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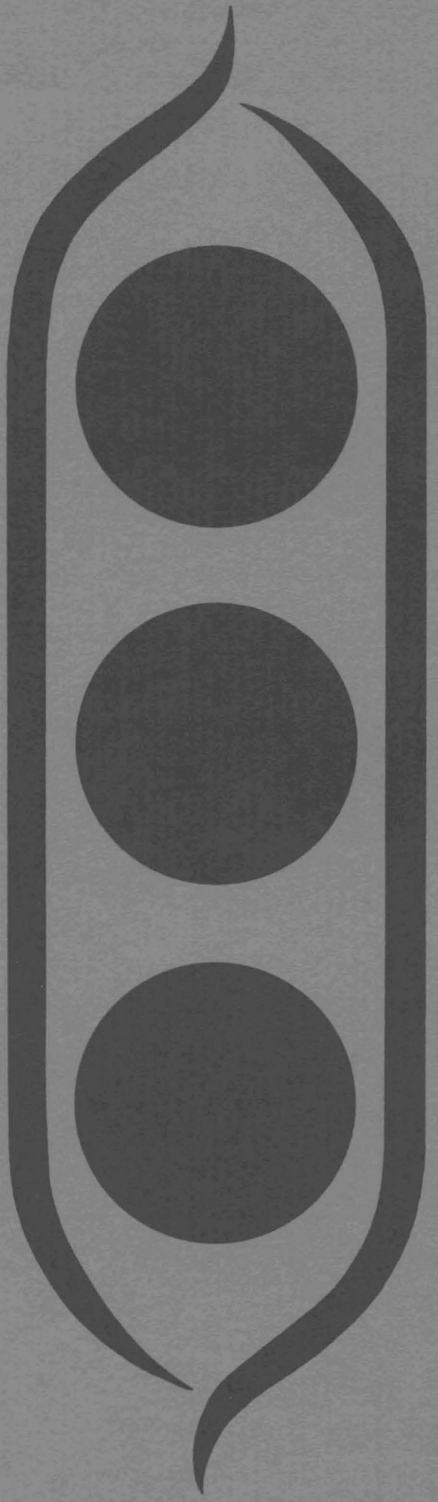

SOYBEAN PRODUCTION IN TEXAS

TEXAS A&M UNIVERSITY • TEXAS AGRICULTURAL EXTENSION SERVICE • J. E. Hutchison, Director, College Station, Texas

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SOYBEAN PRODUCTION IN TEXAS

Soybeans, an important Texas cash crop, are produced primarily on the irrigated High Plains, the eastern portion of the Coast Prairie and the Red River Valley of northeast Texas. Soybeans are adapted to the same general soil and climatic conditions as corn, cotton or grain sorghum, provided moisture, disease or insects are not limiting factors.

In low rainfall areas, yields have been too low or inconsistent for profitable production under dryland conditions. Soybeans' need for moisture in late summer minimizes economic crop possibilities in the Blacklands and Rolling Plains. In the Blacklands, cotton root rot seriously hinders soybean production. Limited moisture at critical growth stages may occasionally prevent economical yields even in high rainfall areas of northeast Texas and the Coast Prairie.

Because of day length sensitivity, soybeans should be planted in Texas during the long days of May and June to obtain sufficient vegetative growth for optimum yields. Varieties planted during this period usually cease vegetative development and initiate reproductive processes during the hot, usually dry months of July and August. When moisture is insufficient during the blooming and fruiting period, yields are drastically reduced. In most areas of the state, July and August rainfall is insufficient to permit economical dryland production. The risk of dryland soybean production in the Coast Prairie and northeast Texas is considerably less when compared to other dryland areas because moisture is available more often during the critical fruiting period. Even though the need for moisture is critical during flowering and fruiting, young plants often die when soil is saturated for extended periods of time. After plants become well established, their growth is not seriously retarded by a wet season.

Utilization and Characteristics

The soybean plant is a legume grown principally for its seeds which contain approximately 20 percent oil and 40 percent protein. Ninety percent of the oil is used in edible products such as shortening, margarine and salad oil; the remaining 10 percent is used industrially. Ninety-eight percent of the meal is used as livestock and poultry protein supplement.

Soybeans are called short-day plants because they flower and produce seed when a critical short-day length is reached. Until daylight becomes sufficiently short to trigger flowering, soybeans remain in a vegetative state. In Texas, most adapted varieties have a critical effective day length of 14 to 14½ hours, with flowering initiated when the daylight period is less than 14 hours.

Most soybeans grown in Texas are of the determinate type, which almost stops vegetative growth when flowering begins. These differ from indeterminate types grown mainly in the Midwest, which continue vegetative growth after flowering is initiated.

Varietal Descriptions

Since soybeans are sensitive to photoperiod or day length, varieties and strains have been classified into ten maturity groups from 00 to VIII for testing and evaluation. Groups 00, 0, I and II flower and mature under a relatively long day in the northern United States and Canada, while groups VI, VII and VIII are best adapted to Gulf Coast states. Varieties grown in Texas are included in groups III, IV, V, VI, VII and VIII. Time of maturity varies slightly among varieties within the same group.

Lee (maturity group VI) is a late variety in this group. It is highly resistant to shattering and is resistant to bacterial pustule, wildfire, frog-eye, target spot and purple seed stain. Lee is characterized by plant height short for its maturity, dense spreading foliage, purple flowers borne on long racemes, tawny pubescence and light brown or tan pods at maturity. Seeds are almost round and have black hila, yellow seed coats and yellow cotyledons.

Lee 68 (maturity group VI) is adapted to the same area as Lee. It was developed in a backcross program to increase resistance to Phytophthora root rot and should be used instead of Lee when the disease is present. Distinguishing characteristics of Lee 68 are the same as those of Lee: purple flowers, tawny pubescence, tan pod wall, shiny yellow seed coats and black hila. It is similar to Lee in growth type, average date of maturity, plant height, quality of seed, seed size and chemical composition of seed. Lodging of Lee 68 is usually higher than Lee where Phytophthora root rot is severe. Increased lodging in the presence of Phytophthora root rot appears to be associated with more vegetative growth and higher yields of Lee 68. Yield trials indicate the two varieties perform similarly when the disease is not a problem.

Hill (early group V) resembles the Lee variety, but is about 3 weeks earlier in maturity. It has tawny pubescence, light brown pods and a plant type similar to Lee. Hill differs from Lee in that the flowers are white, the yellow seeds are slightly smaller and the hila are light brown. This variety is comparable to Lee in disease resistance. It is resistant to bacterial pustule, wildfire and frog-eye, and shows good field tolerance to Phytophthora root rot.

Bragg (maturity group VIII) averages 10 inches taller than Lee, has white flowers, brown pubescence and a brown pod wall. Seeds are yellow with black hila. Plants are resistant to bacterial pustule, wildfire and target spot, and moderately resistant to Phytophthora root rot and root-knot nematodes. It is equal to Lee in seed holding. Bragg apparently has no advantage over Lee, unless a grower desires more plant growth.

Bossier (maturity group VII) is a selection from Lee released by the Louisiana Experiment Station. It produces a stalk 4 to 8 inches taller than Lee, is a more bushy plant and sets pods about 6 inches above the ground. It matures about 7 days later than Lee. Yields have been equal to or slightly greater than Lee. The plants have purple flowers, brown pods and yellow seeds with dark brown hila. Shatter resistance is good and disease resistance is about the same as for Lee.

Semmes (maturity group VII) is resistant to Phytophthora root rot and has the same resistance as Lee to bacterial pustule, wildfire and target spot diseases. Its seedholding ability is very good. The plants have purple flowers, gray pubescence and yellow seeds with brownish-black hila. Like Lee, it is susceptible to the common root-knot nematode. Semmes matures approximately 4 days later than Lee and grows somewhat taller. Its superiority over other varieties is greatest on poorly drained soils because it will tolerate extended periods of wet soil.

Davis (maturity group VI) is considered a midseason variety of this group. It matures about 3 or 4 days earlier than Lee. Davis averages about 7 inches taller than Lee and tends to lodge on highly productive, well-drained soils. It has good seed-holding characteristics, but is slightly more susceptible to shattering than Lee. It is highly resistant to Phytophthora root rot and is resistant to bacterial pustule, wildfire and target spot. Seeds of Davis are slightly larger than Lee and possess dull yellow seed coats with buff hila. The plants have white flowers, gray pubescence and light tan pod walls. Pods are mainly two and three-seeded and are borne rather high on the stem. Oil content of the seed averages about 1 percent higher than Lee, but protein content averages about 2 percent lower.

Patterson (maturity group IV) is susceptible to Phytophthora root rot and foliar diseases. The plants have white flowers, straw colored pods and light cream to white seeds with buff hila.

Clark 63 (maturity group IV) is resistant to both Phytophthora root rot and bacterial pustule leaf spot and has excellent lodging resistance. The plants have purple flowers, tawny pubescence, brown pods and dull yellow seeds with black hila. Clark 63 is indistinguishable from Clark in the absence of Phytophthora root rot and bacterial pustule diseases.

Wayne (maturity group III) is resistant to bacterial pustule leaf spot. Flowers are white; pubescence and pods are brown. Its seeds, slightly larger than Clark 63, are shiny yellow with black hila.

Hampton 266 (maturity group VIII) has good seed-holding qualities, high oil content and resistance to bacterial pustule. The variety has gray pubescence on a brown pod, purple flowers and yellow seeds with light brown hila.

Dare (maturity group V) is about the same height as Lee but matures about 10 days earlier. It has white flowers and gray pubescence. The seed-holding qualities are slightly less than that of Lee, and the seeds have yellow coats and light brown hila. It is resistant to purple stain and seed mottling, bacterial pustule, target spot and moderately resistant to Phytophthora root rot.

Hood (early group VI) matures about 8 to 10 days earlier than Lee. Hood has purple flowers, gray pubescence, yellow seed coat and light brown to buff hila. It is susceptible to Phytophthora root rot and difficulties have been encountered in some areas in obtaining uniform stands. The variety is resistant to bacterial pustule, wildfire, frog-eye and target spot. Its seed-holding ability is less than that of Lee. It has been a high yielder in the Plainview-Lubbock area, but shattering is a problem if not harvested promptly when mature.

Recommended Varieties By Production Areas

South Plains:

Plainview area and north
Hill, Wayne, Patterson and Clark 63
Plainview area and south
Hill, Lee and possibly Hood

North Plains:

Wayne, Clark 63 and Patterson

Gulf Coast Area:

Lee, Bragg, Hood, Semmes, Davis, Bossier and Hampton 266

Northeast Texas Red River Valley:

Lee, Bragg, Hampton 266, Dare and Davis

Seed Quality and Inoculation

Soybean seeds should be pure for variety, free from weed seeds and diseases and have a germination of 90 percent or above. Use certified seed or seed of comparable quality. Soybean seeds deteriorate more rapidly with age and improper handling than most legume seeds because of their high oil content. Improperly stored seed more than 1 year old and mechanically damaged seed are unsafe for planting. If a farmer saves his own seed for planting, a germination test should be made before planting so planting rates may be adjusted if necessary.

Inoculate soybean seed immediately before planting with a special soybean bacterial culture, even though soybeans were grown previously on the field to be planted.

Inoculate by mixing moistened seed thoroughly with inoculant. Water or a water-sugar mixture helps the inoculant adhere to the seed. It is important that each seed be thoroughly coated. Since sunlight, heat and excessive drying will impair or destroy effectiveness of the bacteria, plant seed immediately after inoculation. When properly inoculated, soybean plants may begin fixing nitrogen 2 weeks after emergence.

Seed Treatment

Plant high-germination seed when possible to help control seedling disease. Seed germinating below 85 percent should be treated with a fungicide such as Arasan before planting. Seed treatment is especially beneficial for seeds with low vigor. However, seed treatment may decrease inoculation effectiveness.

Time of Seeding

Texas farmers tend to plant soybeans too early for best results. In many parts of the state, soybeans cannot be planted early enough to utilize spring moisture because of their sensitivity to daylength. In extreme south Texas, most soybean varieties will flower within 30 days after emergence regardless of planting date because of short day lengths in the area. Short, bushy plants and low yields usually result from this short vegetative period and early blooming.

Plant soybeans after minimum soil temperatures have reached 65 degrees and the effective daylight period, ranging from a half hour before sunrise to a half hour after sunset, reaches or exceeds 14½ hours. Because of soybean sensitivity to both light and temperature, better plant growth and seed production are obtained by delaying planting until these requirements are met. Soybeans have been planted successfully in several areas of the state from May 1 to July 1. Generally, areas south of an east-west line from Waco to El Paso should not plant soybeans before May 15. Considering varieties recommended for the northern High Plains, May 20 apparently is the optimum date of planting for this area. However, excellent yields have been obtained from plantings made through June 15 to 20.

When planting must be delayed beyond the optimum period, a later-maturing variety usually will yield better than an early-maturing variety. Early-maturing varieties planted late in the season will flower too early for adequate vegetative growth. This results in low pod set on small plants, making them difficult to harvest.

On the northern High Plains, date-of-planting trials indicate that for varieties in maturity groups II through IV, maturity is delayed approximately 1 day for every 2 days delay in planting after May 20. Also, there is an average yield reduction of a half bushel per acre for each day of delay in planting after that date.

Seedbed Preparation

Prepare the seedbed for soybeans the same as for cotton, corn or grain sorghum. The seedbed should be firm, free of weeds and the row surface should be slightly to well above general ground level to facilitate irrigation and harvest. On heavier soils of the Coast Prairie, farmers find planting on beds above ground level is essential to prevent stand loss during the early growing period when rainfall is generally excessive. Bed planting is utilized on the irrigated High Plains for efficient irrigation and harvest operations.

Planting, Rate and Depth

Soybeans usually are planted in 36 to 40-inch rows; however, limited tests show a slight yield advantage in using closer row spacing under favorable moisture conditions. From limited research and farmer experience, it appears that row spacings of 10 to 20 inches may increase yields 2 to 5 bushels per acre if adequate moisture is available. The wider row system permits utilization of regular cultivating equipment. Enough viable seed should be planted to insure 8 to 12 plants per foot in the drill row for high yields that are easier to harvest. Depending on seed size, 40 to 60 pounds per acre will be required for the 36 to 40-inch rows. Rates up to 90 pounds per acre may be necessary where double rows or narrow rows are used. However, research at Beaumont, Texas, and in Alabama indicates that 60 pounds of viable seed per acre are adequate regardless of row width. Weeds will be more troublesome during the seedling stage when stands are thin. Also, poor stands increase losses because of difficulty in harvesting the resulting short, bushy plants with pods set close to the ground. Thicker stands are more subject to lodging if good growing conditions exist. Seed should be planted 1 to 2 inches deep with a corn or cotton planter equipped with a bean plate. Narrow row spacings can be obtained with a grain drill by plugging certain flutes or by using newer types of unit planters. Young seedlings can be cultivated with a rotary hoe and later with regular cultivating equipment. Cultivation should be shallow and frequent enough to control grasses and weeds.

Fertilization

Fertilize according to a soil test. Apply fertilizer to the side and below the seed at the time of planting or below the seed before planting. Do not apply directly with the seed. Nitrogen and potash are particularly harmful to germination. If nodulation is poor, sidedress with 15 to 30 pounds of nitrogen. Pale green plants sometimes indicate nitrogen deficiency caused by poor nodulation.

On fertile land or where preceding crops have been fertilized heavily, fertilizer requirements for soybeans can be reduced or omitted. Experience and research studies indicate that soybeans utilize native and residual fertility. In lieu of a soil test, consider the use of up to 30 pounds of nitrogen (N), 30 to 60 pounds of phosphorus (P_2O_5) and 30 to 60 pounds of potassium (K_2O). Nitrogen rates should not exceed 30 pounds N per acre. Responses from nitrogen fertilization have not been reported except on acid soils or where inoculation was ineffective. In many areas of the state, soybeans have not responded to fertilizer applications, but highest yields have been produced on soils known to be highly fertile.

Liming

Lime application can increase availability of other plant nutrients in acid soils. Lime also increases growth of beneficial soil bacteria and other micro-organisms which aid in decomposition of organic materials. Nitrogen-fixing bacteria work best around a pH of 6.5. Liming acid soils tends to make native molybdenum more available to plants.

Broadcast and mix lime thoroughly with the soil before planting. If soil pH is below 5.5, apply lime early enough to allow time for it to react before planting. Determine amount of lime needed and application frequency by soil pH test every 2 or 3 years.

Micronutrients

Deficiencies and lack of response to micronutrient fertilization are not a major problem in Texas. Limited iron deficiencies have been observed on highly alkaline soils. For more information about iron, see L-723, *Identifying and Correcting Iron Deficiency in Field Crops.* Questions about zinc fertilization may be answered from information in L-721, *Zinc Deficiency and Fertilization.* Both publications are available from the County Agricultural Agent's office.

In some states, limited responses have been reported from small amounts of molybdenum applied to the seed. However, these have been confined to unlimed acid soils, generally where pH is below 5.5. Where soils have pH values above 6 or have been limed as recommended, molybdenum has not increased soybean yields.

Moisture Requirements

Twenty to 30 inches of water will normally produce good soybean yields. However, availability of moisture during critical growth stages is more important than the total amount. Water requirements are similar to those for cotton since moisture demands for both are critical during the latter part of the growing season. However, irrigations on cotton usually end in late season, thereby forcing maturity, while irrigation on soybeans may continue until seed mature. Yields from all soybean varieties are likely to be limited by insufficient moisture during August and September. Late-maturing varieties may require supplemental moisture through early October. During the seedling stage only, small quantities of moisture are necessary for continuous growth. Higher soil moisture levels should be maintained during flowering and fruiting periods. Under dryland conditions, the distribution and amount of rainfall received during flowering and until pods mature will determine the economy of using soybeans in a farming operation.

Irrigation

Irrigation requirements vary with soil type and geographical location. In irrigated areas, unless good subsoil moisture is available, apply preplanting irrigation to wet the soil root zone. For maximum yields, apply additional irrigation water just before bloom initiation and at 10 to 20-day intervals until pods are well filled. At Lubbock, over a 5-year period, a preplant plus five summer irrigations produced maximum yields. However, in the same area, the most efficient use of total water, rainfall and irrigation, has been obtained by preplant plus two summer applications (bloom stage and one additional irrigation 20 days later). Additional irrigation may be necessary if soil begins drying before seed pods are filled. Also, a prebloom irrigation may be beneficial in promoting vegetative growth of early-maturing varieties which aid in higher pod set. Research conducted on the northern High Plains further indicates that yields are closely associated with moisture levels during the bloom and pod set stage. It showed that soybeans are capable of profitable yields from high moisture levels during this growth period.

Diseases

There are about 50 diseases known to affect soybeans, and annual losses are estimated at 12 percent of the total crop. It usually is possible to find one disease or more present in any field. Intensity of disease development and resulting crop loss depend on organisms present and occurrence of weather conditions that favor disease development. Because most soybean diseases are soil-borne, consider rotating with crops unrelated to soybeans and unsusceptible to the same diseases.

Varieties described indicate resistance to many of the most important diseases. Use of resistant varieties, along with rotation, use of disease-free seed and seed treatment will help prevent soybean disease losses. Some diseases prevalent in Texas, their symptoms and suggested control include:

Soybean Diseases in Texas

Disease	Casual Organism	Symptoms	Source of Inoculum	Control
Downy mildew	Fungus *(Peronospora manshurica)*	Indefinite yellowish-green areas on upper surface. Grayish downy tufts of mold growth on lower leaf surfaces.	Overwinters in soil, on seed and in soybean residue.	Crop rotation. Use of disease-free seed.
Bacterial blight	Bacterium *(Pseudomonas glycinea)*	Angular water-soaked spots appear first, turning yellow and then brown. Lower leaves drop on heavily infested plants.	Bacteria are seed-borne and carried from one season to another in crop residue.	Plant disease-free seed. Bury surface trash during land preparation. Rotate with non-related crops.
Southern blight	Fungus *(Sclerotium rolfsii)*	White mold growth appears at the base of the plant and girdles the stem. Sclerotia (resting bodies) about the size of mustard seed appear in the mold.	The fungus occurs widely in many soils. It is capable of persisting on almost any type of organic matter.	Bury surface trash deeply and rotate to lower the inoculum potential in the soil.
Cotton root rot	Fungus *(Phymatotrichum omnivorium)*	Plants die suddenly during summer. Affected plants are easily pulled from the soil and have buff colored fungal strands on the roots.	The cotton root rot fungus is soil-borne and affects some 2,000 plant species.	Avoid planting soybeans in known infested areas. Deep plowing and burial of high quantities of organic matter during summer months will reduce incidence of disease in future years.
Phytohthora root rot	Fungus *(Phytophthora megasperma* var. *sojae)*	Destroys roots and tender stems of infected seedlings, resulting in rapid death. Older plants turn yellow and leaves wilt. A brown discoloration develops in the stem.	Soil - borne. Damage is more severe on heavy clay soils than on lighter soils.	Resistant variety. Crop rotation. Go to lighter soils if possible.
Purple stain	Fungus *(Cercospora kikuchii)*	Seeds are stained by a fungus that grows in the seed coats and produces a light to dark purple discoloration. Size of the discoloration may vary from a small spot to the entire seed surface. When infested seeds are planted, fungus grows from the seed coat into some of the young seedlings. Such diseased seedlings are the primary source of spores which infect leaves, stems and pods later in the season. Wet weather during the growing season favors development of purple stained seeds.	The fungus survives the winter in diseased crop residue as well as infested seed.	Crop rotation and complete burial of crop residues will aid in holding the disease in check. Fungicide seed treatment will prevent seed transmission but will not prevent purple stain occurrence when the fungus comes from another source such as crop residue. Lee and Hill varieties are moderately resistant to purple stain.
Seedling disease	Fungus *Rhizoctonia solani, Pythium* spp. and other damping-off fungi	Young soybean plants develop a reddish-brown decay of the outer layer of the root and basal stem. Frequently this decay girdles the stem and the plant dies. The lower part of the taproot with its secondary root system is sometimes destroyed.	These organisms are soil-borne and persist in crop residue.	Seed treatment is of limited value in controlling seedling disease. There are no resistant soybean varieties. Rotate with non-related crops. Bury surface trash deeply. Avoid root injury by cultivation. Use high quality seed.

Insects

Various insects may attack soybeans during the season. If not controlled, they can seriously reduce yield and quality. Insects may be grouped according to type of damage they inflict upon the plant: (1) stem and root feeders or stalk feeders, (2) foliage feeders and (3) pod feeders. The three-cornered alfalfa hopper may be the most important insect attacking the stalk. Those attacking leaves include leaf beetles, blister beetles, velvetbean caterpillar, fall armyworm, green cloverworm and various loopers. The most important insects attacking pods are stinkbugs and the corn earworm (cotton bollworm). Stinkbugs have caused economic losses to Gulf Coast soybean farmers for several years. They pierce the immature seeds with their needle-like mouthparts and withdraw plant juices, which may prevent normal development of the seeds and cause lower yields. On older, more mature seed, the puncture provides an entrance for secondary microscopic organisms which cause spotting and discoloration, resulting in quality loss and downgrading. Corn earworms consume the pod and seed, resulting in yield loss.

Determining Infestations

From emergence through blooming, the soybean plant can withstand 40 percent defoliation without important yield losses. However, when pods are forming and beginning to fill, a 20 percent foliage loss will decrease yield. Leaf function is most important during pod formation and filling. After pods are fully filled and seeds are nearing maturity, up to 35 percent defoliation will not cause economic yield reduction. Thus, the stage of growth and an estimate of the percentage of defoliation are important in determining the necessity for insecticide applications to control foliage feeders.

To determine infestations of other types of insects, check 3 feet of row in ten spots per field weekly. These 3-foot checks should be scattered over the field to assure an adequate sample. At each check, shake plants from 3 feet of row over a 2 by 3-foot white cloth placed between the rows. Count the number of corn earworms and stinkbugs dislodged from the plants. If 30 corn earworms per 30 feet of row or 10 stinkbugs per 30 feet of row are found, this constitutes an economic infestation.

Occasional changes in insecticide recommendations may be necessary because of development of new and improved insecticides, methods and techniques of application and changes in specifications and restrictions by regulatory agencies. Soybean growers should contact the local county Extension agent for the latest information on soybean insect control.

Weed Control

Top yields of good quality soybeans are impossible unless weeds and weed grasses are controlled. Not only do dense weed stands compete for available nutrients and moisture, they also interfere with harvesting. Research has shown that one pigweed in every 40 inches of row can reduce the yield by 7 bushels per acre. In addition, the presence of weed seeds may lower the price of soybeans or necessitate recleaning, which would further reduce profits.

Mechanical weed control is an effective method of controlling weeds in soybeans. Because soybeans are fast-growing plants that rapidly shade the soil (in 3 to 5 weeks), early season weed control is most important. The rotary hoe is an efficient tool for early season weed control. Rotary hoe cultivation should begin just before weed emergence and continue until soybeans are 4 to 6 inches tall, or until it would cause excessive injury to the soybeans. Injury can be reduced by working during midday when soybeans are slightly wilted. The rotary hoe is usually more effective after light rains, when a light crust has formed on the soil surface. One to two cultivations with sweeps is usually required to complete weed control.

There is no advantage to ridging rows more than is necessary to control weeds. Ridging does not make plants stand better, and pods are produced about the same distance up the stem from planting depth on ridged and unridged rows. Cutterbar losses are often increased on ridged rows from cutting above or through pods at harvest.

Although properly timed mechanical weed control in soybeans is often successful, additional weed control is usually needed. Early summer rains that favor germination and weed growth may also prohibit or delay mechanical cultivation. Conditions such as these demand other means of weed control; many farmers are fulfilling this demand with herbicides.

Herbicides are now available which can give full-season control of grasses and most broadleaf weeds. They can be used before or just after planting. After soybean plants have emerged, other chemicals can be used to control weeds not controlled by preemergence treatments. Even though some herbicides which have been available for many years have given variable results, they are good insurance against weed competition in a wet year. Remember that chemicals are a supplement to good cultural practices, not a substitute. Check with the local county Extension agent or refer to the latest issue of B-1029, *Suggestions-Weed Control with Chemicals,* for the latest information on weed control in soybeans.

Harvesting

All seeds on a soybean plant mature at essentially the same time. Seed maturity is accompanied by rapid dropping of leaves and drying of stems. The final maturing process is so rapid that chemicals applied sufficiently early to hasten leaf-dropping result in reduced yields. Benefits from applying dessicants for drying weeds in soybeans may not compensate for the expense of application. If chemicals are applied before soybean leaves begin to turn yellow, yields will be reduced. If chemicals are applied, they must have federal clearance before application if soybeans are to be used for food or feed.

Combining should be started when the moisture content is below 14 percent to minimize losses caused by shattering, cutterbar action, threshing, separating and cleaning. The combine operator should check reel speed and height, ground travel speed, cutterbar height and sharpness, pick-up action of lodged plants by guards or special attachments, cylinder speed and clearance and flow of material over the rack and shoe as indicated in his operator's manual. Position the reel to cause a minimum disturbance of standing plants. Moisture variance during the day necessitates combine adjustments to correct for changing conditions.

A loss of four seeds per square foot is equal to approximately 1 bushel per acre. Usually 80 percent of the total harvest loss results from failure to get all pods into the machine. About 50 percent of this is shatter loss. Excessive or inadequate reel speed is one cause of shattering. Reel speed should be just slightly greater than the combine ground speed. Reels should be run just deep enough in the beans to control the stalks, and should be about 6 to 12 inches ahead of the cutterbar.

Operate the cutterbar as low as possible. Shattering, dropped stalks and pods left on the stalk below the cutterbar account for most of the loss.

Ground speed should be 2½ to 3 miles per hour. Most combines have a fixed sickle speed. As ground speed increases beyond 3 miles per hour, the cutterbar begins stripping the pods before the stalk is cut, causing seed loss. Uneven stubble height is an indication of excessive forward speed. As forward speed increases, it is difficult for most operators to keep the header down on the ground, resulting in more pods remaining on the stalk.

Mechanical damage is another source of loss to the soybean grower. Broken beans and splits can reduce the market grade. Mechanical injury is one of the principal causes of low seed quality. Injuries result primarily from impact of the seed with hard surfaces.

Soybean Grades

Soybeans are bought and sold on the basis of U. S. grain grading standards with discounts for excess moisture, splits, damaged kernels, bicolored seeds and foreign matter. It may be necessary to reclean seed to remove foreign material.

Grades are assigned to lots of soybeans on the basis of samples drawn from each lot.

Markets

Approximately 90 percent of the soybeans produced in the United States are sold to country elevators; the remainder goes directly to processors or terminals that assemble beans for export. Both markets are available in Texas. Soybean markets are established in the three main areas of production. Producers outside these areas may want to contact the local county Extension agent for assistance in locating the nearest market facility.

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