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Forage Sorghum

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in North Dakota



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Agricultural Experiment Station

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SORGHUM ACREAGE IN NORTH DAKOTA during the past 25 years has varied from 9,000 to 68,000 acres annually, depending largely on the need for an emergency forage crop. Most of this acreage is planted to forage types, sometimes called "sugar cane", "cane", "sorgo", "hybrids" or "crosses", and is used largely for silage.

Grain sorghum occupies very few acres because farmers generally do not have a "grain sorghum base" for compliance with the federal farm program and because varieties or hybrids that will mature and yield well have not been available.

The general term "sorghum" is often misused and is not very descriptive. Table 1 will help clarify the types of grain and forage sorghum available as open pollinated varieties, hybrids and crosses.

Recent Experiment Station tests have compared forage sorghum varieties and hybrids, sorghum x sudangrass crosses and sudangrass with corn for silage production. These tests showed that forage sorghum yields are superior, or equal to, corn when both crops are planted in June, at all stations except Dickinson. Forage sorghum seeded in June has yielded about equal to early planted corn at Fargo, Edgeley and Williston (irrigated) but less than early planted corn at Langdon, Minot and Dickinson.

TABLE 1. SORGHUM VARIETIES, HYBRIDS AND CROSSES

Types	Examples	Remarks
OPEN POLLINATED		
Grain	Nordak, Midak, Carmon, Norghum, Reliance	Not commonly grown.
Forage	Rancher, Black Amber, Fremont, Leoti Red, Rox, Orange	Hybrids or crosses will yield better.
HYBRIDS (sorghum x sorghum)		
Grain	see footnote	
Forage	see footnote	Suggested for silage.
CROSSES (sorghum x sudangrass)		
All forage types	see footnote	Suggested for silage, bundle or soiling.

Many hybrids and crosses are available on the market. Descriptive literature from reliable seed houses will give grain or forage characteristics of each.

New forage hybrids and sorghum x sudangrass crosses tested during 1960-67 at Fargo and the branch stations have shown outstanding yield performance. Sudangrass for silage has not yielded as well as sorghum or corn. See table 2 for Experiment Station at Fargo and branch station data.

These figures indicate forage sorghum, when kept clean, has a place in North Dakota. As a

regular crop it can be planted in late May and early June and, except in southwest North Dakota, it will yield about equal to early planted corn in tons per acre. When very late planting, June 15 to July 1, is necessary due to spring drouth, late weed control or failure of an early planted crop, forage sorghum is a valuable crop. Such late plantings can be expected to do better than corn.

PLANT CHARACTERISTICS

Forage sorghum grows 4 to 9 feet high, depending on variety, moisture, temperature and soil fertility. It has a slender, juicy, sweet stalk with a large compact or bushy seed head or panicle at the top. Leaves are generally long and broad, similar to corn. However, leaves of some sorghum x sudangrass crosses may be narrow due to the sudangrass parentage.

Sorghum has an extensive fibrous root system. It is drouth resistant and becomes somewhat dormant during drouth periods, resuming growth when moisture becomes favorable. The plant stays green until the first severe frost in the fall. The leaves appear to dry more slowly and shatter less easily than corn.

Sorghum is a warm season crop and grows best during the warm season. Cold night temperatures probably contribute to slow growth at higher altitudes in southwest North Dakota.

Sorghum is considered quite resistant to grasshoppers. No other insects attack sorghums in North Dakota although aphids have been observed in the top leaf whorl.

A bacterial leaf spot disease attacks most varieties, hybrids, crosses and sudangrass.

FEEDING VALUE

Forage sorghum is nutritious and liked by livestock. Silage made from sorghum at the dough to hard seed stage has about 90 per cent the value of well eared corn silage. As bundle feed, sorghum has less stalk waste than corn. The protein content of good sorghum silage has averaged about the same as corn silage.

Early maturing hybrids and crosses tested in 3 foot rows at Fargo have averaged approximately 1,200 pounds of grain per acre more than the standard open pollinated varieties. Average grain yield of the early hybrids and crosses has been approximately 2,600 pounds per acre. This higher grain content greatly improves the feeding value of these sorghums.

PRUSSIC ACID OR HYDROCYANIC ACID (HCN)

Hybrids and crosses contain larger amounts of prussic acid (HCN) than sudangrass. The HCN content decreases as the plant gets older and is much below the toxic level in the mature plant harvested for silage or bundle feed. Prussic acid is highest in small plants or regrowth occurring after drouth or frost. Sorghum should be grown and used for silage or bundle feed and should not be pastured. In curing as silage or bundle feed, a considerable amount of the prussic acid content is destroyed.

Sorghum holds its forage quality through periods of unfavorable fall weather such as drouth, wind or rainy weather better than corn. Even after the seed is ripe it maintains a desirable moisture content of 65 to 70 per cent for silage purposes until after frost. This may be due somewhat to later maturity but probably more to the greater forage characteristics of sorghum in contrast with the high grain producing ability of corn.

PLANTING DATE AND RATE

Sorghum should be planted on a well-prepared seedbed similar to corn. It is a warm season crop and early planting should be about 2 weeks later than corn. This usually will be late May or early June. When necessary, for emergency forage, planting can be delayed until July 1. If moisture and temperatures are favorable, a good crop can be expected.

Sorghum is usually planted in 38 to 42-inch rows, the same as corn. This requires 5 to 8 pounds of seed per acre. Two-foot row spacings have usually given the top yields at Fargo but may not be desirable except in southeast North Dakota. Solid drilled plantings require 25 to 30 pounds per acre. Drilled plantings and narrow row spacings will yield well under irrigation and in seasons of favorable moisture and temperature.

Treat sorghum seed with Arasan or Captan, and seed $1\frac{1}{2}$ inches deep. A special sorghum plate is needed for the corn planter. A grain drill can be used very satisfactorily for row planting by closing off seed openings to the desired spacing to fit cultivating equipment.

WEED CONTROL

Plant immediately after seedbed preparation for best weed control, then cultivate as for corn. Sorghum seed usually germinates quite rapidly but seedlings may make slow early growth, especially in cool soil or weather. After 3 to 5 weeks, growth becomes rapid. The rotary hoe can be used sparingly after emergence for early weed control but the harrow is too rough. Broadleaf weeds also can be controlled with $\frac{1}{4}$ to $\frac{1}{2}$ pound of 2,4-D amine per acre applied when the sorghum is 4 to 12 inches tall.

Pre-emergence chemicals are somewhat erratic and undependable in North Dakota. Such chemicals that may be tried are Radox at 4 pounds per acre, Ramrod at 4 pounds per acre, or Propazine at 2 pounds per acre. However, sorghum silage or forage treated with Ramrod cannot be fed to dairy animals. Band application over the row will reduce cost per acre.

FERTILIZER

Sorghum responds to nitrogen fertilizer, especially when planted on land following a small grain crop. Ten to 60 pounds of actual nitrogen per acre on nonfallow land based on subsoil moisture supply at seeding time and section of the state are suggested. Up to 35 pounds of actual nitrogen per acre are recommended on fallow land based on moisture conditions. Phosphorus has usually not given a response but can be used on a trial basis. Up to 25 pounds of P_2O_5 per acre are recommended for soils having very low phosphorus tests.

HARVEST

Sorghum should be used for silage but can also be used as a bundle feed. It makes excellent silage anytime after the seed has reached the heavy dough stage until several days after killing frost. When harvested before the heavy dough stage the feeding value per ton is lower. At early stages the moisture content is high and it is difficult to make good silage.

Sorghum for silage should be cut into $\frac{1}{4}$ to $\frac{3}{8}$ inch lengths to insure better distribution and packing of forage in the silo. Exclusion of air by proper distribution and packing will result in better production of desired acids, such as lactic and acetic acids, necessary for high quality silage.

THE CROP AFTER SORGHUM

Sorghums will influence the yield of succeeding crops more than cereal crops. This was formerly attributed only to the depletion of soil water and available nutrients by the extensive root system and late summer growth. This yield depression also is due to the rapid buildup of microorganisms that utilize the readily available high sugar content of sorghum stubble and roots. These organisms require large amounts of soil nutrients, especially nitrogen which is "tied up" temporarily but becomes available later in the season as the microorganism population declines. For these reasons the crop which follows needs special consideration. If moisture is favorable, liberal applications of nitrogen are needed, along with phosphate as indicated by soil tests or experience with other crops. In many sections of the state it is advisable to follow or plant sorghum or corn the next year.

VARIETY RECOMMENDATIONS

An early maturing hybrid or cross is suggested for silage in the north and west areas of the state. In other areas later maturing hybrids or crosses are recommended. Farmers still wishing to use open pollinated varieties might use Rancher or other early maturing varieties. Sorghum crosses readily, and therefore, certified seed is recommended for purity.

Hybrids and crosses tested to date in North Dakota have yielded more than open pollinated varieties (see table 2.) Adapted hybrids and crosses recommended by good reliable seed companies can be expected to yield well under North Dakota conditions. Many hybrids and crosses recover after early cutting and produce a second or third crop during a single season similar to sudangrass.

Varieties in Order of Maturity

Rancher is a black amber type, developed and released by the South Dakota Experiment Station in 1945. It is considerably lower in prussic acid

yield, is very susceptible to bacterial leaf spot and has lodged badly at Fargo and Edgeley.

HYBRIDS AND CROSSES

Black Amber is very similar to Rancher except higher in HCN.

Hybrids (sorghum x sorghum): Many hybrids are available on the market. Descriptive literature from reliable seed companies will describe silage or grazing characteristics.

Fremont is 5 to 6 days later than Rancher.

Leoti Red is tall, juicy and one of the sweetest forage varieties. It is resistant to bacterial leaf spot. Leoti Red is several days later than Rancher and reaches late milk to heavy dough stage of maturity at Fargo in most years.

Crosses (sorghum x sudangrass): Numerous crosses also are available on the market. Descriptive literature from reliable seed companies will describe silage or grazing characteristics.

Ellis, Norkan, Rox Orange and Axtell mature later than the above and are not satisfactory for North Dakota.

Dual is a dual purpose grain-forage sorghum type from South Dakota. It has been inferior for

Early maturing hybrids and crosses with forage sorghum characteristics, are preferred for silage. Piper sudangrass is preferred for pasture because of its excellent grazing yield and low prussic acid content. Crosses with sudangrass characteristics also recover rapidly after grazing, although they are higher in prussic acid.

TABLE 2. FORAGE PRODUCTION OF SEVERAL SORGHUM VARIETIES AND HYBRIDS, SORGHUM x SUDANGRASS CROSSES, SUDANGRASS AND CORN FOR SILAGE IN CULTIVATED ROWS.

	Tons of Dry Forage Per Acre ^{1/}							
	Fargo	Edgeley	Williston		Carrington		Minot	Dickinson
	1960-67	1962-66	Irrig.	Dryland	Irrig.	Dryland	1963-65	1963
			1964-65	1962-65	1963-66	1963-66		
Hybrids	5.81	3.95 ^{2/}	4.77	3.05	5.69	3.45	3.37	1.89
Crosses (sudangrass x sorghum)	5.86	3.15	5.04	2.92	4.95	3.31	2.82	2.39
Open pollinated sorghum (Rancher)	4.84	2.98	3.84	2.20	2.88	2.62	2.28	1.32
Sudangrass (Piper)	3.91	2.26	4.02	1.87	3.10	2.40	2.06	1.44
Corn (85- and 95-day)	4.22	2.71	5.04	2.11	3.46	3.08	2.95	2.52

1/ Approximate silage yield at 70 per cent moisture, multiply yield x 3.

2/ High yielding, late maturing, tall growing Pioneer 931 used as hybrid in trials during 1965-66.

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