

Texas Crop Profile

W A T E R M E L O N S

AgriLIFE EXTENSION

Texas A&M System

Prepared by Rodney L. Holloway and Kent D. Hall¹
In collaboration with Frank Dainello, Lynn Brandenberger, James Robinson,
George Philly, Mark Black, Noel Troxclair and Tom Isakiet²

This profile on watermelon production in Texas gives an overview of basic commodity information; and discusses insect, disease and weed pests, cultural and chemical control methods.

Basic Commodity Information—1996-98 Average

State Rank:	Texas is the nation's number one producer of commercial watermelons.
Percent U.S. Production:	20 percent
Acres Planted:	50,000 to 60,000
Cash Value:	Cash receipts total approximately \$50 million. In addition, an unknown quantity of melons are sold out of small roadside stands and from the back of trucks along the roadside by people who do not ship melons. Watermelons, along with a number of other vegetable crops, are an important source of supplemental income in many areas of Texas.
Yearly Production Costs:	
Total fertilizer	\$32.00 per acre, nitrogen applied at 40 pounds per acre; phosphate applied at 60 pounds per acre
Seeding rate	3 pounds per acre at \$20 per pound
Total pesticide	\$110 per acre; herbicides, \$51 per acre; insecticides, \$23 per acre; fungicides, \$32 per acre; application cost, \$4.00 per acre
Pollination	\$30 per acre
Harvest expense.....	\$3.50 per acre
Plastic mulch	\$75 to \$275 per acre depending upon plastic used
Machinery labor cost	\$18 per acre
Other labor cost	\$65 per acre
Variable costs (South Texas)	irrigated, \$1071.94 (drip tape approximately \$225 per acre); dryland, \$748.94 per acre
Fixed costs (South Texas)	irrigated, \$151.55 per acre; dryland, \$78.42 per acre

Commodity Destination

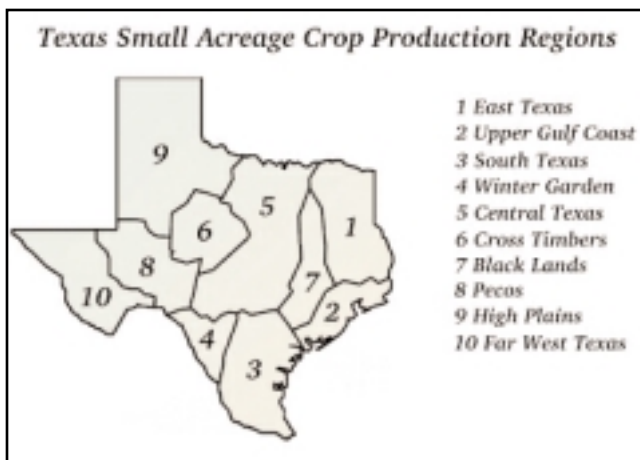
One hundred (100) percent of the state's watermelon production goes to the fresh market.

Production Regions

Watermelons are grown in nearly half the counties in Texas. The top five watermelon producing counties are Hidalgo, Brooks, Knox, Gaines and Wood. The

¹Extension Specialist and Extension Associate, The Texas A&M University System.

²Extension Horticulturist, Extension Horticulturist, Extension Horticulturist, Extension Entomologist, Extension Plant Pathologist, Extension Entomologist and Extension Plant Pathologist, The Texas A&M University System.



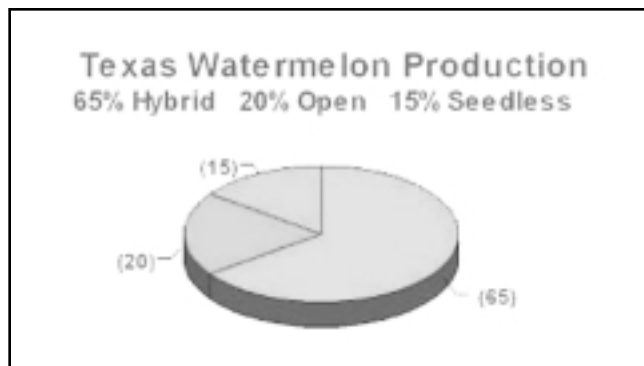
accompanying map shows different geographical cropping areas in Texas. Watermelons are commercially grown in regions 1, 3, 4, 6 and 9.

Watermelons are an annual crop in Texas. Harvest starts in early May in the Lower Rio Grande Valley (South Texas), June in the Winter Garden, June-July in East Texas, late summer and early fall in the Cross Timbers/DeLeon area, and in September and October in the High Plains. Eighty (80) percent of Texas production is marketed in June, July and August. The optimum marketing window is mid June through mid July.

Each of the Texas production regions will often have unique pest problems. Diseases are a good example. Anthracnose and gummy stem blight are important problems in northern areas of the state but are generally not considered to be conditions worth treating in South Texas and the Winter Garden.

Cultural Practices

Varieties: Hybrids - Royal Jubilee, Royal Sweet, Prince Charles, Summer Flavor 500, Sangria, Royal Sweet, Big Stripe, Fiesta. Open pollinated - All Sweet and Jubilee II. About 65 percent of the Texas commercial watermelon production is hybrid, 20 percent is open pollinated and 15 percent is seedless.



Soil preference: Deep, well-drained, light textured soil having a pH range of 5.5 to 8.0 (optimum 6.5 to 7.0) is preferred. Watermelons do not tolerate heavy soils.

Optimum growing conditions: Bright, hot days (80 to 95 degrees F) and warm nights (60 to 70 degrees F) are optimum. Cooler temperatures and excessive rainfall slow growth and maturity. Overcast, cloudy and or rainy weather reduces sugars (fruit quality). In Texas, a 3-year rotation is recommended for watermelons to reduce the incidence of fusarium.

Establishment methods: Watermelons usually are direct seeded or transplanted, often on plastic mulch covered raised beds. Optimum planting time is when all danger of frost has passed and/or soil seed zone temperature exceeds 70 degrees F. Seeding rate is 1 to 3 pounds per acre, 300 to 600 seed per ounce. Plant seed at a depth of 3/4 inch to 1 inch. Seeding spacing is equal to 3-foot in-row on 6-foot beds (irrigated); 5-foot in-row on 8-foot to 10-foot beds (dry land).

Fertilization: Actual fertilization rates must be based on soil test results. General rate, in pounds per acre, is 80-80-80. Actual applications may vary as follows.

- Nitrogen - 40 to 90 pounds total; apply 0 to 50 pounds preplant broadcast incorporated or split band 4 inches deep and 4 to 6 feet on either side of seed row at planting plus 20 to 30 pounds sidedressed 3 weeks after emergence. Under high rainfall, an additional 20 pounds may be required at vining (sidedress is split bands or through fertigation).
- Phosphorus - 40 to 80 pounds total; apply banded 3 to 4 inches below seed at planting or near the level of the transplant root base.
- Potassium - 40 to 80 pounds total; if needed apply with preplant nitrogen. Starter solution for transplants equals approximately 8 ounces of high phosphate starter solution per plant at field setting.

Irrigation: Between 10 inches to 15 inches of water per season is needed. A steady moisture supply (1 inch to 2 inches every 10 to 14 days) is required. Stop irrigation approximately 10 to 14 days prior to anticipated maturity (onset of flesh color). Key stages for irrigation are establishment and fruit set.

Pest Information

Insects

Key pests are cucumber beetles, aphids and squash bugs. Others include cutworms, cabbage looper, leaf hoppers, leaf miners, melon worms, pickleworms, mites, squashvine borers and flea beetles.

Aphids

Aphids are often a mid to late season pest of Texas watermelons. Damage results from the aphids' honeydew secretions. Since most watermelons are taken directly from the field to market, the honeydew, a sticky sweet substance, causes undesirable appearance for market. Aphids also may transmit certain mosaic viruses that attack watermelons. Aphids feed on the underside of leaves, causing cupping and distortion. Warm humid weather coupled with vigorous well fertilized vines are conducive for aphid development. Scouting is an effective management tool; five aphids per leaf signals a damaging population. Beneficial insects such as lady beetles and lacewings can reduce aphid numbers and limit the number of required insecticide applications.

Cucumber beetles

Cucumber beetles are generally only a problem to young watermelon plants. When the crop is first becoming established, these beetles will feed on young tender stems, leaves and shoots. Once vines are older and more dense, beetle damage can be tolerated. Cucumber beetles are green oblong-oval Coleoptera that are about 5 mm long. Females lay oval, orange-yellow eggs in clusters of 25 to 50 on the undersides of host plant leaves. The beetle larvae are about 10 mm long and have a yellow-white, somewhat wrinkled body with three pairs of brownish legs near the head. Pupae are white, tinged with yellow and 6 to 8 mm long.

Overwintering is in fence rows and surrounding fields.

Squash bugs

Squash bug adults and nymphs feed on plant stems and leaves, often near the base of the plant. Damage occurs when unusually large populations are on the melons. Damaged leaves appear grayish and may wilt and die. Adults are brownish gray to dark gray bugs about 5/8 inch long. Nymphs have a green abdomen with crimson head. Eggs are laid in clusters often on the top of leaves. Developing immatures generally are found underneath. Squash bugs transmit anasa wilt to watermelons. Synthetic pyrethroid insecticides used for squash bug control can cause late season aphid population increases.

White flies

White flies feed by sucking plant juices from host plants and heavy feeding can cause mottling or yellowing of the leaves. Adult whiteflies are about 1/16 inch long and have four wings along each side of the body that are covered with a white waxy powder. Immatures or nymphs are light green, oval, and about the size of a pinhead. White fly adults secrete honeydew that often will turn black and blemish fruit because honeydew is a medium for smutty mold.

Diseases

Gummy stem blight

Gummy stem blight (GSB) (*Didymella bryoniae*) is one of the most important diseases of Texas watermelons. Expressed in warm wet weather (the optimal temperature is 74 degrees F), symptoms include round, black, wrinkled spots on leaves and sunken dark areas on stems. A gummy brown material will ooze from older stems in the later stages of disease development. Disease develop-

Chemical	% Acres Treated	Appl. per Year	Pounds A.I. per Acre	Primary Target
Carbaryl (Sevin®)	4	1.3	0.87	Cucumber beetle
Diazinon (Diazinon®)	1	1.9	0.28	Cucumber beetle
Dimethoate (Cygon®, Defend®)	5	1.2	0.12	Aphid
Endosulfan (Thiodan®, Phaser®)	26	1.2	0.69	Squash bug
Esfenvalerate (Asana®)	2	1.2	0.02	Squash bug
Imadicloprid (Admire®, Provado®, Gaucho®)	3	1	0.2	Aphid
Malathion (Malathion)	3	1.2	0.67	Aphid
Methomyl (Lannate)	14	2	0.42	Squash bug

*56,000 acres in 1996.

Table 2: Chemical Alternatives for Major Watermelon Insect Pests.

Cucumber beetle	Aphids	Squash bug
Azinphos-methyl (Guthion®)	Diazinon (Diazinon)	Carbaryl (Sevin®)
Carbaryl (Sevin®)	Dimethoate (Cygon)	Endosulfan (Thiodan®)
Cryolite	Endosulfan (Thiodan®)	Esfenvalerate (Asana®)
Diazinon (Diazinon®)	Lindane	Lindane
Endosulfan (Thiodan®)	Malathion	Permethrin (Ambush®, Pounce®)
Esfenvalerate (Asana®)	Methomyl (Lannate®)	
Lindane	Oxamyl (Vydate®)	
Malathion	Oxydemeton-methyl (Metasystox-R®)	
Methomyl (Lannate®)	Permethrin (Ambush®, Pounce®)	
Methoxychlor		
Permethrin (Ambush®, Pounce®)		

ment begins at the center of the plant and progresses outward. On the fruit, lesions appear as small water soaked areas that eventually enlarge to an indefinite size. This fungus overwinters in infected plant debris in the soil and on seed. Cultural control suggestions include to not disturb vines that are wet from dew or rain.

Anthracnose

Anthracnose (*Colletotrich orbiculare*) is a consistent watermelon disease in East Texas and occasionally a problem in the northeast. Anthracnose can completely kill vines before fruit matures, and will cause lesions on the fruit. The disease symptoms include irregular, brown to black, dry leaf spots that eventually cause the leaf to shrivel up and die. On the fruit, sunken, circular to irregular lesions occur from pinpoint size to 1 inch or more in diameter. Elongate stem and petiole lesions occur. Spores of the fungus produced on lesions may rapidly spread the infection following rainy weather. The fungus overwinters in decaying vines and on seed from diseased fruit. Infected fruit are often ruined in the field or lost to decay in transit.

Powdery mildew

Two fungi, *Spaerotheca fuliginea* and *Erysiphe cichoracearum*, are responsible for the powdery mildew disease. These quickly spreading fungi first appear as a white to gray dusty material on the upper leaf surface and subsequently spread to cover the entire surface. Once a leaf becomes covered by powdery mildew it will become dry and brittle, and eventually die. These diseases develop on older leaves and tend not to be a consistent problem in Texas melons.

Wilt

Wilt (*Fusarium oxysporium*) fungi are soil borne and enter the plants through the roots. Early disease symptoms are a brown discoloration inside roots and stems that leads to plant vascular system breakdown. Plants wilt, then die soon after symptoms are observed. Foliage of infected plants first turn yellow, signaling the presence of fusarium. Crop rotation is the best control method and often requires intervals as long as 5 years between plantings.

Downy mildew

This disease first appears as large brown blotches on the upper surface of leaves and can rapidly defoliate vines. Stems and fruit are not affected. Downy mildew (*Pseudoperonospora cubensis*) development is favored by cool, wet nights and warm humid days. It is mainly important in late-season (fall) production possibly because it does not overwinter well but moves in from tropical areas. The key to effective chemical treatments are early disease detection and regular preventative applications. Cultural control includes planting resistant varieties, isolating fields and reducing plant density to promote more open canopies.

Cercospora leaf spot

This disease (*Cercospora* sp.) causes small leaf spots that can cause defoliation of vines under severe disease pressure. Airborne movement of spores is important for introducing the pathogen. The irregular leaf spots have a yellow halo and a dark brown center that first appear on the oldest leaves. Damage is from defoliation that can restrict fruit development and from increased exposure of melons to the sun, resulting in scalding. Cercospora leaf spot is the most prevalent foliar disease of watermelon in many parts of Texas but it is not usually a serious problem. However, because heavy infection can lead to defoliation, chemical control is often advised, particularly in south Texas.

Alternaria leaf blight

This fungus (*Alternaria cucumerina*) overwinters on plant debris from the previous crop. The disease manifestation is similar to cercospora; older leaves are affected first and then newer leaves, shoots and runners. Alternaria lesions resemble a target with a lighter area encircling a dark spot. A minimum of 2 years rotation is recommended as a cultural management practice for this organism.

Chemical	Target Pests	Pounds A.I. per Acre	% Area Treated	# of Appl.
Benomyl (Benlate®)	Powdery mildew, anthracnose, gummy stem blight	0.22	9	1.7
Chlorothalonil (Bravo®)	Cercospora leaf spot, anthracnose, downy mildew, gummy stem blight, alternaria leaf spot, powdery mildew	1.15	38	3.3
Copper hydroxide		0.42	9	2.2
Mancozeb	Cercospora leaf spot, anthracnose, downy mildew, gummy stem blight, alternaria leaf spot	1.28	12	2.8
Metalaxyl	Combined with maneb for downy mildew	0.12	11	2.3
Azoxystrobin (Quadris®)	Gummy stem blight, powdery mildew, some activity against downy mildew	0.10-0.25	10	2.0

*Many fungicides are applied in combination with other fungicides to broaden an application's spectrum of control.

Angular Leaf Spot Copper & Zinc	Mefenoxam & Chlorothalonil Mefenoxam & Mancozeb Metalaxyl & Mancozeb	Fosetyl-aluminum & Maneb Mancozeb & Copper Mancozeb, Maneb Mefenoxam & Chlorothalonil
Anthracnose Chlorothalonil Fosetyl-aluminum & Maneb Mancozeb, Maneb Maneb Mefenoxam & Chlorothalonil	Gummy Stem Blight Chlorothalonil Fosetyl-aluminum & Maneb Mancozeb & Copper Mancozeb, Maneb Maneb Mefenoxam & Chlorothalonil	Plant Parasitic Nematodes Oxamyl
Bacterial Fruit Blotch Mancozeb & Copper	Leaf Spot Chlorothalonil Fosetyl-aluminum & Maneb Mancozeb & Copper Mancozeb, Maneb Maneb Mefenoxam & Chlorothalonil	Powdery Mildew Copper & Zinc Chlorothalonil Copper & Zinc
Cucumber Belly Rot Chlorothalonil		Scab Chlorothalonil Copper & Zinc Mancozeb, Maneb Mefenoxam & Chlorothalonil
Downy Mildew Chlorothalonil Copper & Zinc Fosetyl-aluminum Fosetyl-aluminum & Maneb Mancozeb & Copper Mancozeb, Maneb Maneb	Leaf Spot/Leaf Blight Chlorothalonil Copper & Zinc	Target Spot Chlorothalonil

Other watermelon maladies

Other diseases considered to be occasional pests of Texas watermelons include white mold (*Sclerotinia sclerotiorum*), *Rhizoctonia solani*, damping off (*Pythium*) which is managed with seed treatments, and bacterial fruit blotch (*Acidovorax avenae*). The squash leaf curl virus, a common disease of fall watermelons, is transmitted by whiteflies and can be managed by controlling the whiteflies. Other viruses include the watermelon mosaic virus, papaya ringspot virus and the tobacco ringspot virus.

Chemical control of watermelon diseases: There are several chemicals that are used for disease control in watermelons. Most are efficacious against more than one pest. This broad spectrum

characteristic influences the use of a material because a product usually becomes the chemical of choice if numerous diseases are controlled with a single application. Use information is complicated by the fact that many compounds are used in combination with other fungicides.

Resistance management: Combination of chemicals is often recommended to help prevent disease resistance. For instance, menfanoxam (Ridomil Gold) can be used in combination with protectant fungicides such as mancozeb or chlorothalonil to help prevent the emergence of resistant strains. Alternative chemical applications are suggested for new fungicides such as Quadris to prevent the development of disease resistance.

Weeds

Weeds are a constant problem in Texas watermelons. Plastic mulch has become an important tool in watermelon weed management and in water conservation. Weed control is essential to prevent mulch damage. Annual broadleaf weeds,

annual grasses and perennial grasses are the targets of herbicide applications. Application timing and the understanding of weed life cycles are essential elements of successful control. Application timings are preplant or preemergence, early postemergence and postemergence (postdirected).

Table 5. Weed Control in Watermelons.*

Chemical	% Area Treated	Appl. per Year	Pounds A.I. per Acre	Comments
Ethalfuralin (Sonalan™)	7	1.0	0.58	Apply after seeding to the soil surface.
Sethoxydim (Poast®)	6	1.3	0.18	Apply postemergence to young, actively growing grass.
Trifluralin (Treflan™)	29	1.0	0.55	Apply postemergence, directed to the soil under crop leaves.

*National Agricultural Statistics 1996: <http://usda.mannlib.cornell.edu/reports/nass>

State Contacts

Rodney L. Holloway
Extension Specialist
2488 TAMU
College Station, Texas 77843-2488
979-845-3849
rholloway@tamu.edu

Kent Hall
Extension Associate
2488 TAMU
College Station, Texas 77843-2488
kd-hall@tamu.edu

Frank Dainello
Extension Horticulturist
2134 TAMU
College Station, Texas 77843-2134
979-845-8567
f-dainello@tamu.edu

Lynn Brandenberger
Extension Horticulturist
TAMU Weslaco Center
2401 East Highway 83
Weslaco, Texas 78596-8344
956-968-5581
l-brandenberger@tamu.edu

Marvin Miller
Research Horticulture
TAMU Weslaco Center
2401 East Highway 83
Weslaco, Texas 78596-8344
m-miller@tamu.edu

References

- Brandenberger, Lynn. South Texas Valley Vegetable Notes. Texas A&M University Research and Extension Center at Weslaco. Vol. 5, No. 11, 1997. 4 pp.
- E-10, "Vegetable and Herb Disease Control Products for Texas," Texas Plant Disease Handbook. Texas Agricultural Extension Service, <http://agpublications.tamu.edu/pubs/eplant>.
- "Texas Commercial Vegetable Production Guide." Texas Agricultural Extension Service.
- B-1305, "Insect Control Guide for Commercial Vegetables." Texas Agricultural Extension Service.
- B-5022, "Weed Control in Vegetable, Fruit and Nut Crops." Texas Agricultural Extension Service.
- National Agricultural Pesticide Impact Assessment Program Web Site
<http://ipmwww.ncsu.edu/opmppiap/>.
- Texas A&M University Research and Extension Center at Weslaco Web Site
<http://primera.tamu.edu/>.
- Texas Agricultural Statistics. 1997.
USDA/National Agricultural Statistics Service
<http://usda.mannlib.cornell.edu/reports/nass>.

The information given herein is for educational purposes only. Reference to trade names is made with the understanding that no discrimination is intended and no endorsement by the Texas Agricultural Extension Service is implied.

Produced by AgriLife Communications and Marketing, The Texas A&M University System
Texas AgriLife Extension publications can be found on the Web at: <http://AgriLifebookstore.org>

Educational programs of the Texas AgriLife Extension Service are open to all people without regard to race, color, sex, disability, religion, age, or national origin.