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Profitable Grain Sorghum Production in the Rolling Plains

PROFITABLE GRAIN SORGHUM PRODUCTION IN THE ROLLING PLAINS

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Grain sorghum is grown on about 250,000 acres in the Rolling Plains. Soils suitable for sorghum production range from loamy sands to clay. Most sorghum in the Rolling Plains is produced without irrigation. Annual rainfall varies from 18 to 25 inches and is erratic. Yields vary considerably; however, with furrow diking and other recommended practices, dryland yields should average 3,000 pounds per acre or higher.

Cropping Sequence

A cropping sequence of various crops or fallow systems usually results in more effective disease, insect and weed control. Increased water storage and improved fertility level are benefits of a crop rotation system as compared to continuous cropping. Grain sorghum returns large amounts of residue to the soil, which protects the soil from wind and water erosion and increases water penetration.

Cropping sequence in the Rolling Plains normally involves cotton, grain sorghum and small grains. At one time, guar played an important role in this rotation.

Some common cropping sequences are (1) grain sorghum-small grain-grain sorghum, (2) small grain-cotton-grain sorghum and (3) grain sorghum-cotton-grain sorghum.

With the advent of the "Sodbuster Provisions" of the 1985 farm bill, crops such as grain sorghum and small grains (high residue crops) should increase in importance on many of the highly erodible soils of the Rolling Plains.

Seedbed Preparation

Proper soil condition and seedbed preparation are essential for good stands and maximum moisture utilization. Consider these important practices:

- Destroy stalks early to prevent regrowth and prepare soil for moisture storage.
- Bed and furrow dike as early in the fall and winter as practical, to allow maximum storage of rainfall and snow. Subsoiling may also be desirable on some soils.
- Re-work all beds in late winter or early spring to the final height for planting and re-establish furrow dikes in all furrows with the exception of wheel track rows for planting.

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- Use herbicides and minimum tillage to control weeds. Avoid disturbing the final seedbed as much as possible.

Using grain sorghum stubble for grazing in association with small grain pastures may alter the time and method of seedbed preparation for subsequent crops.

Planting

Planting rates, row spacing, dates and selection of proper maturity class hybrids are extremely important for profitable grain sorghum production. Select planting seed of proven performance from a reliable seed dealer. Treat seed with both an insecticide and fungicide. Most seed from reputable suppliers will be properly treated. Each of these considerations is discussed in more detail in the following paragraphs.

Planting rate. Avoid excessive seeding rates on dryland and irrigated sorghum. Both Texas Agricultural Experiment Station and county Extension agent demonstrations have proven that excessive seeding rates drastically reduce grain yields in most years on the Rolling Plains.

Under dryland conditions, do not exceed planting rates of 3 pounds per acre. When planting in warm soils, 2 pounds per acre is often adequate. With limited irrigation, in 40-inch rows, 5 to 6 pounds of seed per acre is adequate, and with full irrigation, 8 pounds of seed per acre is adequate. Seed size may vary considerably. Most seed companies now list the number of seeds per pound on the bag. Use this information to plant two to three seeds per foot of row under dryland conditions, five to six seeds per foot under limited irrigation and eight seeds per foot of row for fully irrigated crops.

For narrow row plantings, do not increase the planting rate per acre over the above recommendations. Reduce the number of seed per foot of row accordingly.

Row spacing. Research at the Chillicothe Experiment Station indicates that skip row planting may be advantageous under certain conditions. *If recommended seeding rates are exceeded or if high tillering hybrids are seeded*, a two in, one out, skip row pattern will increase yields per land acre. *If low tillering hybrids are planted*, the skip row practice is not advised.

Planting dates. Two planting date options are available to Rolling Plains producers. Depending on

early soil temperatures, these optimum seeding dates are usually April or mid- to late June. Avoid May seedings because the critical flowering to head-fill growth stage is reached in the hot, dry period of the summer.

Make early plantings as soon as soil temperatures reach 55° F. at seed depth for 3 consecutive days at 7 a.m. This is usually around April 15. Select early maturing hybrids for early plantings to allow grain development and head fill before the onset of hot, dry weather in July.

Make late plantings from mid- to late June and select medium maturity hybrids for this late seeding date. This allows grain development and head fill at the time when cooling temperatures are beginning to occur and early fall rains are expected.

Potential problems are associated with each of these seeding dates. In some years, spring rainfall and winter moisture storage are not adequate for an early planting. In other years, early summer rainfall may be inadequate for normal head fill and maturation.

Several things can occur with late plantings. Insect damage, especially the sorghum midge, is much more likely to occur on the late heading crop than on an early maturing one. Birds are also more likely to be a major problem on the late crop. A third major problem involves drying conditions late in the season. With fall rainfall and poor drying conditions, it is sometimes difficult to get the crop out of the field.

Hybrid selection. Hybrid improvements are made available by many private and public sorghum breeders. As a result, some new sorghum hybrids are presented for sale to producers each growing season. In an effort to provide information regarding yield and other agronomic characteristics, most new hybrids are entered by seed companies into the Hybrid Performance Test at various locations in Texas. One such location is at Chillicothe. Some hybrids are also included in hybrid demonstrations conducted by local county Extension agents in cooperating producers' fields. Select a hybrid with proven performance in the area. Most major hybrid seed companies have some well adapted hybrids for the area. Consult with county Extension agents about hybrids grown in Texas Agricultural Experiment Station and county Extension agent tests. Also, consult with reputable seed dealers.

Consider such factors as yield, standability, tolerance to insects and diseases and maturity requirements. For skip row plantings, consider tillering characteristics. For early seeding, consider early maturing hybrids. For late plantings select medium maturity hybrids, and for irrigated production, select medium to medium-late maturing hybrids.

Fertilization

Consider inherent soil fertility and moisture before applying fertilizer. A good fertility program is necessary for efficient water use and optimum yields.

Soil tests are a valuable means of determining nutrient requirements for optimum yields for potential profit. Existing moisture reserves influence the nutrient amounts required for an economic response.

Increase nitrogen applications when grain sorghum follows grain sorghum or other high residue crops, particularly if seedbed preparation has been delayed and large amounts of residue are not decomposed at planting time.

Most soils in the Rolling Plains are deficient in both organic matter and phosphorus. The most likely nutrient needs are nitrogen and phosphorus. Very few soils are deficient in potassium.

Apply all phosphorus either preplant or at planting, preferably in a band 2 to 4 inches to the side and 2 to 4 inches below the seed. Twenty to 30 pounds is the normal recommended banded phosphorus rate in a soil low in phosphate. If the phosphate is broadcast, rather than banded, increase the recommended application rate by 50 percent.

Nitrogen requirements are based on a soil test and expected crop yield. Approximately 2 pounds of nitrogen are required for each 100 pounds of grain yield. For the following yield goals, use these recommended nitrogen rates:

Yield goal, pounds per acre	Rate of nitrogen, pounds per acre
1,500 to 2,000	40
2,000 to 4,000	80
4,000 to 6,000	120
6,000 to 8,000	160

Avoid applying nitrogen in direct contact with the seed. Nitrogen applications may be split, with a small amount being applied at or before seeding and the remainder sidedressed within 30 days following crop emergence. Sidedressing minimizes the chances for nitrogen leaching on permeable soils such as sands or loamy sands. For irrigated sorghum, 20 pounds of nitrogen may be applied at each irrigation until the crop's needs are supplied; however, apply all nitrogen before the boot stage.

Iron deficiencies occur on some high pH (calcareous) soils in the Rolling Plains. The deficiency appears on top leaves as yellow interveinal stripes extending to leaf tips. Young plants may turn pale yellow. Iron deficiency often occurs only in spots within a field. Plants usually recover from mild deficiencies. Spray applications of iron chelates in a 1 percent solution or iron sulfate in a 2½ percent solution with surfactant are effective. A repeat treatment in 10 to 14 days is usually required.

Zinc deficiency may also occur on either high pH or sandy soils. A broad band of yellow on both sides of the leaf midrib, beginning at the base of the leaf, is the major symptom of zinc deficiency. This deficiency also appears to retard development and maturation of sorghum heads. To correct a zinc deficiency, 1 to 2 pounds of actual zinc per acre may

be applied to the soil annually with other needed fertilizers. Larger multi-year soil applications can also be made if desired. Consider foliar applications of $\frac{1}{4}$ to $\frac{1}{2}$ percent solution of zinc as a salvage measure only.

For further details concerning zinc and iron deficiencies, refer to L-891 *Iron and Zinc Deficiency in Field Crops*.

Irrigation

To produce optimum sorghum yields, 22 to 24 inches of total moisture are required. Water can be supplied from moisture stored in the root zone before planting, by seasonal rainfall and/or by irrigation. Research at Munday, Texas, indicates that 5 inches of available water are required before any grain is produced. That same research and other research conducted at Chillicothe, Texas, shows that 372 pounds of grain can be produced for each available inch of water. All research indicates that soil moisture is particularly important during the critical growth stages of boot, bloom and soft dough.

Sorghum grown on deep permeable soils usually develops extensive root systems. Soils that are excessively wet or dry or with hard pan or compaction problems can severely limit root development.

Adequate soil moisture at planting helps assure uniform stands and contributes to early plant growth. Use preplant irrigation to supply this moisture when winter and spring rainfall does not fill the root zone before planting. If the seedbed contains sufficient moisture for good germination and early growth, but subsoil moisture is deficient, provide water by irrigating after emergence instead of using preplant irrigation. Whether irrigating before or after planting, do not apply more water than required to fill the soil's effective root zone. Mature plant roots may extend to a depth of 4 feet or more. During the vegetative stage, however, roots seldom extend to more than an 18- to 24-inch depth.

To produce the highest sorghum yields, moisture must remain adequate throughout the growing season. To maintain this condition, irrigate when 50 to 60 percent of the available moisture has been used. Use tensiometers or moisture blocks to determine when to irrigate.

Moderate plant moisture stress during early vegetative growth normally does not significantly limit yields. However, adequate moisture must be available by the boot stage. Highest yield increases and water use efficiency have been obtained by irrigating so that ample soil moisture is available during the boot and bloom growth stages. An irrigation at the milk to soft dough stage has also further increased yields. There is no advantage to irrigations beyond the soft dough development stage. Irrigations too late in the season encourage excessive tillering and create harvest problems.

Rainfall, the soil's water-holding capacity, plant-rooting depth and climatic conditions determine the

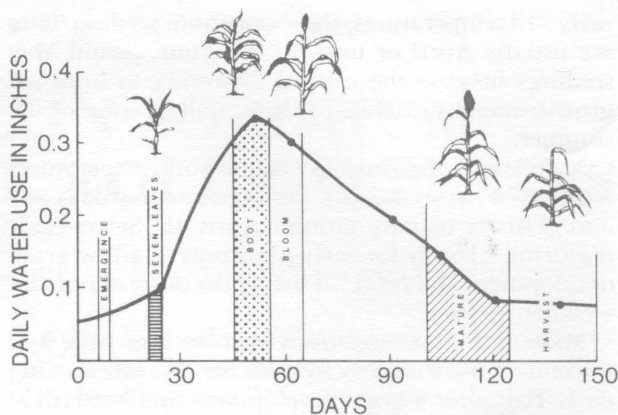


Figure 1. Daily water use from planting to maturity.

number of irrigations required, the interval between irrigations and the amount of water to supply at each irrigation. Sandy soils hold approximately 1 inch of available water per foot of depth. Loam or clay soils may hold 2 inches or more of available water per foot of depth. This means that sandy soils need smaller amounts of water at each irrigation but require more frequent irrigation. Shallow rooted crops also require more frequent irrigation. Encourage deep rooting by maintaining only moderate soil moisture levels during the early vegetative growth stage.

Figure 1 illustrates the general daily water use by grain sorghum that blooms 60 days after planting. Total daily water use is usually less than 0.10 inch until approximately the seven-leaf stage, depending on climatic conditions. Beyond the seven-leaf stage, water use increases rapidly and is likely to be 0.30 inch per day during the boot, bloom and early grain development stages. Plan irrigations to provide adequate soil moisture during these high water requirement periods.

More information is available in L-754 *Soil Moisture Storage*.

Weed Control

Control of broadleaved weeds and grasses can be achieved through timely cultivation, crop rotation and herbicide applications. Select herbicides based on specific weed problems encountered in each field, soil type and rotational crops to be planted following sorghum.

Apply propazine (Milogard®) preplant or pre-emergence to control pigweed (carelessweed), other small seeded, annual broadleaved weeds and some annual grasses. Incorporating propazine to a depth of no more than 2 inches up to 4 weeks before planting improves weed control, especially under dry conditions.

Combinations of propazine with alachlor (Lasso®) and metolachlor (Dual®) or propachlor (Ramrod®) improve the degree of grass control. If Lasso® or

Dual® is applied, either alone or in a mixture, plant Concep® or Screen® safened seed.

Sorghum, corn or cotton may be planted 12 months after a broadcast treatment of 1.2 pounds per acre or less of active propazine (2.4 pints of Milogard® 4L). If 10- to 20-inch band treatments are made, do not exceed a rate proportional to 2 pounds per acre of active propazine on a broadcast basis for rotation with these crops. Do not plant other crops for 18 months, and do not apply propazine on sandy or loamy sand soils.

If winter wheat will be seeded following sorghum, terbutryn (Igran®), Lasso® or Dual® may be applied preemergence. Wheat can be safely planted 4 months after applying Igran® and 4.5 months after Dual®. Incorporate Igran® shallowly to prevent splattering onto seedling sorghum leaves if heavy rains occur.

Under conventional tillage, applying pre-emergence herbicides in bands reduces herbicide cost and minimizes carryover problems.

Do not plant sorghum in fields infested with rhizome and seedling johnsongrass. Johnsongrass and large seeded annual grasses such as Texas panicum (Coloradograss) are controlled best by planting cotton so that trifluralin (Treflan®) or pendimethalin (Prowl®) can be used before rotating to sorghum. If rotation to cotton is not possible, cultivate and incorporate an early post-plant application of Treflan® or Prowl® to assist in curtailing these grasses. After cultivation, Treflan® may be applied after sorghum reaches 8 inches in height and Prowl® may be applied after sorghum is 4 inches tall. Then cultivate to incorporate the herbicide and move the treated soil into the row. Do not apply either of these herbicides preplant to preemergence.

Herbicides to apply postemerge, over the top of sorghum, include atrazine, bentazon (Basagran®), bromoxynil (Bromanil ME 4®), dicamba (Banvel®) or 2,4-D.

Atrazine, plus a surfactant, may be applied after sorghum reaches 6 inches in height and weeds are no more than 1.5 inches tall. Atrazine, plus an emulsifiable oil or oil concentrate in water, may be applied when sorghum is 6 to 10 inches tall but before the boot stage of growth, if weeds are no more than 4 to 6 inches tall. Do not rotate atrazine-treated fields to any crop other than corn or sorghum until the next year, or crop injury may occur.

Banvel is effective on broadleaved annual weeds and suppresses certain perennial weeds (bindweed and silverleaf nightshade). It may be applied postemerge to weeds 3 inches or smaller when the sorghum reaches the two-leaf stage but before it is 15 inches tall. Use drop nozzles if the crop is 8 inches or taller. It may also be applied as a preharvest treatment for escaped weeds after sorghum is in the soft dough stage. Although Banvel® is less subject to volatilization than 2,4-D, use extreme care to avoid drift of spray droplets by wind to susceptible crops.

Broadleaved weeds may be controlled with 2,4-D after sorghum is 6 inches tall. Once crop height exceeds 8 inches, drop nozzles are recommended to

keep spray off the sorghum leaves. Do not treat during boot or early dough stages. Use salt formulations with a low vapor hazard. Do not spray when windspeed exceeds 10 miles per hour, or if susceptible crops such as cotton are adjacent to sorghum fields.

Both Banvel® and 2,4-D are state limited-use pesticides to be sold only to certified applicators. Their use is regulated in certain counties and growers should comply with all restrictions.

Basagran® applications will control certain broadleaved weeds when they are small (2 to 6 inches) and actively growing. Grain sorghum is tolerant to Basagran® at all growth stages, up to and including early boot stage. Do not apply to sorghum that is heading or blooming. Basagran® is a contact herbicide and good coverage is needed for effective weed control. A tank mixture of Basagran® and atrazine plus an oil concentrate will broaden the spectrum of weeds controlled, including pigweed.

Bromoxynil is a contact herbicide, effective on small broadleaved weeds. Pigweed is somewhat resistant and must be no larger than the four-leaf stage for effective control. Make applications after the two-leaf stage but before sorghum is 12 to 14 inches tall. Good weed coverage is required. Do not spray when sorghum foliage is wet.

Read and follow all herbicide labels closely. Take special note of recommended crop size, weed size, crop rotation restrictions, drift hazards, growing condition statements and chemical handling precautions.

Additional information on herbicides is available in the publication *Suggestions for Weed Control with Chemicals in Grain Sorghum—Supplement to MP-1059G*, available at county Extension offices.

Insects

Sorghum insect and mite pests may reach damaging levels at any time during the growing season. For control measures to be effective, identify the pest and apply insecticidal control measures as needed based on the infestation level. Proper choice and careful insecticide use are important. Indiscriminate insecticide use can result in pest resistance, resurgence or secondary pest outbreak.

A healthy plant can withstand higher pest infestation levels. Consider factors such as plant vigor, plant population, growth stage, moisture conditions, time of year, beneficial insect abundance and crop rotation when making control decisions. To evaluate the need for insecticidal control measures, inspect sorghum weekly, biweekly or daily depending on the pest(s) present.

Information on economic injury levels and insecticides for controlling sorghum pests is available in Extension publication B-1220 *Managing Insect and Mite Pests of Texas Sorghum*.

Soil insects in larval stages (*wireworms, white grubs, southern corn rootworm, cutworms and lesser cornstalk borer*) feed on sorghum seed, seedling roots

and seedling plants. Cultivation practices and use of herbicides that provide weed-free fields reduce soil pest densities.

Before planting, inspect fields with high levels of organic matter and a history of soil pest problems. If damaging soil pest infestations are detected, apply an approved insecticide, broadcast and incorporate before planting or apply to the seed furrow at planting.

White grubs are most likely to be found in sorghum planted on land just previously planted to a perennial grass. Examine a 1-square-foot soil sample for each 10 acres before planting. An average of one white grub per square foot is sufficient to cause significant stand loss. An approved insecticide applied broadcast and incorporated into the top 3 to 5 inches of soil provides best results. Seed furrow treatments are not effective for controlling white grubs.

Aphids found on sorghum are *greenbugs*, *corn leaf aphids* and the *yellow sugarcane aphid*. These aphids suck plant juices, and both the greenbug and the yellow sugarcane aphid inject toxins into the plants as they feed. The corn leaf aphids seldom cause excessive damage. The greenbug and yellow sugarcane aphid can greatly limit sorghum yields from the seedling stage to the hard dough stage.

Greenbug infestations occur each year with heaviest infestations developing in irrigated fields. The extent of damage depends upon the number of greenbugs, plant size, vigor and growth stage, moisture conditions and effectiveness of parasites and predators.

Primarily two biotypes of greenbugs are found in the area — biotypes C and E with biotype E being dominant. Sorghum hybrids resistant to biotype C and E greenbugs are available and should be considered when their yield potential is comparable to other hybrids.

Corn leaf aphids are found in the whorl of sorghum, before the boot stage. Very heavy infestations may damage seedling sorghum, but larger plants can tolerate high densities of corn leaf aphids without suffering yield loss.

The yellow sugarcane aphid is more damaging than the greenbug, but infestations in sorghum occur infrequently. Sorghum is infested soon after germination. Therefore, begin field inspection soon after plant emergence. Damage is more severe when sorghum is small as these aphids can destroy stands of small sorghum plants. They are often found on johnsongrass in the early spring. The need for control measures is based on percentage of plants infested, growth stage, potential crop value and cost of insecticidal control. Information on identifying these aphids is presented in Extension publication L-819 *Greenbugs and Other Aphids of Sorghum and Small Grains*.

The *sorghum midge* is one of the most damaging sorghum pests; however, damaging infestations do not occur in this area each year. Damaging numbers may occur by June 30 in the southern Rolling Plains,

but it is often well into August or early September before damaging infestations are found in the northern part of the area. Sorghum midge is more likely to develop damaging populations in areas with considerable acreage of irrigated sorghum. An increase in sorghum acreage in the area results in earlier and heavier sorghum midge infestations.

Damage results from destruction of the grain in an individual spikelet by the sorghum midge larva. Eggs are laid in spikelets of flowering sorghum heads by the tiny female sorghum midge. Each female may deposit about 50 eggs. Heavy infestations can destroy all the seed in the head. Sorghum is susceptible to midge egg deposition until the entire head or field has completed flowering (yellow anthers exposed on individual spikelets). The susceptible period may be from 9 days to several weeks. After midge is found, inspect fields daily during the flowering period. The need for insecticidal control measures is determined by an estimate of the value of the potential yield, the midge density and the cost of insecticidal control measures. Tables on the economic injury levels for sorghum midge-susceptible hybrids and sorghum midge-resistant hybrids are presented in B-1220. The midge-resistant hybrids can withstand midge levels about five times greater than susceptible hybrids.

The *sorghum webworm* is rarely found in the area. It occurs in the more humid eastern half of Texas.

Fall armyworms and *corn earworms* feed in the whorl of preboot sorghum and damage the leaves. Although the damage gives the plant a ragged shot hole appearance, chemical control measures are seldom economically justified. If larvae are damaging the developing heads as the plants near the boot stage, insecticidal control measures may be needed.

These larvae may also be found in the developing head from flowering through the soft dough stage. Corn earworms are cannibalistic; therefore, only one or two larvae are usually found per head. Planting sorghum hybrids with open or loose heads reduces the larval density in the head.

Stink bugs, *leaf footed bugs* and *false chinch bugs* may move from alternate hosts into sorghum in relatively large numbers and feed on the developing grain. The conchuela stink bug develops large populations some years and is the most prevalent stink bug found in sorghum. The leaf footed bugs and false chinch bugs are often found in well defined spots in fields. Damage from these bugs depends on the number present and the grain development stage when the infestation occurs. These bugs cause more damage during early grain development with little or no damage after the hard dough stage.

Chinch bugs are a sporadic pest and only rarely damage area sorghum. They migrate from bunch grasses or small grains and congregate behind the lower leaf sheath of sorghum. Control measures are most effective when applied against chinch bugs on younger plants. Effective control is seldom obtained on booting or larger plants.

Mite densities are highest in irrigated sorghum.

Numbers of mites are usually highest after the boot stage. Infestations most often start on the underside of leaves, and mites migrate upward as the plant develops. Extensive webbing occurs in the head of very heavily infested plants. Plants protected from water stress tolerate mite infestations better. Base control measures on the mite density, potential yield and plant growth stage. Mites can limit grain production until the hard dough stage. Heavy infestations may induce lodging and related harvest losses. Miticides may provide only erratic control.

Diseases

Producers often overlook disease damage in grain sorghum or mistakenly attribute losses to causes such as adverse weather conditions. Identifying and controlling diseases that limit grain sorghum production can be profitable.

Descriptions of the more common sorghum diseases in this area and control principles follow.

Seed Rot and Seedling Diseases

Getting a good stand is the first hurdle of the production year. Fortunately, grain sorghum has fewer problems in this area than most major crops. The organisms that cause seed rot and seedling diseases are more damaging when adverse weather and soil conditions interact.

Most grain sorghum stands are lost when hard, packing rains seal the soil surface and soil temperatures are cold. Emergence is slower and soil organisms may use the seed as a food source.

After emergence in cold soils, plants may have a purple color and grow very slowly. While organisms can be isolated from plant parts, this symptom is usually nutritional in nature. Phosphorus uptake is poor in cold soils, and purpling causes temporary phosphorus deficiency.

Use high quality planting seed that has been treated with a protectant fungicide. Chemical seed treatment compounds usually are applied by the seed companies before seeds are sold to the producer.

Maize Dwarf Mosaic

Maize dwarf mosaic is a virus infection that produces a distinctive mottling in leaf tissue.

The time of infection determines to a large degree how much yield loss is likely to occur on susceptible hybrids. If plants are infected before reaching 45 days of age, losses are greater than if infection occurs later.

Mottling is the most consistent symptom; however, other symptoms may also occur. Red-leaf occurs when highly susceptible hybrids become infected and growing temperatures fall below 55° F. The red-leaf symptom will usually develop in the Rolling Plains area after August 1.

High yielding hybrids with resistance to maize dwarf mosaic are available for all parts of the state.

Downy Mildew

Sorghum downy mildew is caused by a fungus that

was first observed in Texas in 1961. Its greatest damage has been restricted to areas along the Texas Gulf Coast, but it has also been found in the Rolling Plains and High Plains.

Infected sorghum plants have striped leaves with a downy growth on the lower surface. The striping is characterized by light green to yellow streaks within the green leaf. Young plants showing this symptom are systemically infected and will be sterile. Late infection sometimes occurs, leaving plants with partial or completely sterile heads.

A crazy top condition has also been observed with downy mildew and produces sterility in the plants as does the regular downy mildew. Symptoms differ, however, from the regular sorghum downy mildew. Leaves are thickened with rough bumps and ridges along the surfaces. Some leaves twist together and turn downward, giving the plant an unusual crazy top appearance. Affected plants also produce many shoots or suckers which appear bunched.

In the Rolling Plains, producers should rotate with unrelated crops as this disease is soilborne.

Head Smut

Sorghum plants infected with the head smut fungus appear normal until heading time. At heading, a large smut gall appears in place of the panicle and no grain is produced. The entire head turns into a mass of dark brown powdery spores. The gall is first covered with a whitish membrane which soon breaks up allowing spores to scatter by wind and rain to the soil. The fungus overwinters in the soil and can survive for several years.

Head smut can be controlled effectively by growing resistant hybrids.

Seed treatment does not prevent head smut, but crop rotation helps.

Anthracnose

This is another fungal disease that damages grain sorghum foliage and stems. On susceptible hybrids the stem holding the head becomes infected and a brown sunken area with distinct margins develops. When affected stems are cut lengthwise with a knife, one can see the fungus has penetrated the soft tissues and caused a brick red discoloration. This type of infection stops the flow of water and nutrients and essentially stops grain development.

Since the organism is carried over in crop residue and on johnsongrass, practice good residue management and weed control.

Charcoal Rot

Grain sorghum plants affected by the charcoal rot fungus fail to fill properly and may lodge in the latter part of the growing season. The disease is identified easily under field conditions by splitting the lower stalk lengthwise and looking for shredded tissue. Fungus activity within the plant tissue causes the softer portions to be consumed and the tougher vessels remain. Small, dark, fungal bodies cover the vessel bundles and give the tissue a charcoal color.

Charcoal rot invades plants under drought conditions and may cause lodging.

If drought stress can be avoided with lower planting rates or irrigation, the problem may be reduced. Some hybrids have a stiffer stalk and do not lodge as badly as others following infection.

Nematodes

Several different nematode species may attack the roots of grain sorghum and cause reduced yields. Affected plants are usually stunted and show symptoms resembling inadequate fertility. This type of damage is usually noted only in more sandy-type soils. If irregular growth patterns are indicated, nematode damage may be suspected. For diagnosis, send a soil sample to the Plant Nematode Detection Laboratory at College Station, Texas.

Desiccants

In some situations, a desiccant to kill leaves on sorghum or grasses and certain broadleaved weeds may allow the grain to dry faster and reduce harvesting problems. Sodium chlorate, with urea as a fire retardant, partially kills the plant and allows the head and leaves to dry rapidly for about 10 days after application. Rapid drying occurs only when temperatures are high and humidity is low following application. Apply sodium chlorate at a rate of up to 6 pounds per acre of active ingredient when the sorghum is fully mature, and 7 to 10 days before harvest. Use 5 to 10 gallons of solution per acre for aerial applications and 20 to 30 gallons for ground application. Follow instructions given on the product label and do not graze for 14 days.

Harvesting

Harvest when grain moisture has reached a proper level for available handling facilities. Delay means losses. Acceptable moisture is 14 percent. Grain with up to 18 percent moisture may be harvested if drying facilities are available.

To avoid waste, follow the manufacturer's manual on proper combine adjustment. Trash and cracked grain favor stored grain insects, moisture accumulation and mold damage. Practice good sanitation with all harvesting and storing and protect grain from rodents and insects.

Marketing

Grain sorghum producers, individually or as a group, may (1) forward contract a growing crop through mutually agreed upon terms of trade, then deliver the grain at harvest, fulfilling the contract; (2) "hedge" the growing crop through a "cross-hedge" using corn on the futures market, then liquidate the hedge at harvest and deliver the grain to the local buyer for cash or use the corn futures "option" market; (3) deliver and sell the crop at harvest to a local buyer for cash; (4) store the harvested crop in either on-farm or commercial storage facilities for cash sale at some later date; or (5) place the harvested crop under loan in an approved facility for later-than-harvest cash sale, or redeem the loan and deliver title to the grain to the government.

Weigh each marketing method for individuals or groups. Location in relation to feedlots, poultry and egg producing units and swine or sheep feeding, in addition to export demand, helps determine the most advantageous method during any marketing year.

Notice

Suggested pesticides must be registered and labeled for use by the Environmental Protection Agency and the Texas Department of Agriculture. Pesticide label clearances are subject to change. Therefore, before using any recommended pesticide, contact the county Extension agent concerning current label status.

The pesticide user is responsible for a pesticide's use on his own crops or livestock, as well as problems caused by drift or pesticide movement from his property to other properties.

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