OKLAHOMA COOPERATIVE EXTENSION SERVICE

Watermelon Production

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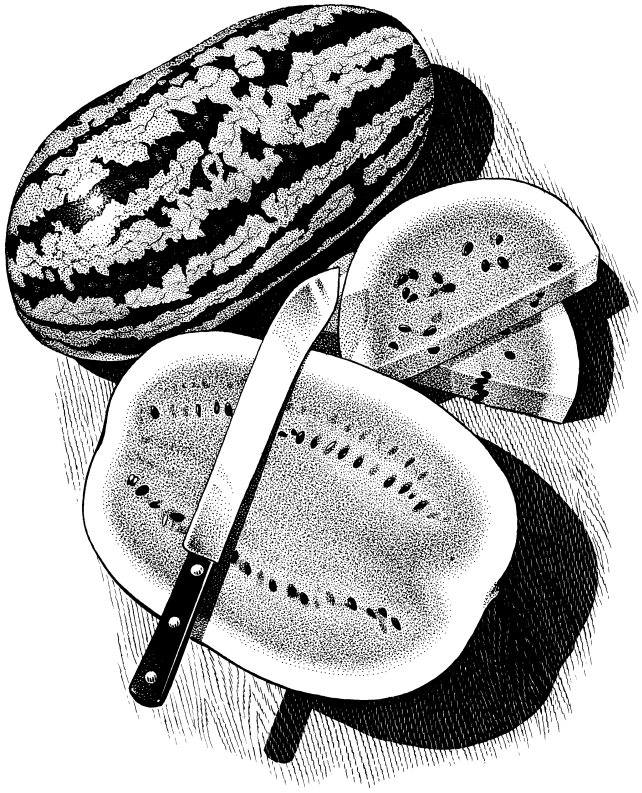

Production Requirements

Watermelon is a warm, long-season crop. Acreage for watermelon has been the second largest for a vegetable crop, after southern pea, in Oklahoma for many years. Production is concentrated in the central and south-central areas, but watermelon can be grown in most areas of the state. Watermelon acreage has declined in the United States in the past several years. Some acreage decrease has been due to increased yields. However, much of the decline was the result of reduced consumer demand resulting from the sale of poor quality melons. Efforts of the National Watermelon Promotion Board have helped reverse the trend toward reduced per capita watermelon consumption.

To show a profit, a grower must produce good yields of high-quality melons. High yields of quality melons can be obtained only with careful management. A good watermelon yield under irrigation in Oklahoma is eight tons per acre; however, the state average yield is about five tons. Under ideal conditions over 15 tons per acre have been achieved.

Sites and Soils

Watermelons grow best on sandy loam soils which are well drained and slightly acid. When planted on very heavy soils, the plants develop slowly, and fruit size and quality are usually inferior. Fine sands produce the highest quality melons when adequate fertilizer and water are provided. Windbreaks are advisable on sandy soils to reduce “sand blast” damage and stunting to young seedlings during spring winds. To reduce the risk of diseases, do not plant on land where vine crops have grown during the past three years.

Variety Selection

Selecting the best watermelon variety is the most important decision made by a producer. Planting a variety that is not suited for the available market and the particular production situation leads to lower profits or possibly crop failure. In addition to market acceptability, a variety must have acceptable yield, be adapted to the production area, and have the highest level of needed pest resistance available.

Light green and gray-green watermelons are less subject to sunburn injury than dark green and striped

varieties. Resistance to races of Fusarium wilt and anthracnose disease is an important varietal characteristic to consider. Most varieties have varying levels of resistance to one or more races of Fusarium wilt and/or anthracnose. Resistance to race 2 anthracnose disease, the prevailing race, is not available. Black Diamond, Texas Giant, Florida Giant, and Tendergold are not disease resistant. None of the watermelon varieties are resistant to all races of Fusarium or anthracnose, so these diseases can occur even though a variety is commonly referred to as being resistant. No varieties have known insect or nematode resistance.

The major watermelon varieties and types produced in Oklahoma are Charleston Gray strains, Crimson Sweet, Jubilee, Allsweet, Royal Sweet, Sangria, triploid seedless, and Black Diamond types. Brief descriptions of several varieties grouped by rind color and fruit shape characteristics are listed below. All are red-fleshed watermelons unless noted otherwise. The weights are average market sizes.

Gray-green rind and round shape:
Mickylee — 10 pounds

Gray-green rind and oblong shape:
Charleston Gray strains — 25 to 35 pounds

Green-stripe rind and oblong shape:
Allsweet — 25 to 35 pounds
Jubilee — 25 to 45 pounds
Royal Jubilee — 25 to 30 pounds
Sangria — 22 to 26 pounds
StarBrite — 22 to 28 pounds
Tendergold — 22 to 28 pounds, orange flesh

Green-stripe rind and round oblong shape:
Crimson Sweet — 20 to 30 pounds
Royal Sweet — 20 to 30 pounds
Fiesta — 22 to 26 pounds
Madera — 16 to 22 pounds

Green-stripe rind and round shape:
Petite Sweet — 6 to 10 pounds

Green rind and round shape:
Black Diamond, Texas Giant, Florida Giant — 30 to 50 pounds
Desert King, light green rind color — 20 to 30 pounds, yellow flesh

Hybrid Triploid

Commonly referred to as seedless watermelon, a triploid hybrid is a cross between a common diploid variety and a tetraploid line. Triploids occasionally contain one or more seeds. Triploids can be produced anywhere conventional watermelons are grown. Numerous varieties exist with light, medium, and/or dark green stripes; round, oval or oblong shape; 12 to 20 pounds; and most with red flesh. A few of the available varieties are: Crimson Trio, Honeyheart, King of Hearts, Millionaire, Nova, Queen of Hearts, Scarlet Trio, SuperSweet Brand series, Tiffany, and the Tri-X series.

Soil pH and Fertilizer

Watermelon is fairly tolerant to soil pH as low as 5.5. Watermelon grows best where soil pH is between 6.0 and 7.0. Apply lime if soil pH is too low. Based on OSU soil test results the following amounts of P_2O_5 and K_2O are recommended.

Phosphorus per acre

When test shows	0 to 19	20 to 39	40 to 69	70 to 99	100+
Add lbs P_2O_5/A	100	75	50	25	0

Potassium per acre

When test shows	0 to 99	100 to 149	150 to 199	200 to 249	250+
Add lbs K_2O/A	250	150	100	50	none

Nitrogen

Apply 50 lbs/A preplant in a band along with recommended P_2O_5 and up to 50 lbs/A K_2O. Broadcast and incorporate any additional K_2O to avoid seedling injury. Commonly, preplant fertilization is accomplished by opening a six-inch-deep furrow or trench with a lister (a double moldboard plow), applying the fertilizer in the trench, and then filling the trench and forming a raised seed bed with a pair of listers or a disk bedder. Three weeks after plants have emerged, sidedress with an additional 40 to 60 lbs N/A.

When transplanting, a starter solution high in phosphorus should be applied at a rate of one-half pint of solution per plant. Three pounds of soluble 15-30-15 in 50 gallons of water can be used in making starter solution.

Soil Preparation

Soil preparation and fertilizer application well in advance of planting promotes improved seed bed moisture and firmness. In addition to plowing and disking, subsoiling beneath the row promotes deeper rooting in soils having a compacted layer. Where winds are a problem, windbreaks of fall-planted wheat or rye or spring-planted hybrid sudan will provide some protection to young plants. The windbreak crop between the rows is cultivated or disked out as the watermelon vines begin to run. A narrow windbreak strip can be left standing between rows for wind protection later in the season, but it should be undercut or killed with chemicals to reduce competition with the watermelon crop.

It is important that the windbreak be early enough, wide enough, and tall enough to provide protection just after watermelon emergence. Late planted windbreaks

do little good when they are needed most. The greatest wind protection is achieved close to the windbreak row. Little protection is achieved when windbreaks under 3 feet tall are farther than 30 feet from the watermelon plants.

Planting and Thinning

Watermelon planting begins in late March in southern Oklahoma and mid-April in northern areas. Seed will not germinate at soil temperatures below 60°F, and the most rapid germination occurs at 95°F. Seedless watermelon varieties have comparatively weak seeds, and planting should be delayed until soil temperature at seed depth is above 70°F. Soil temperatures can be estimated using a soil thermometer or are available at 111 sites statewide through the Oklahoma Mesonet system. County Extension Offices have instant and free access to Mesonet.

Plant seed of open-pollinated varieties at one to two pounds per acre at a depth of 1/2 to 1 1/2 inches, with deeper planting in sandy or dry soils. Hybrid varieties have seed cost about 20 to 30 times greater than open-pollinated varieties. Therefore, reduced seeding rates of hybrid varieties are used to reduce costs. Planters and planter plates can be modified to plant single seeds at desired in-row plant spacing. With this technique one pound of seed can plant several acres with a good chance of achieving an acceptable stand. Extreme weather conditions, including frosts and heavy rains during the spring, may necessitate replanting.

Various plant spacings are found in Oklahoma and are often determined by the type and size of available equipment, by the availability of irrigation water, and by the availability of land. Typical in-row plant spacings range from one plant every 4 to 6 feet in the row on irrigated land to one plant every 6 to 10 feet on dry land. Typical row spacing varies from 6 to 18 feet apart. High yields are being reported with spacings as close as 9 to 18 square feet per plant, but average melon size will decrease as plant spacing decreases. Cultural practices involving soil fertility, plant diseases, and insect control may need to be adjusted according to the plant spacing. Growers should adjust their plant spacing to obtain the best size, quality, and quantity of melons for their market. Some growers seed in twin rows 36 inches apart. This allows young plants to vine together and provides additional protection from wind damage.

For early production, watermelons can be transplanted in bare soil or transplanted or seeded through plastic mulch. Watermelons are difficult to transplant, so seedlings must be grown in containers such as peat pots, Speedling trays, or Jiffy pots to be successfully transplanted. See OSU Extension Fact Sheet F-6020 *Growing Vegetable Transplants* for information on transplant production. For transplant and plastic mulch use to be economical, a premium price must be obtained for the earlier production. See OSU Extension Fact Sheet F- 6034 *Use of Plastic Mulch and Rowcovers in Vegetable Production* for information on use of plastic mulch.

Cultivation and Chemical Weed Control

Shallow mechanical cultivation and hand hoeing are needed to control weeds before plants have vined. Pruning roots and vines with cultivating equipment slows melon development and reduces yield. Several pre-emergence herbicides are available that will control germinating broadleaf weeds and grasses in seeded and transplanted watermelons if used properly. Chemicals are economical when used as narrow band applications in the planted row. Other chemicals can be used as a layby application between the rows before vines begin to run. Consult the most recent revision of OSU Extension Fact No. 6008 *Weed Control in Vegetables* or the latest edition of the *OSU Extension Agent's Handbook* (Circular E-832) for current chemical weed control recommendations.

Irrigation

Eight to ten inches of timely rains or irrigations on a deep, sandy soil produce a good crop of watermelons. Growers with limited irrigation capabilities can often increase yields with only one or two irrigations. Critical periods, when moisture stress is most harmful, are before seedling emergence, at early bloom, and the last ten days before harvest. Inadequate moisture at planting results in poor and uneven emergence. Moisture shortage at bloom results in poor fruit set and misshapen fruit. Moisture stress close to harvest greatly reduces melon size and results in rapid vine decline. When irrigating, apply one to two inches of water. Avoid irrigating in the late afternoon or at night to reduce foliage diseases. Do not operate a sprinkler system between 7 a.m. and 11 a.m. during the flowering and fruit-setting period since bees may be prevented from pollinating the open female flowers. Limit irrigation as the melons approach ripening time. Excessive moisture at this time can cause a white heart, lower sugar content, and fruit bursting.

Field Scouting for Plant and Pest Development

Fields should be scouted at minimum once per week after planting by walking across the entire field in a V-shape or X-shape pattern and recording plant development, and weed and insect occurrence and numbers. Results of surveys will be needed to make decisions regarding projection of harvest date, need to bring in honeybees for pollination, and pest control.

If known, scout for diseases in areas of a field where diseases tend to appear first. Otherwise, use the sampling plan outlined for insects. Some foliar diseases

will first appear where air circulation is reduced and leaves remain wet, such as in low areas and along borders sheltered by trees. Foliar diseases typically appear first on crown leaves close to the base of the main stem. Shaded crown leaves often die and can be mistaken as diseased. Root diseases tend to appear where soil remains wettest, such as in low areas and in heavier soils.

Insects

Fields previously in sod or having heavy infestations of weeds in the prior year should be treated with a soil applied insecticide at planting to control soil insect pests including cutworms. Seedling plants are extremely susceptible to feeding damage from adult striped and spotted cucumber beetles and may need to be treated with a foliar applied insecticide to prevent complete defoliation. Squash bugs must be controlled early in the growing season and can best be located by examining the undersides of leaves for eggs which are laid in groups. Aphids and mites can cause damage to leaves and leave deposits on fruit which reduce marketable yield. Low numbers can be tolerated throughout most of the season. Scouting survey results will indicate whether populations are increasing and should be controlled.

Good fruit set and development are dependent upon insects, primarily honeybees, to pollinate the female flowers. Flowers are receptive to pollination only on the day they open. Flowers should be examined to determine activity of honeybees. If fewer than one bee per ten flowers is noted during the morning hours, the producer should bring beehives into the field to ensure adequate pollination.

Diseases

Watermelons are susceptible to several diseases that attack the roots, foliage, and fruit. The most common diseases in Oklahoma have been Fusarium wilt, anthracnose, downy mildew, and virus diseases. Cercospora leaf spot, gummy stem blight, powdery mildew, bacterial fruit blotch, damping-off, root rots/vine declines, and root-knot nematodes also have been problems. Consult OSU Extension Circular E-853 *Cucurbit Production and Pest Management* or E-929 *Guide for Identification and Management of Diseases of Cucurbit Vegetable Crops* to help identify these diseases.

Disease control is essential in the production of high quality watermelons. A preventive program that combines the use of cultural practices, genetic resistance, and chemical control as needed usually provides the best results.

Cultural practices are useful for limiting the establishment, spread, and survival of pathogens that cause watermelon diseases. Many of the fungal, bacterial, and nematode pathogens survive in old crop debris and in soil. Fields should be rotated with non-cucurbit crops for at least three years to reduce pathogen levels. Grass crops are ideal for rotations where nematodes are a problem. Fields with the proper soil characteristics should be selected. Avoid acid soils or fields with a history of Fusarium wilt or root rots/vine declines. Late plantings should not be situated nearby and downwind of early planted cucurbit fields where foliar or virus diseases already exist. Avoid the movement of contaminated soil or plant debris into clean fields on workers or equipment. Diseases such as anthracnose, bacterial fruit blotch, gummy stem blight, and Fusarium wilt are known to be carried on seed. This can lead to rapid disease development and spread in greenhouse transplant production and to the introduction of diseases into fields. Purchase seed from reputable sources, and apply a fungicide seed treatment prior to planting. Carefully inspect plants to ensure only healthy ones are transplanted into fields. Most foliar diseases are spread by water-splash or are favored by long periods of leaf wetness. Use drip irrigation or avoid frequent sprinkler irrigation with small amounts of water. Finally, use tillage practices that promote the rapid decomposition of old vines and melons soon after harvest.

The use of disease-resistant varieties is an economical means of controlling diseases. Several varieties have resistance to Fusarium wilt. Some varieties also are resistant to anthracnose, but these appear susceptible to the races (strains) of the anthracnose fungus that are prevalent in Oklahoma. Consult OSU Extension Circular E-853 *Cucurbit Production and Pest Management* for a listing of locally adapted varieties with disease resistance.

Management of foliar diseases such as anthracnose, downy mildew, Cercospora leaf spot, and gummy stem blight may require fungicide sprays. Fields should be monitored at least weekly for early detection of disease. Late planted fields are most vulnerable to foliar diseases. Spray programs should be initiated shortly after the first appearance of disease or beginning at flowering to prevent disease in late plantings. A 14-day schedule has been effective in most instances, although a 7-day schedule may be required where downy mildew is severe. Consult OSU Extension Circular E-832 *OSU Extension Agent's Handbook of Insect, Plant Disease, and Weed Control* for a listing of fungicides approved for use on watermelon.

Pesticide Applications

Insecticide applications should be made only when necessary as determined using results of field surveys. For control of diseases, fungicides are most effective when applied before disease begins to increase. The potential for very rapid increase is greatest shortly before harvest when the canopy is most dense or

anytime during rainy periods. Insecticides and fungicides should be selected based on proven effectiveness. Make applications using ground equipment in a minimum spray volume of 20 gallons per acre at 40 psi pressure to ensure adequate canopy penetration and foliar coverage. Aerial applications should be made in a minimum of 5 gallons per acre. Chemigation is an effective method of applying some fungicides.

Beehives maintained near fields for pollination must be protected from insecticide spray drift by removing the hives or covering them. Additionally, the bees working the fields must be protected by using insecticides with a low toxicity to bees and by withholding applications until late in the day when bees are less active.

Fruit Pruning

Fruit pruning in watermelons should begin as soon as defective melons are noted. Remove misshapen and blossom-end rot fruit to promote additional fruit set and better size of remaining melons. If a market demands larger melons, remove all but two or three well shaped melons from each plant. To avoid disease spread, do not prune melons when vines are wet.

Animal Pests

Animal pests can cause major damage to vine crops, particularly watermelons and to a lesser degree cantaloupes. Field mice and rats can cause extensive stand reductions by feeding on seeds before they germinate. The fungicide thiram, used as a seed treatment, acts as a good repellent against rats and mice. Fence row sanitation and brush control around fields will reduce the rodent population, as well as overwintering sites for insect pests, such as cucumber beetles.

Raccoons, coyotes, and deer are highly attracted to ripe watermelons. Propane or carbide guns, loud radios, and/or lights at night can provide short-term deterrence of coyotes. County trappers can be contacted through the county sheriff's office or animal damage control for assistance with coyote control. Shooting can be used as a last resort, when crop damage persists. Raccoons usually cause less damage than coyotes.

Crows are the main bird pest of cucurbits, especially watermelons and cantaloupe. They tend to move from fruit to fruit creating holes that make the melons unmarketable. Strings stretched across the field with aluminum pie-plates or aluminum strips can be an effective daytime repellent. Bright wind-socks hung from stakes flap in the wind and deter entering birds. Propane or carbide guns can be employed for repelling birds. Crows may be hunted during specified seasons. Chemical animal repellents have not been widely used in vine crops because of poor deterrence, impractical application over large areas, and/or the high cost per acre.

Harvesting and Handling

Watermelons reach harvest maturity five to six weeks after pollination, depending upon variety and season. Varieties may differ in certain characteristics that indicate maturity. An experienced person can identify a ripe melon just by glancing at the glossy rind surface. Other indications of ripeness include a change in the color of the ground spot from white to light yellow; a change of tendrils nearest the fruit from green to brown and dry; thumping the fruit, a metallic ringing sound indicates immaturity and a more muffled or dull sound indicates maturity or overmaturity. Thumping is a reliable method to detect overmaturity in round-shaped melons. The best method is to cut a few melons in various parts of the field. Harvesting and marketing green or overripe melons lessens the demand by the consuming public. Sugar content does not increase after harvest; however, red color will continue to develop after a slightly immature melon is picked.

Melons should be cut from the vine rather than pulled, twisted, or broken off to reduce chances of stem decay. Leave a long stem on the fruit. To avoid bruising melons, handle carefully at all times. Never stand melons on end to avoid bruising and flesh separation from the rind. Do not place melons with bottom sides turned up as the ground spot is easily sun scalded. Haul melons from the field in straw or paper-padded vehicles to reduce bruising, punctures, and rind abrasion. To help prevent bruising, do not allow field hands to ride on top of the load. After harvest, load melons directly into trucks for shipment to market or haul them to a central grading station for reloading and shipment. Melons are usually graded and sized during the loading operation. Traditionally, melons have been bulk hauled in trucks. The use of containers has gained popularity because they are more efficient in unloading and injuries related to rough handling during loading and unloading are reduced. Bulk bins made of corrugated fiberboard and holding around 1,000 pounds as well as cartons holding three to five melons are used.

Storage

If necessary, watermelons will keep for 2 to 3 weeks at 52°F to 60°F. Relative humidity should be 85% to 90%; higher humidity may promote stem-end rot. Watermelons are not adapted to long storage. They are subject to chilling injury and lose flavor and color below 50°F. Decay, mainly black rot, can be expected on watermelons previously stored at 50°F or lower. At higher temperatures, watermelons are subject to decay. Holding watermelons for up to a week at room temperature can improve flavor and color. However, after several weeks at room temperature, they have very poor flavor and texture. Watermelons are sensitive to ethylene and should not be stored or shipped with

products that emit ethylene, such as ripe cantaloupes, apples, pears, tomatoes, and bananas.

Marketing

Watermelons usually are sold by the hundredweight at harvest time. The bulk of the commercial crop is shipped out of state. Many are sold from smaller plantings through temporary or permanent roadside stands or at farmers' markets. Some growers sell their fields to shippers or brokers as harvest time approaches. An important consideration in successful marketing is to have adequate facilities for transporting the crop to market outlets. Although earliness usually results in higher prices, quality and maturity should be of prime importance in marketing watermelons.

Fruit Disorders

Misshapen melons (gourd-necked or bottlenecked) are commonly produced by varieties with long fruits. Moisture stress and inadequate pollination are causes. Occasionally melons of any variety may be misshapen because they lie on uneven ground or were injured while small in size.

Blossom-end rot is a deterioration of the blossom end of the fruit. The usual order of development is softening, slight shriveling, browning, blackening with extensive shriveling, and sometimes secondary decaying. Poor calcium nutrition and moisture stress cause blossom-end rot. Hot, dry winds, nematode damage, excessive fertilizer, low levels of calcium in the soil, pruned roots from late cultivations, and other conditions are contributing factors.

Bursting may result from an uneven growth rate, which is particularly associated with heavy rainfall or irrigation when fruits are maturing. The percentage of bursted fruits is usually low, and types with round fruit are more susceptible.

White heart is white streaks or bands of undesirable flesh in the heart (center) of the fruit. This is caused by excessive moisture (and probably too much nitrogen) during fruit maturation.

Hollow heart is a disorder that varies among varieties. Causes are unknown.

Sunburn occurs most frequently in varieties that have dark green rinds. Charleston Gray types and other melons with gray-green rinds rarely sunburn. Good healthy foliage will minimize sunburn as well as favor good yields and quality. Strong winds can blow unprotected vines away from the developing fruit along the edges of the rows and cause full exposure of the fruit to the sun.

Rind necrosis is an internal disorder of the watermelon rind. Symptoms are brown, corky or mealy textured spots in the rind which may enlarge to form large bands of discoloration that rarely extend into the flesh. Experienced pickers often can detect affected melons by the subtle knobbiness that is visible on the surface of affected melons. The cause of rind necrosis is unknown. Bacterial infection has been reported to be a cause, although similar bacteria are found in healthy melons. Drought stress also is reported to predispose melons to rind necrosis.

Related Extension publications

E-832 *OSU Extension Agent's Handbook of Insect, Plant Disease, and Weed Control.*
E-853 *Cucurbit Production and Pest Management.*
E-929 *Guide for Identification and Management of Diseases of Cucurbit Vegetable Crops.*

The Oklahoma Cooperative Extension Service
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The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

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