

SESAME

A High Value Oilseed

Overview

Sesame is an ancient oilseed, first recorded as a crop in Babylon and Assyria over 4,000 years ago. The crop has since spread from the Fertile Crescent of the Ancient Near East to be grown in many parts of the world on over 5 million acres. The biggest area of production is currently believed to be India, but the crop is also grown in China, Korea, Russia, Turkey, Mexico, South America and several countries in Africa. U.S. commercial production reportedly began in the 1950s. Acreage in the U.S., primarily in Texas and southwestern states, has ranged from 10,000 to 20,000 acres in recent years; however, the U.S. imports more sesame than we grow. It would take at least 100,000 acres of sesame in the U.S. just to meet domestic demand, and production on more acres could be exported. Thomas Jefferson recognized the potential of sesame when he grew it in test plots (he referred to it as beni or benne), but 200 years later we have done little to develop this crop in the U.S.

Sesame seeds are unusually high in oil, around 50% of the seed weight, compared to 20% seed oil in soybeans. Sesame is a high value food crop, being harvested both for whole seed used in baking, and for the cooking oil extracted from the seed. This warm season annual crop is primarily adapted to areas with long growing seasons and well drained soils. It is considered drought tolerant, but needs good soil moisture to get established. Sesame has been researched extensively in Missouri and seems to be well adapted to our growing conditions.

Plant Description

Sesame [*Sesamum indicum* (L.)] is a broadleaf plant that grows about 5 to 6 feet tall, with height dependent on the variety and growing conditions. Large, white, bell-shaped flowers, each about an inch long, appear from leaf axils on the lower stem, then gradually appear up the stem over a period of weeks as the stem keeps elongating. Depending on the variety, either one or three seed



capsules will develop at each leaf axil. Seed capsules are 1 to 1 1/2 inches long, with 8 rows of seeds in each capsule. Some varieties are branched, while others are unbranched.

The light colored seeds are small and flat, with a point on one end. Seed size varies, but one report indicates that sesame has roughly 15,000 seeds per pound. Since flowering occurs in an indeterminate fashion, seed capsules on the lower stem are ripening while the upper stem is still flowering. The lowest flowers on a stem may not develop into pods, but pods will generally start 12 to 24 inches off the ground and continue to the top of the stem. Sesame is a long season crop, taking about 125 to 135 days from planting to maturity in Missouri. If planted in early June, leaf drop will usually occur in early October and the stem will begin drying down. Plants stand upright reasonably well with sturdy stems, but strong winds can force the plant into a leaning position late in the season.

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How to Grow Sesame

Sesame will perform best on fertile and well-drained soils, such as silt loams. It is adapted to sandy loam soils, provided there is adequate moisture during seedling establishment. It has been grown satisfactorily on silty clay loam soils, but soil crusting can be a problem in establishing sesame when clay content is higher. Sesame is not adapted to poorly drained soils, and will not tolerate water logged conditions. Soils close to a neutral pH of 7.0 are recommended. Sesame can fit well with other summer annuals in a crop rotation, but may be sensitive to some soil persistent herbicides. Sesame reportedly can provide some improvement in soil tilth or structure due to extensive rooting.

Variety Selection and Seed Sources

The only significant source of sesame varieties and seeds currently in the U.S. is the Sesaco Corporation (1-800-527-1024). Their plant breeder has developed several varieties. Every year or two they update the variety or varieties recommended to their contract producers. A few public varieties of sesame were released decades ago but are no longer available. Occasionally, specialty seed houses will have some sesame available in garden-sized packets, of unregistered varieties that are probably not good agronomic performers (for example, Seeds of Change, New Mexico, phone 888-762-7333, sells small packets of sesame by mail order).

Planting

Planting sesame is the most critical phase of its management. Successful establishment of sesame requires careful seedbed preparation and close attention to soil moisture. Sesame will not emerge from soils that are even slightly crusted and needs fairly warm soil temperatures of 70°F. or more. In Texas, growers are told to pre-irrigate their sandy loam soils to obtain “bright moisture” in the seed zone. Irrigating the crop after planting is often unsuccessful because of the weakness of sesame seedlings in breaking through even a thin soil crust. It’s best to plant into moist soil.

Sesame must also be planted shallow, preferably 1/2” deep, which makes getting into moisture difficult. Ridge-till planting would probably be effective, since scraping off the ridge top with a ridge till planter would expose moist soil. In previous work with sesame in Missouri, the best results were obtained by preparing a seedbed, waiting for rain, then planting as soon as the soil is able to be worked. This final tillage pass should leave a fine textured soil so that a consistent shallow planting depth can be obtained.

Planting close to June 1 is recommended in Missouri. Soil temperatures may be too cool earlier, and sesame planted after June 15 may not mature before frost. By planting around June 1, there is still time to replant if necessary. A planting rate of 2 to 3 pounds per acre is recommended. A precise rate is not critical since sesame will self-thin and compensate for differences in plant population, similar to soybeans. In 30” rows, anywhere from 6 to 18 seedlings per foot is usually appropriate. At maturity, a plant population of 4 to 8 plants per foot is a good target. Although row spacings of 15” or less have shown some yield advantage over wide rows, planting in 30” rows is recommended in Missouri to allow for row crop cultivation. In Texas, 36” rows are typically used to allow a row crop header to be used for harvest. Since seeding rate is low, an insecticide box on a row crop planter could be used to meter out the seed.

Sesame was planted no-till following cover crops in one Missouri study. The system proved feasible, but more difficult than using tillage to prepare a fine seedbed. The advantage of planting after cover crops would be to help with weed control, and in the case of legume covers, to supply nitrogen to the sesame. No-till does offer the advantage of having better moisture at the soil surface, due to the surface residue reducing evaporation; however, this advantage is offset by the difficulty of trying to plant a small seeded crop at a consistent shallow depth through plant residue.

Fertility

Like most alternative crops, sesame's fertility needs are modest. Nitrogen should be supplied at 50 to 80 pounds per acre, with the lower figure for situations where the sesame follows soybeans or another legume in the rotation. Sesame's nitrogen requirement can be fulfilled through organic sources, such as leguminous cover crops or animal manure. Phosphorous and potassium needs are not known exactly, but should be comparable to soybeans or sorghum. If soils are acidic, pH should be brought up through liming.

Pest Management

Weeds

No herbicides are currently labeled for use on sesame, although it is possible that a temporary herbicide use could be allowed under a temporary state registration. Weed control is usually achieved the old-fashioned way, through pre-plant tillage and using a row crop cultivator once or twice after the crop is established. Care should be given with pre-plant tillage to maintain soil moisture.

Insects

Sesame has been grown at several locations in Missouri during five field seasons with no noticeable insect damage to leaves or seed capsules. In fact, sesame has seemed almost uniquely distasteful to many leaf chewing insects. In other regions, however, sesame has been attacked on occasion by insects. Insects could be a problem for sesame in Missouri as disease vectors. Aphids or whiteflies could introduce a virus to sesame field plots. Insecticides are available for sesame, but should be applied only after scouting. In most instances, there is probably not an economic benefit from spraying.

Diseases

Diseases have been reported in sesame grown in other parts of the world, but have not yet been a problem in Missouri. Probably the greatest threat is the soil pathogens that can attack and kill seedlings in cool, wet conditions, creating the damping off symptoms. Using a two or three year crop

rotation with sesame can help avoid disease problems that could eventually develop.

Harvest and Storage

Dry down of sesame plants prior to harvest can seem slow relative to a crop like soybeans. When planted in early June, sesame will normally drop its leaves and begin drying down in early October, but it can take a while for the last of the green to disappear from the stem and upper seed capsules. To deal with the indeterminate nature of the crop, some farmers have windrowed it. Given the potential of fall rains in Missouri, however, it is probably better to plan on direct combining the crop. Harvest should be done before frost if at all possible, because frost can damage the appearance of the seed (important for whole seed confectionery use) and sometimes the quality of the seed.

Sesame can be combined using an all crop reel head or a row crop header, such as a soybean row header. Air speed and cylinder speed should be lowered. A bottom screen or sieve with a 1/8" hole size is recommended by the Sesaco Corporation to their growers. Since seed size is small, holes in combines or trucks may need to be sealed with duct tape.

Since sesame is a small flat seed, it is difficult to move much air through it in a storage bin. Therefore, it is recommended that the seed be harvested as dry as possible, and stored at a moisture of 6% or less. If the seed is too moist, it can quickly heat up and become rancid. Freshly harvested seed above 6% should not be left sitting on a truck for long to avoid spoilage. Idle trucks with sesame on board should generally not be tarped on a sunny day, since the tarp can increase heat build-up. Sesame grain is sold on a weight basis rather than a bushel basis. No market classes have been established, but dockage will be charged by Sesaco Corporation for foreign material, broken seed, or moisture above 6%.

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Utilization

The primary market for sesame seed in the U.S. is use in a variety of baked goods and confections. The taste of sesame differs among varieties and can be negatively affected by poor post-harvest processing and storage. Part of the attraction of sesame for baking is undoubtedly its high fat (50% oil) and high protein content (up to 25% protein by weight).

Sesame oil carries a premium relative to other cooking oils and is considered more stable than most vegetable oils due to antioxidants in the oil. After the oil is extracted from the seed, the remaining meal is a high protein material suitable for feeding to livestock. Although at this time sesame oil is used almost exclusively for human food consumption, it has potential for a variety of industrial uses, as do most vegetable oils.

Markets and Economics

Sesame benefits from both a high price and a strong domestic market. Contract price is generally \$0.20 to \$0.22 per pound or more for conventionally grown sesame, with significantly higher prices for organic sesame. This high price, roughly double that of sunflowers or soybeans, is offset by the relatively low yields of sesame. Typical test plot yields in Missouri during 1992-1994 were 800 to 1000 pounds per acre, with maximum yields of 1200 pounds on small research plots. Thus, gross return for conventional sesame will be in the ballpark of \$200 per acre.

Production costs are modest, being equal to or less than soybeans or sorghum. Seed costs are similar to conventional crops. The cost savings from not using herbicides (none are labeled for sesame) is partially offset by extra tillage for weed control. Fertilizer costs are primarily for nitrogen, which can be met through organic sources. Harvest costs should be similar to other grains, but transportation to market will be an extra expense since delivery points are currently outside of Missouri.

Most of the farmers growing sesame under contract are working with the Sesaco Corporation, a private company based in Texas (1-800-527-1024). Sesaco provides their own exclusive varieties (available only to contract producers), and does the processing and marketing of the seed and oil. Missouri producers could potentially market their sesame directly to food brokers or processors, but may have trouble obtaining good quality varieties to plant, since Sesaco Corporation

is the only group actively developing and distributing seed in the U.S. at this time. Independent food brokers may be unwilling to contract for sesame in advance of planting; planting sesame without a contract in hand is a risky proposition. Producers interested in sesame are encouraged to work out marketing prior to planting.



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