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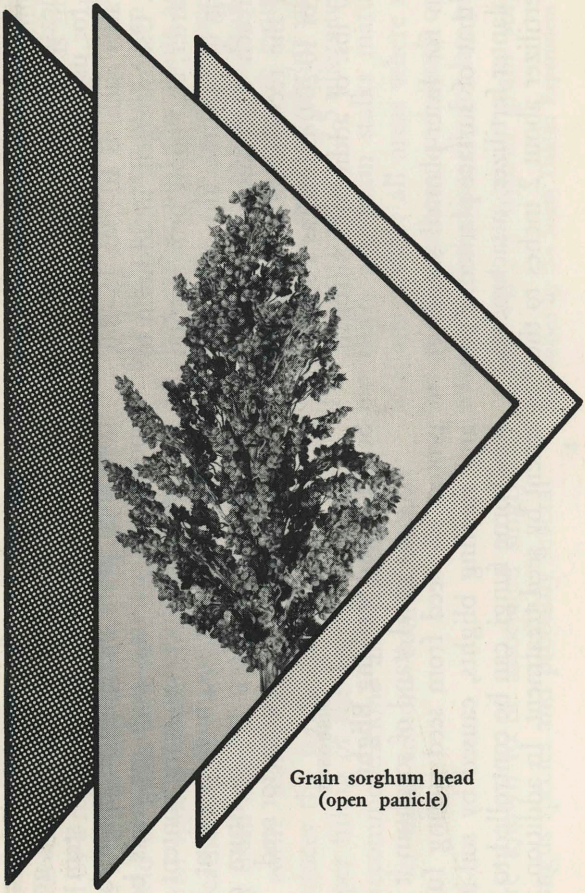

Grain sorghum head
(open panicle)

Cooperative Extension Service

South Dakota State University

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Grain Sorghum Production

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In the last several years about 200,000 acres of grain sorghum have been planted annually in South Dakota. Indications are that the acreage will increase. High-yielding and improved standing ability of recently developed experiment station and commercial hybrid varieties, have stimulated interest in grain sorghum production. The hybrids have largely replaced the open-pollinated varieties.

Grain sorghum has a good potential in South Dakota. Presently, the largest acreages are being grown in the southeast and south central counties. As earlier and better-adapted varieties are developed, the grain sorghum producing area will expand northward.

Sorghum withstands drought, heat, and grasshoppers and is not attacked by corn rootworms. It is a low risk crop, provided you select an early, adapted variety and follow the necessary cultural practices; however, if you select a late variety, sorghum becomes one of the more risky crops.

Sorghum is a relatively new crop. Studying production practices and varieties can help you avoid many difficulties. In the present feed grain program sorghum is handled the same as corn.

Grain sorghum is a highly palatable feed for livestock. For lambs, dairy cows, broilers, and laying hens, it has about the same feed efficiency as corn. For beef cattle and hogs, however, corn is slightly more efficient. Grain sorghum is a carbohydrate feed and is more efficiently utilized by livestock when supplemented by protein.

Grain sorghum is usually grown as a grain crop, but occasionally it is used for silage. The concentration of grain in grain sorghum silage exceeds that of forage sorghum and may exceed that of corn depending on the height of cut. The shorter-growing grain sorghum produces fewer tons per acre than forage sorghum or corn. Cattle do not chew the seed in grain sorghum silage as thoroughly as they do corn. Sheep chew sorghum seed fairly well.

SORGHUM PRODUCTION PRACTICES

If sorghum is planted in rows, the major difference between sorghum production and corn production comes at harvest time. Sorghum, originally a perennial plant, has had most of the perennial characteristics removed through breeding. However, it has a tendency to stay green until after a hard frost. After frost many varieties and hybrids start to lodge. As a result sorghum grain does not get dry enough before harvest and often must be dried artificially.

Planting

Seedbed Preparation

Proper seedbed preparation kills weeds, conserves moisture, and forms a firm, mellow, warm seedbed. Germination is faster in warm soil and more uniform in a firm seedbed. Since sorghum seedlings grow slowly and do not compete favorably with weeds, shallow cultivation immediately before planting is essential.

Plow in early spring, or if necessary, early fall. Just before planting, disk shallow and harrow the land. If you use a lister, blank list in late fall or early spring. Fill in blank listed rows before nosing out with a lister at planting time. A thorough preparation of the seedbed may increase your yield 50%.

Time of Planting

Since sorghum is a hot weather crop, delay planting until the soil is warm enough to insure good seed germination and rapid emergence of the plants. While sorghum can be planted as early as May 15 in some years, experience indicates that if it is planted too early, late germinating weeds like green and yellow foxtail may become troublesome. The usual planting date is between May 20 and June 10. The exact time of planting is modified by seasonal variations and areas of the state. If you use an early grain variety such as SD 441, aim to have the crop planted not later than June 15 to produce a mature crop before a killing frost. A later-maturing variety necessitates an earlier planting date.

Method of Planting

Plant grain sorghum in rows at a depth of 1 inch in heavy soil and 1½ to 2 inches in sandy soil. A corn planter or lister are the most common seeding equipment. A corn planter with furrow-opener attachment is the ideal method. The furrow-opener assures uniform depth of planting and places the seed in moist soil to obtain immediate emergence of the seedling. If you use a lister, list shallower than for corn.

A grain drill can also be used to plant the seed in rows 18 to 42 inches apart. Several rows can be planted with an 11- to 14-foot drill. Bore a hole in a stub 2 x 4, and fasten the stub in drill box above the hole from which the grain is to be seeded. Insert a funnel in the hole in the 2 x 4. An 8-inch funnel will hold about 2½ pounds of seed. A small gas funnel, which holds more seed, can be used.

Sorghum Plates for Corn Planter

Sorghum stands often are either too thin or too thick. To obtain satisfactory yields, a uniform stand is important; therefore, take care to use the right planter plates. For intermediate-size seed varieties, pounds of seed planted per acre amount to approximately two-thirds the number of seeds dropped per foot. Example: If six seeds are dropped per foot in 40-inch rows, the rate of seeding is 4 pounds per acre.

Use plates with holes large enough to hold three to five seeds per hole. If holes are too small, bore them out to the desired size. Some planter plates have rounded notches around the outer edge. If these notches are too small, enlarge them with a rattail file. When fitting the seeds into the holes for testing, pack them in tightly. Count all seeds that will go in at least halfway—a seed that is in halfway will be dropped by the planter.

Countersink holes from the under side. Cut out at an angle of about 30 degrees. The upper edge of the holes should be countersunk very slightly or just enough to take away the sharp edge. Use a false ring, if necessary, to prevent leakage and cracking of small seed.

Calibrating the Planter

Because of the large variation in sizes of sorghum seed, even within the same variety, no "rule of thumb" in planting directions is absolutely reliable. Calibrate the planter each year as follows: (1) block the drive wheel off the floor; (2) turn drive wheel five complete revolutions, catching the seed in a pan; (3) count the seed in a pan and divide the number of seeds by five times the circumference of the drive wheel (in feet). This gives the number of seeds planted per foot.

Rate of Planting

The seed size will influence the pounds of seed to plant per acre. For a grain sorghum variety with intermediate seed size, such as SD 44l, use 3-5 pounds of seed per acre (4-7 seeds per foot) in low rainfall areas and about 4-6 pounds per acre (6-9 seeds per foot) in higher rainfall areas. Under irrigation the optimum stand is 100,000 plants in 20-inch rows. This is four plants per foot of row which would require a seeding of about five seeds per foot.

Narrow Rows

During the last several years, there has been considerable interest in planting sorghum in narrow rows to boost grain yields. Limited tests on row spacing at the Southeast Experiment Farm near Centerville, South Dakota has shown that yields can be increased by planting rows less than 40 inches wide. Present data indicate no yield advantage for rows closer than 30 inches. Increasing the population from 50,000 to 75,000 plants per acre did not increase yield for corresponding row spacings. In areas of lower annual rainfall, the 50,000 plant population would often be too high. With narrow rows, greater distance between plants in the row must be planned in order to get the optimum plant population per acre. Too many plants per acre can easily result in a crop failure. The main advantage of narrow rows is to attain more efficient use of moisture, soil fertility, and sunlight.

It must be emphasized that increased sorghum seed yields will not be obtained using narrow rows if other good cultural practices are neglected. Adequate weed control becomes an important concern with narrow rows. Unless you follow all the recommended practices involved in grain sorghum production, including the selection of an adapted variety, you very well could be disappointed in your results with narrow row planting. If your equipment is geared to 40-inch rows, you will need to decide whether the possible increase in yield will jusitfy converting to narrow-row spacing.

Although sorghum will withstand drought better than most crops, it responds to additional moisture. Poor yields have been obtained during relatively dry seasons from sorghum planted following alfalfa or any other moisture depleting crop. Under irrigation best sorghum grain yields have been obtained with rows spaced about 20 inches apart.

For more detailed information on row spacing and plant population for sorghum, check with the annual report from the South East Experiment Farm.

Weed Control

Sorghum seedlings have a dormancy period which often allows weeds to become very competitive with sorghum in the early growing stage. Plant breeders have been working on seedling dormancy and, as a result, the dormancy characteristic has been lessened in many of the new hybrid sorghum varieties.

Early spring seedbed preparation followed by one or two shallow cultivations just before planting the sorghum seed will kill the weed seedlings and give the sorghum seedling a chance to get ahead of the weeds. Timely cultivations just before planting and during the early growing stages are highly im-

portant in a good weed control program for successful sorghum production.

Chemicals that give good weed control when applied pre-emergence or post emergence are available to supplement good cultural practices. For complete details on controlling weeds in sorghum, get the Extension Service Fact Sheet entitled "Weed Control in Sorghum".

Fertilizer

Nutrient needs of sorghum closely resemble those of corn in that sorghum uses relatively large amounts of nitrogen and moderate amounts of phosphorus and potash. Sorghum will frequently respond to applications of commercial fertilizer containing any or all of the above nutrients, particularly where they are in short supply in the soil. Intensive past cropping management or inherently low soil fertility can cause such a condition. Overall fertilizer application rates for sorghum can be taken from the fertilizer recommendations for corn found in the Fact Sheet, "Fertilizing Corn in South Dakota." Sorghum, like corn, will utilize nearly twice as much nitrogen as phosphorus or potassium. Use a soil test as a guide in determining the most economical fertilizer rate.

Surface-planted Sorghum

Apply phosphorus and potassium, when needed, to surface-planted sorghum at or prior to planting time to make sure these nutrients are available for early plant growth. Nitrogen, however, can be effectively applied and worked into the soil before or after seeding. Broadcast applications made prior to seeding are equally effective whether done in the spring or fall if nutrient loss due to erosion is prevented.

Suggested alternative methods of applying fertilizer to sorghum resemble those recommended for corn. Starter fertilizer applied at seeding time is effective where surface planting is practiced and adequate weed control measures are used. Common fertilizer ratios suitable for use as a starter would be 1-2-0, 1-3-0, 1-4-0, or grades such as 10-20-0, 16-48-0, and 8-32-0, respectively. Use nitrogen, in addition to that contained in the starter, and apply broadcast on the field prior to seeding, or sidedress any time after planting until plants reach a height of 10 to 12 inches. For example, if the recommendation called for 50-20-0 and 100 lbs. of 10-20-0 is used as a starter, apply approximately 40 lbs. of additional nitrogen.

Listed Sorghum

Fertilizer application for lister-planted sorghum varies somewhat from that of surface-planted. Specially designed lister-planter-fertilizer attachments that place the starter fertilizer about 2 inches to the side and slightly below the seed can be used. Apply the additional nitrogen after planting to assure more efficient use of the fertilizer during and after cultivations. Broadcasting fertilizer prior to listing can give poor results because a considerable portion becomes mixed with the dry listed soil ridges between the rows where plants are unable to take full advantage of it.

Fertilizing irrigated sorghum is similar to dryland as far as method and time of application. Remember, however, that for maximum profit higher fertilizer rates should be used in irrigated sorghum fields because potentially higher yields result. If irrigation will increase sorghum yields 40% over dryland yield, then increase fertilizer rates 40% over those for dryland conditions.

Harvesting

Most grain sorghums are combined while standing. This method involves less manual work and can be used under most conditions. The crop must be ripe and the moisture content of the seeds below 13%. Drying equipment is desirable for sorghum production because you can combine the crop when the moisture content is higher (16-18%) and before sorghum plants break or lodge. Artificial drying allows earlier harvesting and reduces the hazards of a cool, wet fall.

Sorghum seed is easily damaged in the threshing operation, especially when the grain is dry enough for storage. Usually, the cylinder speed can be reduced to one-half of that for wheat to prevent cracking the seed. For high moisture grain that will be artificially dried, however, you will need to use more speed. Remove concaves as necessary. Generally, the same riddles and sieves used for barley can be used for grain sorghum.

Storage

Take extreme care in storing grain sorghum. Cracked kernels and pieces of stem and stalks in combined grain increase the danger of heating and spoilage. Removing such materials before grain is binned can reduce moisture content of the grain. Store commercial sorghum grain at 13% moisture content or less. Keep the moisture content below 12% for safe storage of grain for seed.

Diseases

Seed Rot and Seedling Blight

To get a good stand of sorghum it is necessary to protect the seed from seed rotting fungi. Seed rots and seedling blights, caused by soil-inhabiting and seed-borne fungi, can be controlled to a considerable extent by seed treatment. In addition, to get the full

germination potential, use only sound, carefully threshed, and uncracked seed of adapted varieties.

Insist that hybrids and varieties purchased from commercial seed companies or seed dealers be treated with an approved fungicide such as a mercurial material or captan or thiram. Where soil insects are a problem use an approved fungicide-insecticide combination such as captan-dieldrin, thiram-dieldrin, and thiram-methoxychlor. Seed treatment is best done by custom application at the time seed is cleaned. If necessary or desirable to treat on the farm, refer to Fact Sheet "Seed Treatment for Small Grains and other Field Crops" for further information. Follow safety precautions on the label and do not use left over, treated seed for livestock or human feed.

Smut

Several smut diseases occur on sorghum, but only covered kernel smut is of importance in South Dakota at the present time. In smutted heads, enlarged round or cone-shaped spore-containing galls replace the kernels. Usually smut destroys all of the kernels in an infected head. Threshing breaks up the galls and spreads the spores to healthy seeds.

Covered smut can be effectively controlled by seed treatments suggested for control of seed rot. Because it is not safe to assume that seed is entirely free of smut and because recommended varieties are susceptible, seed treatment is important in South Dakota.

Leaf Diseases

Several fungus and bacterial blights occur on sorghum. For the most part, they are of minor importance in South Dakota. The most common leaf disease is bacterial spot, also known as holcus spot. In addition to sorghum, this disease attacks sudangrass, millet, and green or yellow foxtail. It is recognized by small circular to irregularly oval red or tan spots or blotches on the leaves and leaf sheaths. Often the spots have straw or tan colored centers usually surrounded by a red or tan border.

In most seasons bacterial spot does not appear to adversely affect yield of grain sorghum. Like most leaf diseases bacterial spot is favored by warm (75° to 85°F.), moist weather. In such seasons the disease may spread rapidly from lower to upper leaves until half or even the entire leaf surface is destroyed. This materially reduces the forage value and may interfere with proper filling of the kernels. No satisfactory control recommendations are possible at present; however, in most seasons control is not necessary.

Stalk Rot

At least four fungus species and probably several bacterial species are known to be associated singly or in combination with the stalk rot complex of sorghum. It is thought that these organisms invade the plant through openings caused by insects or by mechanical injuries.

Stalk rot becomes most evident as plants approach maturity. The effects vary with the organism involved and location of the stalk infection. In general, poorly developed kernels, premature ripening, and softening at the base of the stalk are external signs of the disease. Inside, the stalk may show water-soaked or discolored pith and streaked fibers.

Standability of the plant is an important factor in varietal performance. Lodged plants, regardless of cause, create harvesting difficulties. Stalk rot may follow drought, extreme heat, or other unfavorable conditions that weaken the plant. High winds at maturity or after a frost increase the amount of lodging in plants weakened by infection. Some varieties have weak necks caused by a genetic factor or, under certain conditions, by stalk rot. Good control measures for the disease complex are not available; tough, resistant varieties offer the best hope for reducing losses.

RECOMMENDED GRAIN SORGHUM VARIETIES

Winner*, an extra-early maturing, low prussic acid grain sorghum, has a seedling of average size and vigor with the normal dormancy period. It is leafy, has slender, sweet, juicy stems, and grows to a height of 30-40 inches under good soil fertility and average climatic conditions. The open, spreading panicle bears white mottled seeds. When planted in 40-inch rows during May, it matures 93-95 days after emergence. Planting in late June appears to materially shorten the time required for maturity.

Winner, recommended primarily as an emergency crop, can be seeded late in closely-spaced drill rows to replace an earlier-planted crop. High yields have been obtained from planting drilled rows 6-24 inches apart in late June. It is important to control weeds when planting late in closely-spaced rows.

SD 102*, an extra-early grain sorghum, matures 3-5 days earlier, and the plants are shorter than SD 441 or SD 451. The heads are open and fast drying, and extend well above the leaves which helps in combining. Its medium-size grain has a brown-rust color. It lacks standing ability after a killing frost. This variety produces 2-5 tillers when planted thinly, but tillers and main stalks mature simultaneously. It is adapted for all areas where sorghum is grown, but in the southeast and south central counties it is recommended primarily for late planting.

SD 441*, a hybrid grain sorghum, has bright

*Developed by the South Dakota Experiment Station.

rust color grain and a good test weight. The kernels are medium-large, and the plants are a few inches taller than SD 451. The heads extend well above the leaves facilitating an easy, clean harvest. The open heads are fast drying. SD 441 stands fair but tends to lodge after a killing frost. It has high yield potentials under dryland conditions and is adapted for all areas where grain sorghum is grown.

SD 451*, a hybrid grain sorghum, has rust-colored grain and a medium kernel size—slightly smaller than SD 441. The plant height and the heads are somewhat more compact than SD 441 but are fast drying. The heads extend well above the leaves, a desirable characteristic for combining. It has good performance and lodging resistance. Since it is a few days later than SD 441, it is best adapted to the area south of U. S. Highway 14.

SD 503*, a mid-season hybrid sorghum, has a semi-compact head with good head exertion. Plant height ranges from 40-44 inches. It has good stalk strength. SD 503 normally matures about the same time as SD 451, SD 502, and RS 501. It has good yielding potential. It is adapted to counties south of Highway 14.

RS 501, an early hybrid grain sorghum, is slightly later and a few inches taller than SD 441. Its greater height and large heads make it susceptible to stalk breakage, especially under drought conditions. The seed is light red, and the head is open and spreading which facilitates rapid drying. It has excellent grain quality, and the grain threshes clean. It is adapted to all areas where grain sorghum is grown.

RS 608, a hybrid grain sorghum, is one day earlier, about 4 inches shorter, has better lodging resistance, and a more open head than RS 610. The seed is reddish-yellow. The yield record is similar to that of RS 610. RS 608 is recommended for the southern areas of the state.

RS 610, a relatively short-growing hybrid grain sorghum, is a few days later than RS 608. The head is rather compact but dries rapidly. RS 610 is a high yielding variety with fair to good resistance to lodging. It is recommended only for the southern areas of the state.

Commercial Hybrid Varieties

The South Dakota Experiment Station has followed the practice of recommending only Experiment Station-developed varieties; however, several commercial varieties have performed very well. According to experimental tests, the early to medium-early grain hybrid varieties are superior to the late varieties in yield and quality of grain.

Several commercial companies are cooperating in the statewide Sorghum Performance Trials. The results of these trials are published annually and may be obtained from the County Agricultural Agent's Office or may be requested from the State University Bulletin Office.

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