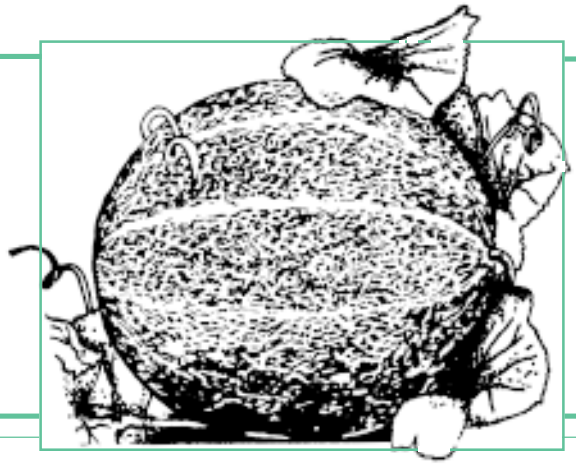
MUSKMELONS



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Muskmelons require warm weather, a fairly dry atmosphere, and ample soil moisture, especially during the early growth stages. Thus, muskmelons are well-adapted for growing in Kansas. The crop, however, does require careful management and attention to detail. Timely management through the season often makes the difference between profit and loss. This production guide will describe several of the necessary production practices for successful melon growing in our state.

VARIETIES

There are numerous varieties of muskmelons all of which belong to the botanical species *Cucumis melo* L. Two subspecies are grown in the United States—*reticulatus* and *inodorous*. The reticulatus are netted, primarily orange-fleshed, and may be "ribbed," while the inodorous type are the "winter melons," including honeydew, Persian, casaba, and similar melons. A third subspecies *cantalupenis* is not commonly grown in the United States. The name, however, is applied as cantaloupe and many people use the two terms—muskmelon and cantaloupe interchangeably. This production guide will describe muskmelon growing but many of the same practices and recommendations would apply to other types of melons as well.

Two types of muskmelons are grown in Kansas. One type is larger, ribbed (with prominent sutures around the melon), has a large seed cavity, and is usually softer and jucier. This type is referred to as an Eastern fresh market, since it predominates in farm markets and retail outlets in the Eastern United States. The second type, Western shipping melons, predominate in the western United States growing areas and are smaller, not ribbed, have a solid seed cavity, and are firmer-textured. The western shipper type is often referred to as the Rocky Ford melon because of the historical production of this type of melon around the Rocky Ford, Colorado, area.

Most of the newer melons are hybrids. Hybrids have many production advantages; however, the seed cost is considerably higher. This makes hybrids well-suited for transplant melon production. Some of the common varieties that should be considered by commercial producers are listed on page 2.

CLIMATE AND SOILS

Muskmelons are a warm weather vegetable that should be planted after all danger of frost is past and soil temperatures are a consistent 60°F. This is usually in early May in eastern Kansas to mid- to late May in western Kansas. Melons prefer the well-drained, sandy to loam soils; however, muskmelons may be grown to a limited extent on some upland, heavier soils as well. Irrigation is recommended, especially in central and western areas of the state. Growing locations should be well-drained since melons will not tolerate waterlogged conditions, especially near the harvest period. As with many other crops, a 3-year rotation is suggested to limit disease buildup.

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Variety	Disease Resistance	Size	Comments
Eastern Fresh Market Muskmelons			
Earlisweet	F	Small	Early
Supermarket	F	Medium	Standard, good yields
Superstar	F	Large	Very large fruit
Cordele	F	Large	Large, good quality
Starsweet	F	Large	Good yields, color
Gold Star	F	Medium	Good flavor, color
Classic	F,PM	Med-Large	Large seed cavity
Saticoy	F,PM	Medium	Poor netting, good flavor
Mainstream	F,PM	Medium	A good non-hybrid
Harper Hybrid	F	Medium	Excellent quality, cracks with rain
Western Shipping Type			
Magnum 45	F,PM	Medium	Good quality
Allstar	F,PM	Medium	Slight sutures
Easy Rider	F,PM	Large	Good quality
PMR 45 Improved	F,PM	(Several commercial varieties)	

(Disease reaction: F=fusarium wilt, PM=powdery mildew tolerant)

Avoid planting muskmelons in areas that may have been treated with a herbicide with a long residual the previous crop year. Atrazine carry-over and post-emergent soybean herbicides have both been shown to cause serious damage to succeeding melon crops.

FERTILIZER

Fertilization depends on the inherent soil fertility, so a soil test is needed for accurate estimates of needed nutrients. Muskmelons should receive 70 to 90 pounds of nitrogen per acre. Half is added prior to planting and the other half applied along the side of the row or through the drip irrigation system as the crop is growing. Sidedressed applications should be made when the vines are 8 to 12 inches long. Any phosphate or potassium should be added prior to soil preparation and planting, with amounts indicated by soil test recommendations. There is little indication that applications of any additional fertilizers may be beneficial in Kansas. Any additional applications should be done on a few plants, on a test basis.

PLANTING

Muskmelon seeds germinate slowly at cool soil temperatures. A minimum of 60°F soil temperatures are needed to support germination. In addition, the melon plant loses the ability to absorb water below 60°F so dehydrated plants with a shriveled, rotted root system will develop if soil temperatures drop too low. Plastic mulches warm the soil and encourage early growth of melon plants; so plastic mulches are a natural addition to the production of melon plants.

Many growers set melon transplants when earliness is desired and when expensive hybrid seed is used. Plant melon seeds in 1 to 2½-inch containers filled with a commercial potting mix 2 to 3 weeks prior to field setting and germinate the seeds at warm (80°F) temperatures. Reduce the temperatures when the seeds have germinated and set melon plants while they have 2 to 3 true leaves. Avoid large, overgrown transplants. Use a starter solution at transplanting time and firm the soil around the root system.

For seeding, use a precision “flex” planter equipped with plates or adjustments to drop 2 to 3 seeds at 8- to 12-inch intervals or 1 seed at 8- to 10-inch intervals. Rows are usually spaced from 5 to

9 feet apart. About 2 pounds of seed will be required to plant an acre depending on the seed size. Plant seeds about 1-inch deep.

INTENSIVE PRODUCTION TECHNIQUES

For early production, melon transplants should be planted on raised planting beds covered with black plastic over drip irrigation tubing. A small grain (rye or wheat) winter cover crop should be used and strips of grain allowed to stand every 4 to 5 rows of melons to serve as a windbreak. Mulched plastic beds are usually about 30 inches wide. Drip tubing should be placed 3 to 4 inches from the center of the row. Set melon plants every 1½ to 2 feet by making a hole with a bulb planter or similar hole-punching device.

Monitor soil moisture status with tensiometer stations in the planting row and apply water when readings indicate the need. Fertilizer can be applied with irrigation water using a fertilizer proportioner or injector in the drip system. (See K-State Commercial Production Guides *Plastic Mulches* and *Drip Irrigation* for more information).

Warming the environment around the melon plant and protecting the plants from frost may be necessary in many Kansas springs. Hotcaps—paper covers over individual plants—may offer the greatest degree of frost protection. Hotcaps need to be vented and removed fairly early in the season. Row covers made of slitted plastic or porous fabric material can be used over individual rows or several rows. Materials are available in widths from 6 to 42 feet. Some row covers are supported by wire hoops while others are "floating" row covers, supported by the canopy of plant foliage. All covers need to be removed when any flowers begin to develop, as insect pollination will not occur with covers in place.

CULTIVATION AND WEED CONTROL

Shallow cultivation to control weeds should be started as soon as the crop rows can be followed and before weeds become established. Plastic mulches eliminate the need for in-row weed control. Herbicides can be used for weed control in melons; however, melons are very sensitive to many chemical applications. Therefore, careful application following all label directions is necessary.

CHEMICAL WEED CONTROL MATERIALS

Before planting: Alanap + Prefar (tank mix) Incorporate ½ to 1 inch just prior to planting melons.

After planting: Curbit 3E–Apply within 3 days of seeding. Needs ½ inch of rain within 5 days of application. If no rain falls, cultivate shallow to incorporate.

Poast 1.5E–Apply to well-established plants or transplants for the control of growing grasses. Include 1 quart of Crop Oil Concentrate as a wetting agent. Do not use within 2 weeks of harvest.

POLLINATION

Muskmelons require bees to transfer pollen from male to female flowers. Male flowers develop first and outnumber the female flowers. Small, fuzzy, undeveloped muskmelons are visible at the base of female flowers. Bees must visit each flower several times for adequate pollination. Therefore, one hive of bees for every 2 to 3 acres of melons may be needed. Make sure that insecticide applications are made late in the day and avoid using materials that are toxic to bees during pollination season.

INSECTS

Muskmelons have several insect problems that can cause serious crop injury during the season. Striped or spotted cucumber beetles and aphids are considered to be the most common and most destructive.

Cucumber Beetles. These striped or spotted yellow and black beetles, approximately ¼ inch long, overwinter in and under various sites protected from winter conditions. They become active before melon plants are established and quickly move to the developing melon crop. One of the most severe types of injury is the feeding on young, emerging seedling melon plants. Beetles can completely, and quickly, destroy a crop. Later in the season, beetles feed on blossoms, damaging fruit set. Larger established plants can be injured, indirectly, by the transmission of **bacterial wilt** transferred into the melon plants by the feeding of the cucumber beetle. Later in the season, larvae of the beetles may feed on the bottom of developing fruit, causing a purplish, scabby growth. Larvae may tunnel into the fruit causing premature rotting.

Early season beetle control may be achieved by floating row covers applied to the field or rows. **When using chemical insect controls, always spray late in the day, when flowers are closed, to reduce injury to bee populations necessary for pollination.** Chemicals used for control include:

carbofuran (Furadan) 15G applied 1½ pound / 1,000 feet of row. *Use only at planting time. Liquid Furadan cannot be used.*

endosulfan (Thiodan): 0-day harvest interval.

malathion: apply to dry plants only; 1-day harvest interval

diazinon: 7-day harvest interval

permethrin (Ambush, Pounce): 1-day harvest interval

esfenvalerate (Pydrin, Asana): 3-day harvest interval

carbaryl (Sevin): 0-day harvest interval. *Sevin is very toxic to bees. Sevin can cause a whitening of foliage in young melon plants when used in humid, warm weather.*

Aphids. Feeding of melon or peach aphids can cause damage to melon plants early in the season. Aphids are small, soft-bodied insects which congregate near the tips of shoots and on the undersides of leaves. Aphids cause a distorted shape to develop in plants and may transmit virus diseases to cause crop yield losses later in the season. Some protection from aphids may be offered by row covers. Several chemical controls are the same as for cucumber beetles.

endosulfan (Thiodan): 0-day harvest interval

dimethoate (Cygon): 3-day harvest interval

malathion: 1-day harvest interval

(Control will also be achieved with permethrin, esfenvalerate, and diazinon treatments as described above. Sevin, however, will not control aphids.)

Mites. Spider mites become a problem in melon fields later in the season in hot, dry weather. Mites are very small—almost invisible to see—and generally congregate on the undersides of leaves. Injury is characterized by a pale, whitening of foliage with later stages of injury having a bronzed appearance. Mites often build up in specific areas in fields which growers often refer to as "hot spots." Be sure to inspect all areas of the field to assess mite injury.

Spray placement is critical in mite control. Sprays must be directed to the undersides of leaves. Thus, strong pressure with sufficient air movement to flip plant leaves so they become covered with spray is necessary. The use of a wetting agent will usually improve control. Insecticides registered for use include:

ethion: 0-day harvest interval

malathion: 1-day harvest interval; apply to dry plants only.

HARVEST AND HANDLING

Melons for local markets are harvested at a ripe stage as indicated by easy removal of the stem from the end of the fruit. This "full slip stage" means the melons are firm and fully ripe. The stem should be easily removed with slight pressure from the finger. Depending on the variety of melon, rind color should be mostly yellow; however, some varieties may still have a partial green rind at ripeness.

High temperatures at harvest can often result in melons that have a high internal temperature. This is known as "field heat." Rapid removal of field heat is important in maintaining quality. Melons should be cooled to 50 to 60°F as rapidly as possible.

The most effective method of cooling is hydrocooling which is the immersion or drenching of the melons in cold water. Hydrocooling can cool melons to the desired temperature in 12 to 15 minutes. Forced air cooling in a refrigerated storage area results in slow cooling of the product. If possible, direct the air flow through the melons. High humidity is necessary since dry air can cause water loss from the melons. Forced air cooling may take 3 to 6 hours.

Some melons grown for distant markets can be package-iced by placing the melons in waterproof cartons and filling the empty spaces with crushed ice. This type of cooling is seldom used in Kansas since most melons are for local markets.

Melons for commercial markets can be marketed individually but most markets prefer some type of containerized handling of the product. Melons may be delivered in large, wooden bins, called "bulk bins," that are retrieved when empty.

Melons can be packed in cardboard cartons with a given number of melons contained in each carton. Western shipping melons are often sold in cartons containing 18 to 45 melons per carton. However, larger eastern type melons are more difficult to pack in cartons and sold by count.

Check with your buyer to determine the packaging required and whether the melons will be sold on a weight (price per pound) basis or count (price per melon) basis.

Melons are typically harvested by hand with 8 to 15 trips over the field to select melons that are ready for harvest that day. Melons should be placed gently in baskets or harvest bags for emptying into bulk bins or boxes. Other growers toss harvested melons to a central drive road or place melons on a wide field conveyer moving slowly through the field. A drive road every 5 to 10 rows allows movement of sprayers and harvesting trucks into the field. Yields may range from 150 to 300 cwt per acre, depending on conditions and growing practices used. An additional quantity of "seconds," or lower quality product, will be produced which could be sold, if profitable.

Melons that become excessively dirty from rains during the harvest period may be taken to a packing shed for washing and sorting across a brushing-washing line. A brush-washer must have high enough clearance so muskmelons will fit through the brushes. Melons can then be sorted into sizes and packed ready for shipment.

DISEASES

Bacterial Wilt. Bacterial wilt is a common and destructive disease of muskmelon and cucumber. The bacterium which causes the disease is transmitted from plant to plant by cucumber beetles. Diseased plants initially develop a dark green color, then rapidly wilt and die. A good diagnostic feature of the disease is bacterial streaming from the water-conducting system of the plant. This may be observed by slicing through a vine near the soil surface, then squeezing one end of the cut vine. An infected vine will extrude a buff-colored bacterial matrix that can be pulled away from the stem with a knife blade or other object for ¼ inch or more without breaking. On noninfected plants, the sap cannot be pulled into strings.

The wilt pathogen is dependent on the cucumber beetle for its transmission. Therefore, control should be directed at reducing early insect feeding. Insecticides should be applied as soon as the plants are set in the field and continued on a regular interval. A physical barrier over the plant, such as a floating row cover, may prevent insect feeding and transmission of the bacterium.

Virus Diseases. Virus diseases have become increasingly important as limiting factors in muskmelon production. Several virus diseases, including papaya ringspot, and cucumber, watermelon, squash, and zucchini yellows mosaic, may be present. Symptoms may vary depending on the particular virus, but generally plants are stunted. Younger leaves may turn yellow or mottled and often are distorted, as if damaged by phenoxy-type herbicides. Older plants develop a distinct mottling of leaves and fruit. Plants severely infected fail to produce fruit.

All of the viruses mentioned above, except squash mosaic (vectored by cucumber beetles), are transmitted from plant to plant by aphids. Also, certain viruses (squash mosaic and cucumber mosaic) may be seed-borne. None of the viruses persist in the soil for long periods.

Control of virus diseases is difficult. Certain viruses, such as cucumber mosaic, have a broad host range. Therefore, all perennial weeds near the field should be controlled. Use seed that is know to be free of virus. Control of weeds may also help reduce aphid populations near the field. The use of insecticides to suppress aphid populations has not resulted in effective control of the spread of virus diseases in the field. Nevertheless, recent research indicates that reflective mulches may reduce aphid feeding and lower the incidence of virus diseases. Unfortunately, most commercial varieties do not have resistance to many of the virus diseases.

Fusarium Wilt. Muskmelons affected with Fusarium wilt are stunted, yellow, and eventually wilt and die. A characteristic symptom of the disease is the formation of a yellow to brown streak that begins at the soil line and runs up the side of the vine. Occasionally, a small cottony growth of the fungus can be seen at the base of this streak.

Crop rotation is not effective because the fungal incitant is persistent in the soil. The best means of controlling Fusarium wilt is through the use of resistant varieties (see variety table).

Powdery Mildew. Powdery mildew can severely affect yields of muskmelon. The disease also occurs on cucumber, squash and pumpkin. Powdery mildew is most damaging if it appears more than 3 to 4 weeks before harvest. Infected plants develop white, powdery lesions and the leaves turn yellow and die. Though the fruit is not attacked by the fungus, it may become malformed or develop sunscald because of a lack of leaf coverage.

Disease development is favored by hot daytime temperatures, cool nights, and high relative humidity. Many cultivars of cucumber and muskmelon have been selected for tolerance to powdery mildew and should be planted in areas where the disease has been a problem. The disease also may be controlled with fungicides applied at a 14- to 21-day interval beginning at the first signs of mildew in the field (usually the first or second week in August). The disease is much more difficult to control once heavy infection of the leaves has occurred. Sulfur, benomyl, chlorothalonil, and triadimefon (Bayleton) are labeled for control of powdery mildew. Sulfur may cause some burning of leaves during hot, humid weather. Bayleton is very effective against powdery mildew, but should not be used alone where black rot has been a problem. Spreader-stickers may be helpful in obtaining thorough coverage of the foliage, but be sure to read the fungicide label for use.

Anthracnose. Anthracnose is most severe during relatively warm periods with frequent rainfall and a high relative humidity. Leaf spots first appear as light yellow to tan depressed areas. Lesions may also form on the petioles and stems. Severely blighted plants look scorched and unthrifty. The fruit develop sunken, roughly circular lesions that are water-soaked. During humid weather, masses of pink to salmon-colored spores are extruded from fruiting structures in the center of the lesions.

The incidence of anthracnose can be reduced by the use of clean seed and crop rotation. Rotation periods should not be shorter than 2 years. Check fields regularly for anthracnose or other foliar diseases. Fungicide sprays should be applied as soon as symptoms appear. Continue sprays at 5- to 10-day intervals as long as weather conditions remain favorable for disease development.

Fungicide rates and waiting intervals for the control of powdery mildew (PM), anthracnose (AN), downy mildew (DM), and Alternaria leaf spot (ALS) of muskmelon.

Chemical	Rate per acre	Disease				Waiting interval
		PM	AN	DM	ALS	
CHLOROTHALONIL						
Bravo 720	1.5–2.0 pt		X	X	X	0
CHLOROTHALONIL PLUS METALAXYL						
Ridomil/Bravo 81W	1.5–2 lb		X	X	X	0
BENOMYL						
Benlate 50 WP	0.25–0.5 lb	X	X			0
COPPER COMPOUNDS						
Kocide 101	1.5–3 lb			X		0
Kocide 606	2.75 pt			X		0
K-cop flowable	0.3–0.75 pt			X		0
Tri-basic copper sulfate 53WP	2 lb			X		0
C-O-C-S wettable	2–2.2 lb			X		0
Tenn-Cop 5E	2 qt			X		0
TRIADIMEFON						
Bayleton 50 WP	2–4 oz	X				0

Downy Mildew. Downy mildew is relatively uncommon in Kansas, however it has the potential to be devastating to cucumber and muskmelon crops during wet summers. Symptoms first appear as small, angular, yellow lesions on the upper side of the leaf. A white to purplish mildew can be seen on the lower side of the leaf during humid weather. As the lesions expand, their centers turn brown. Often, the margins of diseased leaves curl upward. Coalescing leaf lesions can kill entire leaves, causing plant stunting and fruit damage.

Control depends on cultural practices, early detection, and timely fungicide applications. Transplants should be carefully checked for downy mildew. Fields should be inspected regularly for evidence of the disease. Early detection is essential. If weather conditions are favorable for disease development, begin protective fungicide applications and continue on a 4- to 7-day interval. Protective sprays of fixed coppers, chlorothalonil, metalaxyl (Ridomil), or a combination of metalaxyl and chlorothalonil are effective.

COST OF PRODUCTION

Production costs will vary depending on the individual grower and types of markets. These estimated production budgets are provided for local market melons where extensive investments in packing shed and transportation facilities are not made.

COST-RETURN PROJECTION FOR MUSKMELON PRODUCTION IN INTENSIVE MANAGEMENT

Variable costs per acre	*Total*
1. Fertilizer	$ 57.00
2. Seed, transplants	80.00
3. Herbicides	22.50
4. Insecticides	25.75
5. Fungicides	17.00
6. Nematicides	0.00
7. Labor	1,650.00
8. Fuel and Oil	63.05
9. Repairs	113.75
10. Water	16.00
11. Utilities	0.00
12. Custom hire	0.00
13. Supplies	260.00
14. Marketing	0.00
15. Other	25.00
A. Total variable costs	$ 2,330.05
Fixed costs per acre	
16. Interest on land and buildings	60.00
17. Taxes on land and buildings	10.00
18. Rent for rented land	0.00
19. Depreciation on machinery	75.00
20. Interest on machinery	45.00
21. Depreciation on buildings	12.50
22. Depreciation on irr. equipment	50.00
23. Interest on irrigation equipment	60.00
24. Insurance	5.00
B. Total fixed costs	$ 317.50
C. Total costs	$ 2,647.55
D. Yield per acre (lb)	30,000.00
E. Price per unit (lb)	0.15
F. Returns per acre (lb)	4,500.00
G. Returns over variable costs	2,169.95
H. Returns over total costs	1,852.45
I. Variable costs per unit (lb)	0.08
J. Total costs per unit (lb)	0.09

COST-RETURN PROJECTION FOR MUSKMELON PRODUCTION IN EXTENSIVE MANAGEMENT

Variable costs per acre	*Total*
1. Fertilizer	$ 59.80
2. Seed, transplants	75.00
3. Herbicides	50.00
4. Insecticides	35.00
5. Fungicides	26.00
6. Nematicides	0.00
7. Labor	1,250.00
8. Fuel and Oil	45.45
9. Repairs	86.75
10. Water	16.00
11. Utilities	0.00
12. Custom hire	0.00
13. Supplies	0.00
14. Marketing	0.00
15. Other	40.00
A. Total variable costs	$ 1,684.00

Fixed costs per acre	
16. Interest on land and buildings	60.00
17. Taxes on land and buildings	10.00
18. Rent for rented land	0.00
19. Depreciation on machinery	75.00
20. Interest on machinery	45.00
21. Depreciation on buildings	12.50
22. Depreciation on irr. equipment	165.00
23. Interest on irrigation equipment	99.00
24. Insurance	6.63
B. Total fixed costs	$ 473.13
C. Total costs	$ 2,157.13
D. Yield per acre (lbs)	2,000.00
E. Price per unit (lbs)	0.12
F. Returns per acre	2,400.00
G. Returns over variable costs	716.00
H. Returns over total costs	242.87
I. Variable costs per unit (lb)	0.08
J. Total costs per unit (lb)	0.11

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