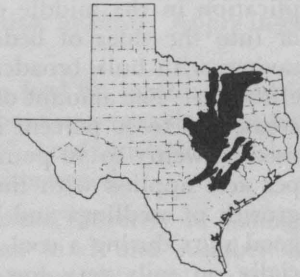


KEYS TO PROFITABLE GRAIN SORGHUM PRODUCTION IN THE BLACKLAND PRAIRIE AND THE GRAND PRAIRIE

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Grain sorghum is the major annual cash crop in the Blackland and Grand Prairies of Texas. Average rainfall in these areas ranges from 30 to 45 inches, but its erratic distribution often makes grain sorghum production more reliable than corn production. This, along with easier stand establishment and easier harvesting, results in most growers preferring grain sorghum to corn when market price is not a significant influence.

Cropping Sequence

Crop rotation, to avoid growing the same crop on a field in succeeding years, will help reduce diseases, insects and weeds. Suitable systems, however, may vary among individual farms. Grain sorghum residue helps maintain proper soil physical condition. Rotation based on 1 or 2 years of grain sorghum and 1 year of cotton is favored in much of the area. Three-year rotation of grain sorghum-cotton-small grain permits soil moisture storage and johnsongrass eradication during the fallow period following small grain harvest, and also is advantageous for livestock. Rotations of other crops can also be used.

Keep records of crop locations, because chemical residues may necessitate changes in the rotation system if certain chemicals are used.

Seedbed Preparation

Seedbed preparation should begin after harvesting the previous crop to allow more time for weed control, soil moisture storage, crop residue decay, fertilizer application and soil firming.

To prepare the seedbed: (1) shred stalks of the previous row crop promptly; (2) chisel, disk, plow or bed to stop crop and weed growth and to mix the plant residue into the soil; (3) bed land by fall or winter; if land is to be rebedded, complete this operation 6 to 8 weeks before normal planting date;

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and (4) control winter weeds with chemicals, row disking or rotary hoeing to avoid disturbing the seedbed.

Fertilization

A balanced fertilizer program is essential for optimum yields, efficient use of water and crop growth to maturity within a normal period of time. The wide range of soils, rainfall and management practices requires tailoring fertilizer applications to each field. The best guide is a soil test recommendation from a reliable laboratory that has correlated the level of available soil nutrients and other factors influencing yield response. Send the laboratory a representative soil sample. In addition, a description of soil conditions, past fertilization and future cropping, and an estimate of expected yield should be sent.

If a soil test is not available, a general estimate of needs at 3,000- to 5,500-pound yield levels includes:

| <u>Nutrient</u> | <u>Pounds per acre</u> |
|---|------------------------|
| Nitrogen (N) | 40 to 100 |
| Phosphorus (P ₂ O ₅) | 40 to 60 |
| Potassium (K ₂ O) | 0 to 40 |

If much undecayed crop residue remains at planting time, increase the nitrogen by 15 pounds for each estimated ton of dry residue per acre.

Fertilizer nutrients generally are used most efficiently when applied near planting time. However, it may be easier and cheaper to fertilize in the late fall before rebedding, or in early winter in the sides of beds with chisel or sweep applicators. Allow ample time for the seedbed to settle before planting. Use placement methods that avoid disturbing the seedbed. Phosphorus and potassium may be applied at any time prior to or at planting; however, some loss of nitrogen may occur if it is applied too early. To reduce application costs, these nutrients are usually applied at the same time and should be added just prior to or after rebedding. If soils are extremely dry or are likely to be covered with water for extended periods, nitrogen should be applied as near planting as possible, or

sidedressed after planting. If anhydrous ammonia is used, apply it 2 or more weeks before planting or as a sidedressing. Sidedressing should be midway between the rows, and should be completed within 30 days after planting.

Band application usually gives the most efficient use of phosphorus. This can be done by chisel application in the middle of rows before rebedding, or into the sides of beds after rebedding. Labor savings with bulk broadcasting may offset banding efficiency. The amount of phosphorus should be increased 40 to 50 percent if broadcast application is used. Twenty to 40 pounds of phosphorus (P_2O_5) per acre applied with the seed may improve early growth of seedlings and help get the crop off to a good start during a cool season. This is true especially on soils very low in phosphorus. Do not apply nitrogen or potassium with the seed.

Zinc and iron deficiencies occur on a few soils. Iron-deficient areas may need two or three foliage sprays of iron sulfate solution at 10- to 14-day intervals. Zinc deficiencies can be corrected by the addition of 10 to 20 pounds of zinc sulfate per acre, or lesser amounts of chelate materials.

For additional information on micronutrients, obtain L-891, *Iron and Zinc Deficiencies in Field Crops*, (Texas Agricultural Extension Service), from your local county Extension office.

Seed

Because high quality seed are important for maximum yields, purchase seed produced by reliable seedsmen. Select seed with high germination and vigorous seedling growth. To insure an adequate stand, seed should be properly treated with a fungicide and an insecticide, and be free of noxious weeds and other foreign material.

Select a hybrid based on previous performance under local or similar conditions. Ask your county agent about hybrids grown in local demonstration trials and/or in Texas Agricultural Experiment Station tests. Yields, standability, tolerance to important diseases in the area and maturity requirements should be considered. Although later-maturing hybrids have the potential for higher yields, under good moisture conditions and normal planting dates medium- to medium-late-maturing hybrids give the best yields most consistently over a period of years. Medium- or early-maturing hybrids may be more productive when planting is delayed or when moisture is short.

Planting

Plant near the average frost-free date when a warming trend is forecast, after the soil temperature at about 7 a.m. is at least 55 degrees F. This ranges from February 15 to March 20 in the central and southern counties, and March 10 to April 1 in the northern counties.

Plant about $1\frac{1}{2}$ inches deep in moist soil. On medium- to fine-textured soils firm the drill row when possible by rolling lightly to conserve moisture and insure germination. Higher yields will be produced with row widths averaging 30 inches or

less if weed control and other cultural practices are performed properly. Use 1 pound of average-size seed for each 700 pounds of expected yield per acre, not to exceed 6 plants per foot on 40-inch rows (80,000 plants per acre). Seeding rates should not be increased when planting on rows less than 40 inches apart or broadcast. Because seed size varies, adjust planters to obtain a seeding rate similar to the amount suggested.

Example: For rows 38 to 40 inches wide and seeding rates equal to 4, 6 or 8 pounds per acre, plant 4, 6 or 8 seeds per foot of drill, respectively. For two rows per bed and rows 18 inches wide, plant one half as many seeds per foot of drill.

Irrigation

Adequate moisture is necessary during the critical growth stages of boot, bloom and soft dough. High-yield grain sorghum uses 20 to 22 inches of water during the growing season. This may be supplied from moisture stored in the root zone before planting and from seasonal rainfall. Producers with bottomlands can use irrigation to maintain ample moisture. Roots of mature sorghum plants can penetrate 4 to 6 feet deep in permeable soils. They may be somewhat shallower in less favorable soil conditions.

Preplanting irrigation can be used if rainfall has not filled the root zone. When enough surface moisture is present for good germination, water for early growth can be applied after plant emergence. During the growing season, apply water when 50 to 60 percent of the available moisture in the root zone has been used. When water supplies are limited, irrigate for ample moisture during the early boot to soft dough stages. Additional water for leaching may be needed with each irrigation when poor quality water is used. Rainfall, soil texture, depth of roots, weather and water quality will determine the number of irrigations, the interval between them and the amount per irrigation. Lighter, more frequent irrigations are required on sandy, shallow soils.

Figure 1 shows the daily use of water by grain sorghum. Daily use begins to increase at the 7-leaf stage, and may be 0.30 inch per day during the boot to grain formation stages.

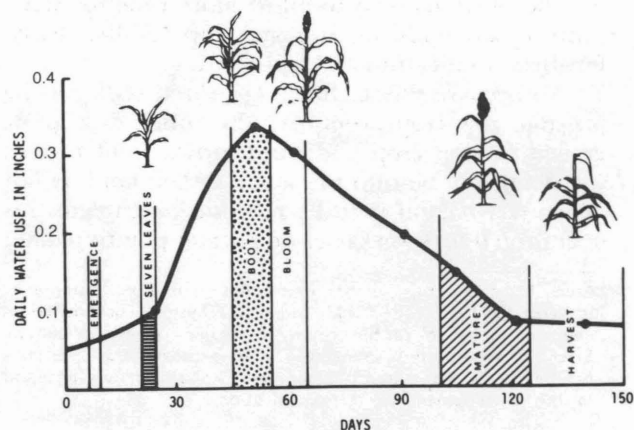


Fig. 1. Daily water use from planting to maturity.

Weed Control

Weeds and grasses reduce yields and may interfere with harvesting. Satisfactory control can be obtained by combining timely cultivation, crop rotation and herbicide applications. Herbicide selection should be based on specific weed and grass problems encountered in each field.

If possible, fields heavily infested with johnson-grass should not be planted to sorghum. Large-seeded grasses such as Texas panicum (Colorado-grass) are not consistently controlled with presently available herbicides.

Milogard or combinations of Milogard with Ramrod or Lorox can be used preemergence to control pigweed (carelessweed), other broadleaved weeds and many annual grasses. Grass control is generally improved when combinations are used. Sorghum, corn, cotton or soybeans can be planted 12 months after application of these herbicides. Other crops should not be planted for 18 months.

If winter wheat is to follow sorghum, Igran can be used preemergence. Wheat can be planted safely 4 months after application.

The preemergence herbicides mentioned should not be used on sand and loamy sand soils. Band applications reduce costs and result in less residue than broadcast spraying.

Postemergence herbicides include Aatrex, Banvel, 2,4-D and Karmex or Dynex.

Aatrex plus a surfactant or nontoxic oil can be applied after sorghum is 6 inches tall. If oil is used, application should be made prior to the boot stage. Small (4-inch), broadleaved weeds and some small-seeded grasses can be controlled. Do not use on sand or loamy sand soils. Residue limits next crop to sorghum or corn.

After sorghum is 6 inches tall, but prior to flowering, 2,4-D can be used to control broadleaved weeds. Use salt formulations with a low vapor hazard, take precautions to avoid spray drift, and comply with restrictions in regulated counties. Banvel can be used from 10 to 25 days after sorghum emergence. At recommended rates it is less injurious than 2,4-D to nearby crops.

Karmex or Dynex plus a surfactant can be applied as a directed spray when sorghum is 15 inches tall and when weeds and small-seeded grasses are less than 2 inches tall.

Additional information on herbicides is available in MP-1059, *Suggestions for Weed Control with Chemicals - Agronomic Crops, Perennial Weeds, Fence Rows and Non-Cropped Areas* (Texas Agricultural Extension Service). Product labels should be consulted before applying any herbicide. Follow all directions carefully.

Insects

Several common insects attack grain sorghum in the Blackland and Grand Prairies:

Southwestern corn borer larvae feed within crown and stalk, causing stunting, lodging and field loss. Plant early to avoid late-season buildups. Ap-

ply insecticides when 25 percent of plants show injury. Shred and plow under stalks promptly after harvest.

Corn earworms and sorghum webworms feed on developing and maturing grain. Because the corn earworm is cannibalistic, insecticides often are not needed. Plant early to avoid late-season buildups. Check plants frequently after heading. Apply insecticides when necessary.

Fall armyworm larvae feed on seedlings and in the whorl during the preboot stage, causing leaf ragging and "buck shotting." Apply insecticides when stand or bud damage is threatened.

Aphids suck plant juices. Severity of damage depends upon plant size, kind and number of aphids, parasites and predators. The yellow sugarcane aphid and greenbug may cause losses from the seedling through grain formation stages. The corn leaf aphid sometimes causes seedling loss. Extension publications give detection and control information.

Sorghum midge adults deposit eggs in florets during the blooming stage. Larvae consume developing seeds and cause "blasted" heads. Plant early to avoid late-season buildups. If midge are present and damage is expected, begin insecticide applications when about 50 percent of heads first begin blooming.

Soil insects (seed-corn maggot, corn rootworms, wireworms, cutworms) in larval stages feed on seeds, seedlings, roots and stems of sorghum. Preplant insecticide application is the most effective control, but seed furrow treatment often is satisfactory. Treatments on seedlings may control cutworms.

Other insects (chinch bug, false chinch bug, stinkbug, flea beetle) occur in local areas. Chinch bugs suck juices from young plants. Flea beetles chew holes in leaves. Stinkbugs and false chinch bugs suck juices from developing grains. Apply insecticides when populations reach damaging levels.

Diseases

For best results in controlling the common sorghum diseases, use a combination of suggested control practices.

Seed rots and seedling diseases are caused by several fungi and bacteria. Seed treatment fungicides used by seedsmen usually give protection, but the grower should keep crop residue out of the seedling zone and use crop rotation.

Downy mildew, caused by a fungus, has two distinct phases. The foliar phase is characterized by distinctive chlorotic spots and downy-like appearance on under leaf surfaces. The systemic phase is characterized by a striking chlorotic leaf stripping and sterility. Rotate sorghum with non-related crops and use tolerant hybrids.

Maize dwarf mosaic produces a typical chlorotic mottle on upper leaves, and a red-leaf symptom on highly susceptible sorghums. Infected plants are stunted and yield less if infected within 45 days

after emergence. The virus overwinters in rhizomes of johnsongrass and is transmitted by insects. Control johnsongrass in and around fields. Use hybrids resistant to maize dwarf mosaic.

Head smut, caused by a fungus, produces smut galls on the stalk and causes sterile heads. Use resistant hybrids and rotate sorghum with an unrelated crop.

Charcoal rot causes shredded stalk interior near ground level, poor seed development and stalk lodging. Infection by this fungus is likely when drought stress occurs near heading. Conserve moisture and mature the crop before usual drought periods.

Anthraxnose, caused by a fungus, forms circular to oval spots on leaves. Neck and stalk rots occur if the fungus penetrates the stalk. Use tolerant hybrids and crop rotation where the problem exists.

Leaf spots and *rust*, caused by several fungi and bacteria species, produce spots, strips, pustules or streaks on leaves, depending on the organism. Use crop rotation.

Nematodes stunt the root system, resulting in poor uptake of water and nutrients. Rotate sorghum with crops which do not host the nematode involved.

Harvest Aids

In some situations, using a desiccant to kill leaves on sorghum or grass and certain broad-leaved weeds may help dry the grain faster or reduce harvesting problems. Desiccants available for grain sorghum used as feed or food usually do not kill the stalks.

Sodium chlorate used with urea as a fire retardant may be applied in quantities of up to 6 pounds per acre of active ingredient when the sorghum is fully mature, and 7 to 10 days before harvest. Four pounds usually are sufficient for desiccation of sorghum and grass. Follow label instructions for gallons of solution per acre for aerial and ground application.

Harvesting

Sorghum should be harvested when moisture in the grain has reached a proper level for available handling facilities. Delay means losses. Acceptable moisture for storage is 13 percent. Grain with up to 18 percent moisture may be harvested if drying facilities are available.

Trash and cracked grain favor insects, moisture accumulation and mold damage in stored grain.

Practice good sanitation during all harvesting and storing operations. Protect grain from rodents and insects.

To avoid waste, the combine operator should follow the manufacturer's manual in regard to proper adjustment. One way of estimating the loss is to measure off 10 square feet of row area (40 inches wide X 36 inches), and count the number of grains on the ground and in the thrashed heads. Each 40 grains is equivalent to 100 pounds of grain lost per acre.

Marketing

Grain sorghum producers should coordinate marketing and production activities to improve the likelihood of a profit on their crops. Growers can base their marketing decisions on a wide range of available sources of information.

Producers, acting individually or as a group, may select one or a combination of the following marketing alternatives: (1) deliver and sell the crop at harvest to a local buyer; (2) contract the crop at a pre-arranged price before harvest, then fulfill the contract by delivering the grain at harvest for cash; (3) "hedge" the crop before harvest on the futures market, then liquidate the "hedge" at harvest and deliver the grain to a local buyer for cash; or (4) store the harvested crop on-farm or in a commercial elevator for later cash sale. The producer can sell later in one lot or he can try to achieve an average price by marketing in several smaller lots throughout the year.

A thorough understanding of how to use these marketing techniques, as well as their advantages and disadvantages, is essential to making a sound marketing decision. This is true whether the producer is marketing individually or cooperating in a group effort. Producers also should compare expected prices from all alternatives prior to choosing one, as prices may vary sharply at various times in the year. Up-to-date market information from reliable sources should help in this analysis. Location in relation to feedlots, poultry and dairy producing units, in addition to export demand also will help determine which marketing decision is most advantageous during any one year.

Economics

See current budgets, or obtain information from local county Extension office. Also refer to L-900A, *Economics of Grain Sorghum Production in the Blackland Prairie and Grand Prairie* (Texas Agricultural Extension Service).

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