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LEGUMES

for Better Farming

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Legumes For Better Farming

D L. Gross, Extension Agronomist

Sometimes we might think of soil as a mass of lifeless, pulverized mineral material More realistically, however we might describe good soil as a living, breathing workshop where bacteria, fungi, yeast, insects, worms and other organisms are the workers and where crop residues provide the power or energy Without these organisms to break down the crop residues and to give good structure to the soil, we could not easily obtain high crop yields.

Of the many kinds of bacteria that live in the soil, the nitrogen fixing bacteria seem to be the most interesting of all These bacteria have an amazing relationship with legume plants Each legume requires a particular kind of variety of bacteria, although one kind of bacteria may be suitable for more than one specific legume.

In this peculiar association, the bacteria enter the root hairs of the legumes, where they multiply in great numbers and form lumps called nodules on the legume roots Within these nodules special processes occur whereby the bacteria, among other things, convert ordinary inert atmospheric nitrogen into a form suitable for use by common crop plants This is called nitrogen fixation When the nodules decay, this fixed nitrogen becomes available for any of our crop plants and tends to promote high crop yields

It is of interest to note that in the earliest recorded history, legumes were recognized as an important source of both food and feed for man and beast The value of legumes for soil improvement was recognized before the time of Christ It was not until 1886, however, that the relationship between legumes and the nitrogen fixing bacteria was discovered. Since that time, legumes have been growing in importance as an agricultural crop, as a source of pasture and high-value winter feed, and as a means of soil improvement

It is estimated that as many as 2 million tons of fixed nitrogen are produced in the United States each year by legumes In the world as a whole, it is estimated that there are 12 to 15 thousand legume species, about 2,000 of which are native to the United States More than 40 species have been introduced into this country

When we consider crop rotations, we usually have in mind a more or less systematic sequence of different crops for every field including a legume as an essential part of the rotation.

When crop plants have a plentiful supply of available nitrogen along with other necessary soil elements and soil moisture, they show a dark green color, grow vigorously, and produce high yields. The growing of legumes also tends to improve the structure of the soil, making it more granular, easier to work, and more receptive of water Such soil usually does not erode easily. Crops grown on nitrogen-rich land are very palatable to livestock and more nutritious. Animals grazing on nitrogen-rich herbage give more milk or make more rapid gains than animals on nitrogen-starved herbage.

Characteristics and Utilization of Legumes

BIENNIAL SWEETCLOVER

Considering annual and biennial legumes, biennial sweetclover seems to be more efficient in nitrogen fixation than any of the legumes now commonly used. Under favorable conditions this legume may fix from 150 to 200 pounds of available nitrogen per acre in its first year of growth. About one-fourth of the fixation occurs in the second year of growth. Grazing or clipping first-year sweetclover reduces the amount of fixation. This indicates that the heavier the topgrowth, the greater the amount of fixation. Fixation continues into the late fall months In Nebraska, biennial sweetclover is used more widely than any other legume. It is adapted to all parts of the state. It is used most extensively where irrigation is practiced.

RED CLOVER

The use of this legume is confined largely to the eastern half of the state. It is less drought-resistant than sweetclover. Where adapted, however, it is a valuable legume for hay and for soil improvement. Generally red clover is planted with wheat, oats, or barley. It is commonly used for hay in its second year of growth. Cutting the hay crop at the early bloom stage provides a high quality hay of high protein

content Such early cutting also favors the production of a good seed crop.

The use of red clover for hay removes some of the fixed nitrogen. Some of this may be returned if manure is used In the wet meadows of the sandhills, red clover has become an important constitutent of the native herbage. Red clover provides nitrogen for the native grasses, thus increasing their nutritive value.

The Midland vareity of red clover is superior to the Common type. The amount of nitrogen fixation made by red clover has not been determined. Limited data indicate that red clover can be expected to fix considerable nitrogen in both its first and second years of growth.

ALFALFA

On irrigated land this legume is outstanding in both hay production and soil improvement. Land recently broken from an old stand of alfalfa may produce as many as three or four consecutive 100-bushel yields of corn.

On nonirrigated land, corn and other corps following old stands of alfalfa may sometimes make a luxuriant early growth, only to be severely damaged later because of insufficient soil moisture. A reduced rate of planting will help to overcome this problem.

In recent years alfalfa has become one of our most important pasture plants, both alone and in combination with grass. In legume-grass pastures alfalfa provides nitrogen for the grass. This not only promotes a more rapid growth of pasture plants, but at the same time improved the nutrient value of the entire herbage. On legume-grass pastures a system of rotation grazing is essential if the destruction of alfalfa is to be avoided. A variety of alfalfa that is resistant to both cold and to the wilt disease, such as Ranger alfalfa, is essential. Using pastures in rotation with other crops is a good conservation practice.

ALSIKE CLOVER

This clover, also called Swedish clover, is a native of Sweden, It is not as heat-resistant as red clover but is very cold-resistant. It is more tolerant of acid and wet soils than is red clover. The seed of Alsike clover is smaller than that

of red clover. About 700,000 seeds are required to make a pound The seed should not be planted more than one-half inch deep. A seeding rate of 5 to 6 pounds per acre is suggested if good seed is used Alsike hay is equal to that of red clover in feeding value.

HAIRY VETCH

Vetch is a newcomer on Nebraska farms. Although this legume has been under observation for many years, its development was delayed for lack of a winter-hardy strain. Discovery of the Madison variety of vetch has solved this problem. Preliminary observations now indicate that vetch may become an important factor in the reclamation of many thousands of acres of sandy soil. Vetch is a viney prostrate plant which protects the soil from wind erosion. These vines are high in protein and are relished by all classes of livestock. Preliminary observations indicate that in a given time, vetch may fix as much nitrogen in its tops and roots as biennial sweetclover.

As with other legumes, vetch seed must be inoculated at the time of planting with a special type of bacteria. Otherwise, the legume will not fix nitrogen and therefore will make a poor growth. Since non-winter-hardy vetch is on the market, it is important that certified seed be used. Only the Madison variety is eligible for certification. Vetch is commonly seeded with rye early in September, using 1 bushel of rye and about 15 pounds of vetch per acre.

See Nebraska Experiment Station Circular 89 for a more complete discussion of this legume

LADINO CLOVER

This legume might be called a large variety of white clover. It has become extremely popular wherever adapted In Nebraska it tends to be winterkilled. Apparently this is due to summer drought and to dryness of our atmosphere during the winter months, since it does very well in some of the northeastern states where winter temperatures average lower than they do in Nebraska. The discovery of strains suitable to Nebraska's climatic conditions would be fortunate There is need for study of this legume in the irrigated areas of Nebraska Apparently it will perform well where the soil remains moist. Ladino has a creeping habit which tends to maintain the stands.

BIRDSFOOT TREFOIL

There are two general types of this legume One has a broad leaf and the other has a narrow leaf Both types are under observation at the Nebraska Experiment Station It appears that these legumes may become valuable in Nebraska as a constituent of both tame and native pastures The broadleaf type seems to offer the most promise. This legume has a deep taproot and is therefore drought-resistant The Empire strain of broadleaf type from New York state seems to be most popular. Both types of birdsfoot trefoil perennial and under careful management they should maintain stands over a long period. This legume is slow in establishing itself. When grown with other legumes and with grasses it tends to improve its stands.

KOREAN LESPEDEZA

This annual legume was introduced into the United States many years ago and became very popular in the central and southern states It is noted for its ability to withstand acid soils. Although this is an annual legume, it performs somewhat as a perennial in that it reseeds itself where the season is not too short

The failure of lespedeza to become popular in Nebraska may be due in part to its late maturity but probably to a greater extent to the fact that we can grow other more profitable legumes It is especially useful on rough, stony land where tillage is not feasible On the other hand, it responds well to good soil conditions Lespedeza is commonly planted in the spring at the rate of about 20 pounds per acre. Scarification and inoculation of the seed are very important.

INOCULATION OF LEGUMES

When legumes are planted to enrich the soil, we are inclined to think that it is the legume which brings about this enrichment. Actually, the legume cannot do this It can act only as a host or protection for the bacteria, which do the work of nitrogen fixation.

Sometimes the bacteria may be destroyed or weakened in some way. Then the legume will not thrive and the soil will not be improved in productivity. It is usually impractical to try to determine whether or not good nitrogen fixers are present in the soil. For this reason it is best to inoculate

all legume seed before planting, even if preceding crops may have indicated a plentiful supply of the desired type of bacteria.

The different types of bacteria for the various legumes may be obtained at seed stores. Directions for application are given on the containers. It is important to follow the directions closely. Keep inoculants in a cool place and do not expose treated seed to sunlight.

PRINCIPAL LEGUME GROUPS ACCORDING TO THEIR SPECIFIC BACTERIAL REQUIREMENTS

(All Members of a Given Group Require the Same Inoculant)

Alfalfa Group --- Alfalfa, Sweetclover, Yellow Trefoil, Hubam.

Clover Group --- Red Clover, White Dutch Clover, Mammoth Clover, Shamrock, Crimson Clover, Strawberry Clover, Alsike Clover.

Pea Group --- Garden Pea, Field Pea, Common Vetch, Hairy or Winter Vetch, Sweet Pea, Lentil.

Bean Group --- Garden Bean, Kidney Bean, Navy Bean.

Lupine Group --- Lupine.

Soybean Group --- Soybean.

Cowpea Group --- Cowpea, Black-eyed Bean, China Bean, Partridge Pea, Lespedeza (Jap Clover), Mung Bean, Lima Bean, Tepary Bean, Kudzu Vine.

Lotus Group --- Birdsfoot Trefoil.

Sanfoin Group --- Sanfoin.

Trailing Wild Bean Group --- Trailing Wild Bean.

Locust Group --- Common Locust, Yellow Locust.

Crown Vetch Group --- Crown Vetch.

PLANTING LEGUMES

Whenever legume seed is to be planted, it is important to keep several items in mind.

1 Inoculate the seed with the proper bacteria.
2 Plant in a mellow, firmly packed seedbed.
3. Apply lime and phosphate fertilizer where needed.
4. Use certified seed of adapted varieties.
5. See your county agent about current problems, the latest approved varieties, and how soil tests can be obtained.

Suggested Cropping Practices

EASTERN NEBRASKA

Plant a legume with all spring-sown small grain. Follow with two years of corn, using nitrogen fertilizer on the second crop. Keep crop residues on the surface to reduce runoff and erosion. Use bromegrass-alfalfa pastures and rotate these over the farm where most needed as a soil conservation measure.

Both red clover and sweetclover are well adapted to the eastern area. Plant red clover in winter on land already sown to winter wheat.

On land subject to severe erosion, do not plant corn or other row crops two years in succession. Reduce runoff and erosion by using subtillage equipment to keep crop residues on the surface.

If steep land is to be cropped, it is suggested that a wheat-sweetclover rotation be used whereby alternate crops of wheat and sweetclover seed are produced by subtillage methods. In this procedure, the sweetclover reseeds itself.

CENTRAL NEBRASKA

(Nonirrigated Land)

Cropping in central Nebraska is similar to that in eastern Nebraska. The primary difference is that of reduced rainfall in the central area. Careful use of crop residues to preserve rainfall is very important. In dry years excess nitrogen may promote more growth than can be

supported by the available soil moisture. Reduction in the rate of planting as compared with eastern Nebraska and the use of a somewhat smaller type of corn is essential In the central area, wheat is relatively a more promient crop than in eastern Nebraska.

Sweetclover is the only legume used extensively in this area. It is superior to red clover

WESTERN NEBRASKA

(Nonirrigated Land)

In western Nebraska on nonirrigated land, legumes are seldom used for soil improvement since soil moisture, rather than soil fertility, is the limiting factor. In this area, winter wheat rather than corn is the chief crop Summer tillage operations are practiced as a means of building up soil moisture reserves The amount of storage is often inadequate for a satisfactory corn crop Care in preventing wind erosion is of special importance

(Irrigated Land)

Wherever irrigation is practiced, the use of legumes for soil improvement is of great importance. Irrigation is an expensive method of farming and yields must be high.