FROM THE GROUND UP

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AGRONOMY NEWS

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RESEEDING OLD ALFALFA STANDS AND AUTOTOXICITY

Each year we continue to receive questions regarding depleted alfalfa stands and the feasibility of improving them by interseeding into existing depleted stands. Attempts to accomplish this objective are not very successful because the new seedlings normally turn yellow and eventually die shortly after emergence. In fact researchers around the turn of the century recommended that alfalfa should not be sown back to alfalfa until another intervening crop was grown. However, some producers are not convinced that this effect exists, and recent popular press articles have added to this controversy. What has recent research shown about seeding alfalfa into existing or recently destroyed stands of alfalfa?

We recently attended a two day alfalfa training seminar in St Louis, MO conducted by the Certified Alfalfa Seed Council and alfalfa specialists from several states. According to the information presented at this seminar, it appears that nearly all of the research conducted around the U.S. has shown an inhibitory or toxic effect of existing alfalfa plants on germinating alfalfa seedlings in an interseeding situation. This toxic effect, known as autotoxicity, is thought to be caused by a chemical or chemicals produced by the mature alfalfa plant. These chemicals adversely affect alfalfa seedlings. Some have speculated that this adverse effect is due to a combination of chemical inhibition as well as an increase in fungal pathogens in the soil of old stands which might inhibit or kill young alfalfa seedlings. However, several studies involving seed-applied fungicides (Apron) appear to have ruled out this possibility.

These recent studies strongly suggest that alfalfa autotoxicity is the sole explanation for the observed response. The autotoxic compounds originate from the alfalfa plant or indirectly from the plant during decomposition of plant residues. The main chemical suspected of causing the autotoxic effect has been identified as a water soluble isoflavonoid called medicarpin. Other compounds might also be involved as well. Medicarpin is produced in above-ground plant parts, is found in soil with mature plants, and can be absorbed by seedlings, causing the toxic effect. The research indicates that established alfalfa plants exert a 20" radius zone of influence on new alfalfa seedlings. This would imply that old stands would have to be thinned to 2 plants per square yard before new plants could be successfully established. At this stand density, it would probably be more appropriate to destroy the old stand and establish a new stand.

According to nearly all U.S. research, existing alfalfa plants exhibit an inhibitory or toxic effect on germinating alfalfa seedlings in an interseeding situation.

So the next question is how long do we wait after destroying an old stand before safely reseeding with alfalfa? Based on the results from these recent studies, we recommend that the best situation would be to allow a one-year break between old alfalfa stands and new seedings. However, this many not always be possible. Presently we do not know all the factors controlling the persistence of the toxin in the soil. Soil texture, moisture regime, and temperature could significantly affect the persistence of the toxin. One would assume that more precipitation after stand destruction could potentially leach more toxin out of the seedling root zone. Since the toxin appears to be more prevalent in the above-ground plant parts than in the crowns and roots, it would also help to remove all residue from an existing stand prior to tilling it. Research in Michigan suggests that using herbicides such as Roundup to kill the old stand, and direct seeding into the undisturbed stand might also reduce the time required for safe seeding. For example, this work showed that alfalfa could be safely seeded three weeks after killing the alfalfa. Keep in mind that temperature and precipitation conditions differ considerably from Colorado conditions. Other suggestions would be to use disease resistant varieties and fungicide-treated seed.
▫Shanahan and Smith

STARTER FERTILIZERS

Band placement of fertilizers at planting (starter fertilizers) is a common practice, especially for spring-planted crops in cold soils. Results of many experiments have shown that crops use banded fertilizers more efficiently than with broadcast applications. In recent years, it has been shown that the differences in efficiency due to fertilizer placement are minimized as soil fertility levels have been increased. Yet, starter fertilizers are especially effective for crops planted in cold soils such as are commonly found in the spring season in Colorado.

Most starter fertilizers are banded 2 inches to the side and 2 inches below the seed row. Fertilizers placed at this distance are in position to be reached by newly emerging plant roots for early uptake by the crop. Placement at this distance also does not affect seed germination or damage emerging seedlings. Application equipment must be properly adjusted to maintain the correct placement distance. Since equipment may be jarred out of adjustment by stones or hard soil, it should be frequently checked and adjusted to maintain the proper separation from the seed row.

Rates of starter fertilizer vary widely, but usually range from 50 to 200 pounds of fertilizer material per acre for most crops. Sugarbeets and sunflowers are more sensitive to salts in fertilizers, so fertilizer rates should not be excessive and placement distances from the seed row should be carefully checked for these crops. Popup placement (directly with the seed) should not be used with these crops because seedling emergence may be decreased, especially in dry soil and at rates supplying more than 10 pounds of nitrogen per acre.

Starter fertilizers are especially effective for crops planted in cold soils, which is common in Colorado in the springtime.

Research results usually have shown equal effectiveness of side-band versus popup (seed) placement. However, popup placement is discouraged because of the potential for decreased seedling emergence, especially for sensitive crops in dry soils. Knowledge of the salt index of fertilizers is important in selecting fertilizers to be applied directly with the seed. The salt index is a measure of the relative tendency of a fertilizer to increase the osmotic pressure (saltiness) of the soil solution. The lower the fertilizer salt index, the less the risk of reducing seed germination or seedling damage in dry soils with popup fertilizer.

Application of phosphate fertilizers such as monoammonium phosphate (MAP) directly with the seed is an effective method for wheat and other small grains. Germination usually is not affected because the actual fertilizer rate per seed row is lower since the distance between rows is much less than that for corn and other similar row crops.

Fertilizers such as urea or diammonium phosphate (DAP), which release free ammonia in some high pH soils, should be used only be used at low rates in starter fertilizers, if at all, because small amounts of ammonia are quite toxic to seedlings. Rates of nitrogen which can be safely banded with starter fertilizers may not be sufficient for the total crop needs. The remainder of the recommended nitrogen will have to be applied preplant, topdressed, sidedressed, or with sprinkler irrigation.

Phosphate fertilizers generally are more effective for crops as banded starter fertilizers than with broadcast applications because phosphorus is not mobile in soil. Suggested phosphorus rates are lower with banded than broadcast applications for this reason. Broadcast applications must be incorporated into the soil to be effective for crops.

Starter fertilizers may be especially important for reduced-tillage cropping systems. Nutrient availability may be reduced, especially with early planted crops under the cool, moist soil conditions associated with conservation tillage systems. Recent central Kansas results on no-till wheat showed more tillers and greater dry matter production and phosphorus uptake with subsurface banded than with broadcast phosphate fertilizer application.

Colorado results have shown that dribbling liquid phosphate fertilizers in the soil after row closure is an effective placement method for dryland wheat planted with hoe drills. This surface-banded fertilizer becomes a subsurface band after wind and water move soil over the fertilizer which was surface-applied above the seed row. Later, crown roots grow into the fertilized soil and absorb the applied phosphorus.

Benefits of starter fertilizers can be summarized by the following statements:

a. Starter fertilizers usually are more effective for early plant growth than an equal rate of broadcast fertilizers.
b. Starter fertilizers are most effective in cool weather; nutrient absorption and diffusion of phosphorus in soil are slower in cold soils.
c. Phosphate fertilizers generally are more efficient with band than broadcast application, especially in soils testing low to medium in available phosphorus.
d. Efficiency of some micronutrients is increased when banded with starter fertilizers.

▫Mortvedt

SHOULD I PRODUCE PINTO OR WHITE BEANS IN 1995?

Although it is impossible to make precise predictions about the price of beans, supply and demand forces suggest a smaller discrepancy between pinto and white beans for the 1995 crop.

This year dry bean growers are asking themselves whether they should continue to grow pinto beans in light of the fact that the current grower price for white or navy beans is $10 to $15 higher than pinto. The trend in prices for pinto and navy beans over the past three to four years may help us predict what grower prices will be for the 1995 crop. During each of the past three years, September grower prices for navy and pinto beans alternated in rank. Navy prices were higher than pinto in 1994 and 1992, lower in 1993, and similar to pinto in 1991. Of course, the price is dependent on supply and demand. For example, last year the pinto crop was plentiful due to an abundance of production in North Dakota, Colorado, and Idaho, and the navy crop was short due to lower production in Michigan. The strong export demand for white beans and weak export demand for pinto beans in 1994-95 also contributed to the large discrepancy in price between white and pinto beans.

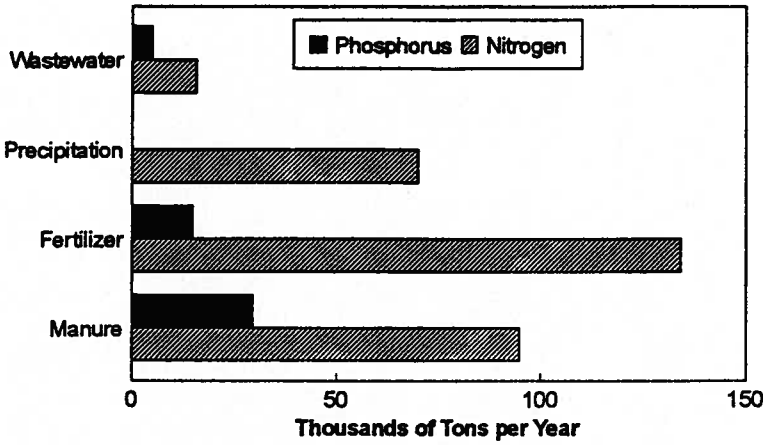
What will 1995 bring? The USDA Agricultural Statistics Board has predicted that intended acres for dry edible bean planting will rise two percent in 1995 from 1994. Based on the USDA survey, intended acres in Colorado and the U.S. will be 220,000 and 2,075,300 acres in 1995 compared to 215,000 and 2,025,800 in 1994, respectively. Intended acres in North Dakota are also expected to rise to 600,000 from 570,000 in 1994, a record for that state. Since the grower price of navy beans is significantly higher than pinto beans at the present time, much of the area in North Dakota planted to pintos in 1994 may shift to navy beans in 1995. That shift, along with a good to average navy crop in Michigan, could cause prices for pintos to be higher than navies for the 1995 crop. Of course, the export demand will play a big role in the supply and demand equation.

In the final analysis, it is impossible to make precise predictions about the price of beans for the fall 1995. However, supply and demand forces suggest a smaller discrepancy between pinto and white beans for the 1995 crop. The best advice to reduce risk and spread out your capitol investment is to diversify production into more than one market class. You should develop a plan to grow a portion of your dry bean crop in a market class other than pinto beans, then discuss it with your local dry bean buyer. This will ensure a market for the crop in the fall and the buyer can usually provide you with first hand experience regarding the best varieties and production practices for the specific market class. ▫Brick

NUTRIENTS IN THE SOUTH PLATTE RIVER

Recent newspaper articles have implicated urban landscapes and wastewater as the predominant sources of nutrients in the S. Platte River system. While these sources are obviously contributors, are they really the major nutrient sources?

Sources of Nutrients to the S. Platte River Basin



The 2nd South Platte Ag Tour is scheduled for Tuesday, July 18, 1995. We will be visiting farmers who are implementing irrigation and nutrient management BMPs.

The US Geological Survey (USGS) has been conducting a study of water quality in the S. Platte basin which has shed some light on this subject. While nitrogen (N) and phosphorus (P) are essential nutrients for plant and animal growth, excessive concentrations are a water quality concern. In surface water, high levels of nutrients can accelerate the growth of algae and other aquatic plants (eutrophication), causing problems such as clogged pipelines, fish kills, and decreased recreation and aesthetic value. The EPA recommends that total P not exceed 0.1 mg/L in rivers, and less than .05 mg/L where rivers enter lakes and reservoirs.

The USGS estimates that 300,000 tons of N and 40,000 tons of P enter the S. Platte annually from various sources. Although the wastewater treatment plants of Front Range cities discharge approximately 200 million gallons of effluent daily to the river, this accounts for only about 5% of the total N load. The remainder of the N in the system is estimated to be from fertilizers (~45%), animal manures (~30%), and precipitation (~20%).

Urban fertilizer use on turf undoubtedly contributes some N to the system, but groundwater monitoring in urban areas of the river basin has revealed few instances in which the EPA drinking water standard of 10 mg/L NO_3-N was exceeded (the mean of wells tested in urban areas was 4 mg/L). The Colorado Department of Agriculture estimates that less than 5% of the total fertilizer sales in Colorado are for the urban market. In the S. Platte basin the percentage of the total fertilizer used on turf is certainly higher, but is still significantly less than agricultural use. This information, combined with data from studies that indicate that leaching and runoff from turfgrass generally yields very low nutrient concentrations, indicates that urban fertilizer applications are not the major source of nutrient loading in the Platte.

Irrigation in the S. Platte basin results in an alluvial aquifer that generally discharges to the river, rather than a system where the aquifer gains at the expense of the river. By measuring concentrations of freon in the groundwater, the USGS determined that

it takes about 10 to 20 years for groundwater from precipitation and irrigation to move from recharge areas to the river. Monitoring data show that the average NO_3-N concentration in groundwater in the Platteville to Kersey area is about 26 mg/L. The nitrate concentration in the river in this same area averages about 4.5 mg/L.

The USGS found that the saturated zone beneath the river, where discharge occurs from the aquifer, was relatively anaerobic and had adequate organic carbon to allow rapid bacterial denitrification of nitrate. The recharge areas of the aquifer, on the other hand, tend to contain too much dissolved oxygen to permit denitrification of NO_3 to N_2 gas. The ability of denitrifying bacteria to remove NO_3 from the groundwater before it enters the S. Platte River probably keeps NO_3 levels from exceeding EPA standards. The USGS has concluded from their studies that leaching of NO_3 from irrigated croplands where manures and fertilizers are applied is the predominant source of elevated nutrient levels in S. Platte basin. ¤Waskom

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

EASTERN COLORADO FIELD DAYS

On the back page of this newsletter is the finalized schedule for the Winter Wheat Field Days at the various locations around the state and we would like to share this schedule with everyone. We are in the process of organizing an agenda for each event and feel that this agenda will be of great interest to all wheat producers. The agenda will include information about potential new winter wheat and feed grain varieties, soil fertility recommendations, Russian wheat aphid control, as well as the wheat production factors. Also, a representative from the Natural Resources Conservation Service will be on the program to address issues pertaining to the NRCS conservation provisions in farm programs. ¤Shanahan

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