red. The charts supplied with the kit usually show about 5 or 6 colors that correspond to concentrations of nutrients in the soil. If the soil being tested does not match exactly with one of the colors, then an estimate of the nutrient level has to be made. Higher quality kits provide more color comparison ranges, are more accurate and are easier to use.

Problems arise when the soil does not settle and the solution cannot be clarified by filtration. Fine clay particles or dispersed sodium-affected soil can pass through most conventional filter papers resulting in a cloudy solution. Colors of cloudy solutions are difficult to interpret, making nutrient level determinations difficult. Soils high in organic matter such as those found in gardens and greenhouses are also difficult to analyze. Organic soil solutions require filtration since these soils usually do not settle out. The extracts from organic soils can be very dark brown, again making comparisons difficult. The colors from mixing soils with reagents can also be influenced by other elements. For example, high arsenic or phosphorus can result in a dark blue color.

Color comparisons found in kits frequently cover a narrow range of nutrient levels. The nitrate-nitrogen range may be from 2 to 25 ppm and phosphorus may range from 0.5 to 5 ppm. For some crops, nitrate may be required when soil tests indicate from 26 to 42 ppm nitrate-nitrogen and additional

phosphorus added when soils test from 6 to 11 ppm.

Prices for kits can range from $15 to several thousand dollars depending on their complexity. The lower priced kits are supplied with material to analyze N, P, and K, while higher priced kits allow analysis for additional elements with improved accuracy.

When utilizing a kit for soil analysis, be sure to read the instructions carefully and understand them before proceeding. Correct field sampling techniques must be used. Air dry the soil and thoroughly mix it before analysis. Do some practice analyses to improve your techniques. Sending the sample to a laboratory for analysis is a good way to check results obtained from a kit.

Several soil testing kits can be obtained from the Nasco Agricultural Sciences Catalog No. 297 (1-800-558-9595) or from the Hach Co. (303-669-3050). A good kit for basic soil analysis can cost $200 to $300. (Self)

EVALUATING CORN FOR NITROGEN EFFICIENCY

Improving ground water quality on your farm makes sense. Nitrogen, a significant polluter, may occur in excessive amounts below the surface profile and then later move into the ground water table. Deep sampling will detect excessive nitrogen losses.

A quick review of yield goals, amount of nitrogen applied and subsequent yields on a particular field probably will indicate one cause of nitrogen accumulation.

Determining nitrogen uptake efficiency is an excellent way to optimize nitrogen fertilizer rates of application. This exercise can be done for any crop and may improve the nitrogen efficiency on your farm. The nitrogen applied to your farm either is used up, taken up by living matter, remains in the soil profile or is lost by leaching, de-nitrification or other means. Lost nitrogen reduces profitability.

First, an inventory of the field will help evaluate a crop's success. Problems detected by the inventory will result in lower efficiencies. Information helpful to gather for corn is:

- **Final plant population**
- **Yield at 15½" moisture**
- **Pounds of grain per plant**
- **Problems such as insects, disease, weeds or nutrient deficiencies.**
- **Erosion problems**
- **Nitrogen efficiency**

The items listed in the inventory all relate to nutrient usage. For example, a evenly-spaced stand will deplete nitrogen consistently over the field while a spotted stand will not.

Corn contains about 8.4% protein as fed and will contain about 0.75 lbs of nitrogen per bushel. The 6.25 is a conversion factor of protein to fertilizer nitrogen.

Example:

$$.084/6.25 = .0134 \text{ lbs nitrogen/lb of corn}$$
$$.0134 \text{ lbN/lb of corn } X \text{ 56 lbs/bu} = .75 \text{ lbN/bu}$$

If we harvest the corn as silage at 2.3% protein and 30% dry matter, the equation would be:

$$.023/6.25 = .0036 \; X \; 2000 = 7.36 \text{ lbs N/T}$$

A 145 bushel per acre corn crop would therefore extract 108 pounds of nitrogen per acre and a 25T silage crop would take 184 lbs of N.

Things aren't all that simple, as leaching, nitrification and denitrification, insects and disease, and microbial activity all change availability level for plants. Fertilizer recommendations usually call for about 1.2 pounds of added nitrogen per bushel of expected yield. In this manner, soil testing laboratories insure adequate application rates under very poor management conditions.

To calculate nitrogen recovery efficiency, multiply the yield per acre in bushels by .75 and divide by the amount of nitrogen applied. Then multiply by 100 to convert to percent. For example, if you applied 175 lbs of nitrogen and harvested 145 bushels per acre, the nitrogen efficiency would be 62%.

$$\frac{145\ bu/acre\ X\ .75\ lb\ N/bu}{175\ lb\ N\ applied/acre}\ X\ 100 = 62\%$$

See Table 2 for nitrogen removal of other crops.

Strive for 90% nitrogen efficiency to lower costs while protecting groundwater. This will not be easy to do, but the closer you get to this goal, the better off financially you'll be.

Table 2. Plant food removed in harvested crop

CROP	UNIT	N
Alfalfa	lb/T	56.00
Barley	lb/bu	1.10
Corn	lb/bu	.75
Corn Silage	lb/T	8.30
Grain Sorghum	lb/cwt	1.50
Oats	lb/bu	.80
Sugar beets	lb/T	4.20
Sunflower	lb/cwt	3.60
Wheat	lb/bu	1.29

Conversion factor of protein to fertilizer nitrogen:

Wheat = 5.7
All other crops = 6.25 (Croissant)

Where trade names are used, no discrimination is intended, and no endorsement by the Cooperative Extension Service is implied.

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Sincerely,

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