CORN TALK NEWS
PENNSYLVANIA MASTER CORN GROWERS ASSOC., INC.

Nitrogen Management For Corn

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Good nitrogen (N) management is a critical component of successful corn production.

In addition to being one of the largest economic inputs into producing a corn crop, it is often the most limiting farmer-controlled factor in producing corn.

Nitrogen management can be broken down into decisions on how much N to apply, what source of N to apply, when to apply it, and how to apply it.

Rates

Recommended N rates for corn are 1 to 1.1 pounds of N per bushel of expected grain yield or 7 pounds of N per ton of expected silage yield. Thus, one of the key factors in determining the appropriate N rate is having a reasonable estimate of expected yield.

Sources

There are numerous sources of N that can be effectively used to meet the N requirement of a corn crop. The common N fertilizer sources include urea (46 percent N), UAN solution nitrogen (30 percent N), ammonium nitrate (34 percent N), ammonium sulfate (21 percent N), and anhydrous ammonia (82 percent N).

If used properly, these are all very good sources of N for growing corn. There are however, some special considerations.

Urea and UAN can both lose significant amounts of N by ammonia volatilization if these sources are not incorporated soon after application. Incorporation by tillage or ½ inch of soaking rain within 48 hours will minimize this loss. Without incorporation, losses as high as 30 percent of the applied N within a week have been measured.

With UAN, this loss can be reduced by banding the solution rather than spraying it on the soil surface. Ammonium nitrate and ammonium sulfate do not release volatile ammonia, therefore they do not need to be incorporated. Anhydrous ammonia is a gaseous source of N that must be injected or the gas will be lost into the air.

Manure is also a very significant source of N on many corn farms. The N content of manure will vary greatly — thus, manure analysis is critical to confidently utilizing the N from manure.

Book values for manure N are 10 pounds N per ton for dairy manure, 14 pounds per ton for swine manure, and 60 pounds per ton for poultry manure. Actual values may vary as much as 100 percent from these values, however.

Only about 50 percent of the N in most manures (75 percent in poultry) is available the year the manure is spread. This available fraction is mostly urea and therefore is subject to volatilization losses as discussed earlier for urea fertilizer. For this reason, the availability of manure N will depend on incorporation and ranges from 50 percent for immediate incorporation to 20 percent for no incorporation. The fraction of manure that is not available the year the manure is applied will become available over the next several years.

Legumes are also a major source of N for corn production. Legumes such as alfalfa and soybeans fix all of their N needs, plus leave considerable N in the soil that can be used by the following crop in the rotation. An alfalfa crop, with at least 50 percent of the alfalfa remaining, will supply all but about 20 to 40 pounds of the N requirement of the following corn crop. Even a very poor stand of alfalfa will supply 40 to 60 pounds of N per acre to the following corn crop. A soybean crop will supply about one pound of N per bushel of soybeans for use by the following corn crop.

Timing

The timing of N fertilizer application to corn is important to reduce the potential for loss of the applied N. Nitrogen should be applied as close to the time of crop uptake as practical to avoid potential losses of the N before the crop can use it. For corn, this means that the ideal application time for most of the N would be when the corn is 12 to 18 inches tall.

This is usually after the spring wet conditions when N losses are greatest and just before the period of rapid growth by the corn. If the field has, a history of manure or legumes, all of the N can be applied at this time. If there is no history of manure or legumes, then 30 to 50 percent of the N should be applied near to planting.

When delayed application is not practical, the N should be applied as near to planting time as possible. The longer before planting that N is applied, the greater the potential for significant loss of the N before the plant can use it.

Applying N in the fall for corn is not recommended because of the high N losses that can occur before the crop is even planted.

Methods

Finally, the method of N application must be considered. If the N source contains urea (urea, UAN, or manure), then incorporation either by tillage or by rain is important, regardless of application timing, to reduce volatilization losses. Also, banding can reduce this volatilization loss.

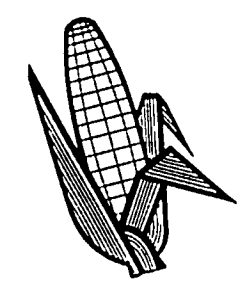
For delayed application, the best method of application is injecting the N between every row of corn. A close second best is banding the N on the surface between every row. Nitrogen can be banded between every other row but to be effective it must be banded exactly in the middle between the rows.

The N can also be broadcast over the growing corn and cultivated in or applied just before a rain to provide incorporation. This method will result in some burning of the corn but this does not typically have any negative effect on the final yield.

Good N management depends on determining the correct amount of N to apply based on a sound estimate of expected yield, then choosing a high quality economical source of N to meet this need.

Remember to include manure and legume N in this decision. The N should be applied as close to the time of crop need as practical.

Finally, the proper method of application must be used for the material that has been chosen to minimize losses and thus maximize crop utilization of the N.



Small-Scale Ag Alternative: Specialty Corns

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ter the expansion, the higher the quality.

Moisture content should be 13.5 to 14 percent for best results. Varieties differ as to quality, which also includes flavor, tenderness, absence of hulls, color, and shape.

Shape can vary from mushroom-spherical to butterfly. The confection industry usually prefers the spherical — easier to coat with flavors or syrups. The butterfly-shaped popcorn has a better "mouth feel" and is preferred for on-premises sales, as in theaters.

For more information, contact the Popcorn Institute, 401 N. Michigan Ave., Chicago, IL 60611, (312-644-6610).

Hi-Lysine Corn

Corn is a major staple in many underdeveloped countries. As dent corn is a relatively poor source of protein, many consumers have to supplement their diets with other protein sources, such as beans.

Most of the protein in corn is zein, which cannot be efficiently digested by humans and other nonruminant (single stomached) animals such as pigs and chickens.

Zein exists at the expense of lysine and tryptophan, which tend to be very low in dent corn. Lysine and tryptophan, two of eight essential amino acids that nonruminants can't synthesize on their own, must be obtained from food they eat.

In 1963, scientists at Purdue University found that the corn strains containing opaque-2 (02) genes contained lesser amounts of zein and greater amounts of lysine and tryptophan in their endosperms than dent corn. Opaque-2 kernels, however, appear dull and tend to have soft textures and very little hard endosperm. It makes them difficult to harvest and subject to attack by various pests.

Opaque-2 varieties also tend to have lower yields and must be isolated from other corns to retain protein quality.

High-Oil Corn

The highly polyunsaturated and high linoleic acid content of corn oil makes it an excellent energy and essential fatty acid source for both humans and livestock.

Livestock feeders may be interested in varieties with greater oil contents. Such varieties have more calories, bringing greater gains per feed unit.

Most hybrid dent corns will average between 3.5 and 6.0 percent oil. Varieties with oil contents greater than 6.0 percent tend to have lower yields. Oil quality is dependent on the amounts of unsaturated and saturated fatty acids it contains. Oils high in linoleic acid and low in oleic, palmitic, and stearic acids are preferred for human diets.

For information on breeding high-oil corn, contact John Dudley, Agronomy Department, S-112 Turner Hall, 1102 South Goodwin Avenue, University of Illinois, Urbana, IL 61801. (217) 333-9640.

Waxy Endosperm Corns

Waxy endosperm hybrids contain 100 percent amylopectin starch — the normal dent corn ratio is 72 percent amylopectin and 28 percent amylose. The waxy (wx) mutant was found in China in 1909 but was not fuily developed until 1936, when researchers from Iowa State University noted its unique properties and started developing hybrids.

Steers make better gains when fed waxy endosperm corn rather than dent corn. The stability and clarity of amylopectin starch make it highly suitable as a food thickener.

For more information on food processing aspects, contact Edith Munro, Corn Refiners Association, 1100 Connecticut Avenue NW., Suite 1120, Washington, DC 20036, (202) 331-1634.

Blue Corn

Atole, tortillas, corn chips, and other corn products have been the backbone of most traditional and present-day Native American and Mexican American cuisines.

Blue corn and other flour corns historically represented the major kernel type of corn ground into "harinas" flour and meals in the American Southwest. But dent corns, both white and yellow, now dominate the market. However, the blue corns are finding new market outlets.

Although Pueblo tribes have historically grown many different colored corns, blue corn is one of the most important, both as food and for religious purposes.

Unlike most commercial yellow hybrid dent corns that can yield 8,000 to 10,000 pounds of grain per acre, blue corn is open pollinated and characterized by relatively low yields of 1,000 to 4,000 pounds per acre. It also tends to lodge, making machine harvest somewhat difficult.

Blue corn has a coarser, sweeter, and nuttier taste than other corns grown for flour or meal. Its grainier consistency results in a somewhat denser tortilla than those made from white or yellow corn flour.

Research of the New Mexico Cooperative Extension Service found blue corn, like Opaque-2 corn, higher in lysine than either white or yellow dent corn varieties used in tortillas. Most blue corn varieties were also found to be high in iron and zinc.

Blue corn flours and meals have traditionally been used in making tortillas and corn chips. Native American products less well known include piki or paper bread, chaqueque (similar to corn meal mush), atole (corn meal drink), and nixtamal or lime hominy used in making stews.

Newer products include pancake and muffin mixes and corn flakes.

For more information, contact George Dickerson, New Mexico Cooperative Extension Service, (505) 275-2576.

Corn Cob Corns

Although most corn grown in the United States is for grain or silage, at least one hybrid variety is grown for making corn cob pipes. Cobs should be at best 1-½ inches in diameter and long enough to make at least two bowls (2 inches each). The diameter of the cob should be relatively uniform.

Cobs should be woody and sufficiently hard to keep smoking tobacco from burning through the bowl.

For more information, contact Harry Minor, the Agronomy Department, Extension Service, Waters Hall, University of Missouri, Columbia, MO 65211, (314) 882-2001.