Delaware Cooperative Extension

UNIVERSITY OF DELAWARE | DSU DELAWARE STATE UNIVERSITY

This is a section from the

2024/2025
Mid-Atlantic Commercial Vegetable Production Recommendations

The recommendations are **NOT** for home gardener use.

The full recommendations are available online at:
https://www.udel.edu/academics/colleges/canr/cooperative-extension/sustainable-production/commercial-crops/vegetable-crops/midatlantic-vegetable-recommendations/

Printed copies of the recommendations are available for purchase at the New Castle, Kent and Sussex County Extension Offices in Delaware.

This publication will be revised biennially. In January 2025, a Critical Update with important updates for this publication will be communicated through the above website.

These recommendations were prepared and reviewed by individuals from Cornell University, University of Delaware, Delaware State University, University of Maryland, Penn State, Rutgers University, Virginia Tech, and West Virginia University with the purpose of providing up to date information for commercial vegetable growers in the Mid-Atlantic states of **Delaware, Maryland, New Jersey, Pennsylvania, Virginia,** and **West Virginia**.

Disclaimer

- The label is a legally-binding contract between the pesticide user and the manufacturer.
- The user MUST follow all rates and restrictions as per label directions.
- The use of any pesticide inconsistent with the label directions is a violation of Federal law.

F. Commodity Recommendations

Pesticide Use Disclaimer

THE LABEL IS THE LAW

A pesticide applicator is legally bound by the labeling found on and with the pesticide container in their possession. Before using a pesticide, check and always follow the labeling distributed with the product at the point of sale for legally enforceable rates and use restrictions and precautions.
Although labels are available on the Internet from electronic label services such as Proagrica's CDMS (*https://www.cdms.net/*), Greenbook (*https://www.greenbook.net*), or Agworld DBX powered by Agrian (*https://www.agrian.com/labelcenter/results.cfm)* the information contained in these electronic labels may not be identical to the labeling distributed with the product. **Please be advised that these electronic label services provide use disclaimers, and in some cases legally binding *User Agreements* assigning ALL liability to user of service. (**See section D 3.1. Labels and Labeling for more detail.)

Guide to the Recommended Pesticide Tables in the Following Crop Sections:

1. Pesticides are listed by **group number or code based on chemical structure and mechanism of action**, as classified by the Herbicide Resistance Action Committee (**HRAC**, *https://hracglobal.com*) for herbicides, the Insecticide Resistance Action Committee (**IRAC**, *https://irac-online.org*) for insecticides, and the Fungicide Resistance Action Committee (**FRAC,** *https://www.frac.info/*) for fungicides. **In this guide, if the group number or code is in bold font, there are resistance concerns for the product.**
2. **Restricted use pesticides** are marked with a * in the Tables. These products may only be used by certified and/or licensed pesticide applicators, and when stated on the label, those making applications under their direct supervision. Some labels may restrict use solely to certified and/or licensed applicators. (See section D 3.2.1 Restricted Use Classification Statement for more detail).
3. **In addition to the pesticide products listed in the Commodity Recommendations below, other formulations or brands with the same active ingredient(s) may be commercially available. ALWAYS CHECK THE LABELING ON THE PRODUCT CONTAINER ITSELF:**
   a) to ensure a pesticide is labeled for the same intended use,
   b) to ensure the pesticide is labeled for the desired crop,
   c) for differences in application rates and % active ingredient(s), and
   d) additional restrictions.
4. All pesticide recommendations contained in this document are prescribed for spray applications to a **broadcast area of 1 acre** (43,560 square feet). **Adjust the rate accordingly for banded applications** (See section E 1.3. Calibrating Granular Applicators) **or for chemigation** (check labels for amounts per 1,000 feet).
5. Check the physical product label for and do not exceed the maximum amount of pesticide *per application* and the maximum number of applications *per year*.
6. **Bee Toxicity Rating (Bee TR)**: N=nontoxic; L=minimum impact on bees; M=moderately toxic, can be used if dosage, timing, and method of application are correct, but should NOT be applied directly to the crop if bees are present; H=highly toxic, severe losses expected, -- = data not available.
7. In accordance with the USDA National Organic Program, the Organic Materials Research Institute (OMRI) maintains a directory of all products that OMRI has determined are allowed for use in organic production, processing, and handling. These products are catalogued online in the **OMRI Products List** (see *https://www.omri.org/omri-lists*).

Watermelons

Recommended Varieties[1]

Type	Reported Disease Resistance[2]						Size (lb)	Shape	Flesh Color	Rind Description
	Fon[3] Gen	Fon 0	Fon 1	Fon 2	Co[4]	Px[5]				
Seeded (also see seeded pollenizers)										
Crimson Sweet	R				R		16-20	globe	red	medium green with dark green stripes
Jamboree			I		I		24-28	oblong	red	dark green with broken light green stripes
Jubilee II			I				20-30	oblong		medium green with dark green stripes
Sangria	I				I		20-24	oblong	red	dark green with broken light green stripes
Starbrite					R		22-31	oblong	red	medium green with dark green stripes
Top Gun			I		I		21-24	globe	red	medium green with dark green stripes
Seedless Early										
Blackjack			I		I		15-23	globe	red	dark green
Charismatic							13-16	globe	red	medium green with dark green stripes
Jetski			I				17-20	oval	red	medium green with dark green stripes
Melody					I		14-16	globe	red	medium green with dark green stripes
Secretariat							16-20	oval	red	light green with broad, medium green stripes
Sweet Eat'n	I				I		15-20	oval	red	light green with broad, medium green stripes
Sweet Gem							13-16	globe	red	dark green
Warrior		I	I				16-20	oval	red	medium green with dark green stripes
Seedless Mid-Season										
Amarillo							13-15	globe	yellow	light green with narrow dark green stripes
Bottle Rocket			I				18-21	oblong	red	medium green with dark mottled stripes
Buttercup							12-18	globe	yellow	light green with narrow dark green stripes
Cut Above	I						15-17	oval	red	medium green with dark green stripes
Eleanor		I	I		I		15-19	oval	red	medium green with dark green stripes
Embasy			I		I		15-20	oval	red	medium green with dark green stripes
Excursion			I		I		17-24	oval	red	medium green with dark green stripes
Fascination			I		I		16-20	oval	red	medium green with dark green stripes
Guardsman			I		I	I	14-19	oval	red	medium green with dark green stripes
Kingman							16-20	oval	red	light green with broad, medium green stripes
Neptune							16-20	oval	red	medium green with dark green stripes
Paradigm						I	13-15	globe	red	medium green with dark green stripes
Red Opal			I		I		15-19	oval	red	medium green with dark green stripes
Road Trip	R				R		16-18	oblong	red	medium green with mottled green stripe
Shoreline			I		I		16-18	oval	red	medium green with dark mottled stripes
SS 7167							16-20	oval	red	medium green with dark green stripes
SV0241WA			I		R		12-15	oval	red	light green with medium green stripes
Tailgate							17-18	oval	red	medium green with dark green stripes
Traveler					R		15-20	oval	red	medium green with dark green stripes
Troubadour					R		13-18	oval	red	medium green with dark green stripes
Turnpike							16-20	oval	red	light green with medium green stripes
Unbridled							13-16	globe	red	medium green with dark green stripes
Seedless Late										
Captivation			I		I		14-17	oval	red	medium green with dark green stripes
Crunchy Red					R		16-20	oval	red	light green with broad, medium green stripes
Exclamation			I		I		17-21	oval	red	medium green with dark green stripes
Maxima							19-22	globe	red	medium green with dark green stripes
Orange Crisp							17-19	globe	orange	medium green with dark green stripes
Premont			I		I		15-17	oval	red	medium green with green stripes
Red Amber			I		I		16-20	oval	red	light green with medium green stripe
Shoreline							16-18	oblong	red	medium green with dark mottled stripes
Talca							17-20	oval	red	green with very dark green stripes

Recommended Varieties (Seedless Late) - continued next page

Recommended Varieties (Seedless Late)- continued

Type	Reported Disease Resistance[2]						Size (lb)	Shape	Flesh Color	Rind Description
	Fon[3] Gen	Fon 0	Fon 1	Fon 2	Co[4]	Px[5]				
Seedless Late *(continued)*										
Wolverine							16-18	oval	red	medium green with dark green stripes
7187HQ							16-20	oval	red	medium green with dark green stripe
7197HQ					I		16-20	oval	red	medium green with dark green stripes
Seedless Personal Melon										
Ana							6-8	globe	red	medium green with dark green stripes
Extazy							4-7	globe	red	medium green with dark green stripes
Ocelot							3-5	globe	red	medium green with dark green stripes
Sorbet		R	R		R		6-8	globe	red	dark green with thin darker stripes
Edible Pollenizers										
Estrella			I		I		20-24	oblong	red	dark green with broken, light green stripes
Jade Star							13-16	globe	red	dark green
Mickeylee	R				R		8-12	globe	red	light green
Premium		I	I				5-7	oval	red	light green with thin dark green strips
Sangria			I		I		20-24	oblong	red	dark green with broken light green stripes
Stargazer					I		24-26	oblong	red	dark green with broken light green stripes
Inedible Special Pollenizers										
Accomplice					R					
Ace Plus			I		I					
Sidekick					R					
SP 6			I	I	I	I				
SP 7			R		R	R				
Wild Card Plus			I		I					
Wingman										

[1]**Alphabetical order within type**.
[2]Reported disease resistance from source seed companies and university trials. R=Resistance; I=intermediate/partial resistance.
[3]Fon Gen=general resistance to Fusarium Wilt. Fon=Fusarium Wilt caused by *Fusarium oxysporum f. sp. niveum* Race 1,2, or 3.
[4]Co=Anthracnose caused by *Colletotrichum orbiculare*.
[5]Px=Powery Mildew caused by *Podosphaeria xanthii.*

Grafted Watermelons

Commercially produced grafted watermelons are available. Watermelons are susceptible to Fusarium Wilt and watermelon varieties are often grafted onto resistant rootstocks where wilt is present. Common rootstocks are bottle gourd (*Lagenaria siceraria*) and interspecific winter squash hybrids (*Cucurbita maxima* x *Cucurbita moschata*). Bottle gourd rootstocks include 'Liga' RST12-123-W, and PelopsRZ. Interspecific hybrid rootstocks include RS841, AQ, BS1, Carnivor, Flexifort, FerroRZ, Cobalt, and Super Shintosa. The citron melon (*Citrullus lanatus* var. *citroides*) rootstock resistant to both Fusarium Wilt and Root Knot Nematode is Carolina Strongback. Grafted watermelon may also increase tolerance to high and low temperatures, improve nutrient uptake, improve water use efficiency, and improve yield, fruit quality, and fruit size. Watermelon grafted onto these rootstocks will often have a more extensive root system and will require less nitrogen and can be planted further apart with no impact on yield.

Recommended Nutrients Based on Soil Tests

In addition to using the table below, check the suggestions on rate, timing, and placement of nutrients in your soil test report and chapter B Soil and Nutrient Management. Your state's soil test report recommendations and/or your farm's nutrient management plan supersede recommendations found below.

Watermelons[1]		Soil Phosphorus Level				Soil Potassium Level				
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
	N (lb/A)	P_2O_5 (lb/A)				K_2O (lb/A)				Nutrient Timing and Method
Non-Irrigated	80-100	150	100	50	0[2]	200	150	100	0[2]	Total nutrient recommended
	50	150	100	50	0[2]	200	150	100	0[2]	Broadcast and disk-in
	25-50	0	0	0	0	0	0	0	0	Sidedress when vines start to run

Recommended Nutrients Based on Soil Tests - ***see next page for Irrigated Watermelons and Footnotes.***

Recommended Nutrients Based on Soil Tests - continued. ***See previous page for Non-Irrigated Watermelons***

Watermelons[1]		Soil Phosphorus Level				Soil Potassium Level				
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
Irrigated	125-150[1]	150	100	50	0[2]	200	150	100	0[2]	Total nutrient recommended
	25-50	150	100	50	0[2]	200	150	100	0[2]	Broadcast and disk-in or follow fertigation schedule for K
	25-50	0	0	0	0	0	0	0	0	Sidedress when vines start to run or follow fertigation schedule
	25-50	0	0	0	0	0	0	0	0	Sidedress after first harvest or follow fertigation schedule

[1]Apply 20-30 lb/A of sulfur (S) for most soils. [2]In VA, crop replacement values of 25 lb/A of P_2O_5 and 50 lb/A of K_2O are recommended on soils testing Very High.

Fertigation Schedule Examples

This table provides examples of fertigation schedules based on two common scenarios – sandy coastal plain soils and heavier upland soils. Modify according to specific soil tests and base fertility.

Fertigation recommendations for 125 lb N and 125 lb K_2O[1,2] For soils with organic matter content less than 2% or coarse texture and low to medium or deficient K								
			Nitrogen			**Potash**		
Preplant (lb/A)[3]			**25**			**50**		
			N	**N**	**N**	**K_2O**	**K_2O**	**K_2O**
Stage and Description	Weeks	Days	lb/day	lb/week	lb/stage	lb/day	lb/week	lb/stage
1 Early vegetative	1-2	1-14	1	7	14	1	7	14
2 Late vegetative	3-4	15-28	1.5	10.5	21	1.5	10.5	21
3 Flowering and fruiting	5-8	29-56	2	14	56	2	14	56
4 Harvest	9-10	57-70	1.5	10.5	21	1.5	10.5	21
5 Repeat harvest[4]	11-12	71-84	1	7	14	1	7	14
Fertigation recommendations for 100 lb N and 50 lb K_20[1,2] For soils with organic matter content greater than 2% or fine texture and high or optimum K								
			Nitrogen			**Potash**		
Preplant (lb/A)[3]			**50**			**50**		
			N	**N**	**N**	**K_2O**	**K_2O**	**K_2O**
Stage and Description	Weeks	Days	lb/day	lb/week	lb/stage	lb/day	lb/week	lb/stage
1 Early vegetative	1-2	1-14	0.4	2.8	5.6	0.3	2.1	4.2
2 Late vegetative	3-4	15-28	0.9	6.3	12.6	0.6	4.2	8.4
3 Flowering and fruiting	5-8	29-56	1.4	9.8	39.2	0.9	6.3	25.2
4 Harvest	9-10	57-70	0.9	6.3	12.6	0.6	4.2	8.4
5 Repeat harvest[4]	11-12	71-84	0.4	2.8	5.6	0.3	2.1	4.2

[1]Rates are based on 6,222 linear bed ft/A (7 ft bed spacing). If beds are closer or wider, fertilizer rates should be adjusted proportionally. Drive rows should not be used in acreage calculations (see section C 3. Fertigation). [2]Base overall application rate on soil test recommendations.[3]Applied under plastic mulch to effective bed area using modified broadcast method.[4]For extended harvest after 12 weeks continue fertigation at this rate.

Plant Tissue and Petiole Sap Testing

Plant tissue and petiole sap testing are useful tools for monitoring plant nutrient status, especially for N and K.

Petiole sap:

Petiole sap can be tested with a portable meter. When vines are 6 inches long, petiole sap nitrate-N should be 1200-1500 ppm and K 4000-5000 ppm. When fruit are 2 inches long, nitrate-N should be 1000-1200 ppm for seeded cultivars, 900-1100 ppm for seedless cultivars and K 4000-5000 ppm. When fruit are half mature, nitrate-N should be 800-1000 ppm for seeded cultivars, 600-800 ppm for seedless cultivars and K 3500-4000 ppm. At first harvest, nitrate-N should be 600-800 ppm for seeded cultivars, 400-600 ppm for seedless cultivars and K 3000-3500 ppm.

Tissue testing:

For tissue testing, sample the most recent fully expanded leaves at first fruit set and follow laboratory instructions for handling. Plant tissue testing can be a valuable tool to assess crop nutrient status during the growing season to aid with in-season fertility programs or to evaluate potential deficiencies or toxicities. Critical watermelon tissue test values for most recently matured leaves at first fruit set: N 2-3 %, P 0.3-0.5 %, K 2.7-3.5 %, Ca 1-2%, Mg 0.25-0.5% and S 0.2-0.4%. For additional nutrients and other growth stages consult with a tissue testing laboratory or this web link at the University of Florida: *https://edis.ifas.ufl.edu/publication/ep081*.

Seed Treatment

Check if seed has been treated with an insecticide and fungicide. See Disease Control below.

Plant Production

Transplants should be grown in plug trays with cells at least 1.5 inches in diameter and 2 inches deep. Smaller pots or cells will restrict root growth and provide less protection to the transplant. Plant 1 seed per cell. Triploid (seedless) watermelon seeds require a special regime to germinate well. The seed coat tends to adhere to the seedling as it emerges, at times slowing growth or reducing stand. Seeds are of lower vigor than standard diploid types.

Seedless watermelon transplant production can be broken into 6 stages:

1) Seeding

Trays should be evenly filled with a general commercial greenhouse growing medium with a starter fertilizer. Do not use fine seed starter or plug mix types. Do not compress the growing media. Trays should be watered to capacity and then allowed to drain excess water for 24 h in a heated area so that the media can warm up to 85°F (29°C). This temperature should be maintained during seeding. Make 1 inch deep planting holes and plant seeds with the "pointed" side up. Cover with a small amount of warm moist medium. Do not water after seeding.

2) Initial Germination

During germination it is critical that trays are kept at a uniform temperature of 85-90°F (29-32°C) and at high humidity. It may be necessary to move trays around after 24 h (trays on bottom shelves moved to top shelves and vice versa) to ensure even temperature exposure. During this 48 h phase, the root will emerge but the epicotyl ("crook") that will carry the leaves above the media surface should not be visible. If crooks are visible, trays may have been left in the germination area for too long. In that case, plants may "stretch" during emergence which results in poor transplant quality.

3) Emergence

After initial germination, move plants immediately to the greenhouse. If another grower germinates your seeds, schedule pickup or delivery without delays. Greenhouses should be set at 72-75°F (22-24°C) during the day and 65°F (18°C) at night. Do not water until after crook emergence. Thereafter, water sparingly as needed to prevent media and emerging seedlings from drying out. Excess water and too high temperatures during the emergence phase will lead to stretch.

4) Seed Leaf Stage to First True Leaf

Maintain greenhouse temperatures in the 72-75°F range during the day and at 65°F at night. Water moderately. Do not fertilize if you are using a medium with starter fertilizer. Plants should grow slowly for the highest quality.

5) First True Leaf to Second True Leaf

Maintain greenhouse temperatures in the 72-75°F range during the day and at 65°F at night. Once the first true leaf emerges, trays can be fertilized. Generally, 2 fertilizations of 100 ppm N, one at first true leaf and one at second true leaf appearance will be sufficient. If a constant feed system is used, set for 50 ppm N for each watering once the first true leaf has emerged. Avoid using fertilizers with large amounts of ammonium as the N source as this can lead to stretch. Use fertilizers with calcium nitrate and potassium nitrate instead. Avoid over-watering. These rates are for media that contain starter fertilizer, like the ones listed in the seeding section above. If a medium without starter fertilizer is used, use a different fertilizer program. Using fertilizers with calcium nitrate and potassium nitrate as N sources, apply 50 ppm N every 3 days from emergence to first true leaf, and 200 ppm N every other day from first true leaf to second true leaf.

6) Hardening Off

It will take 4-6 weeks from sowing to finish transplants. Prior to transplanting into the field, harden off plants for one week. This is accomplished by lowering day temperatures (if greenhouses have side curtains, roll them up during days if temperatures are not too cool). Reduce watering and stop fertilization. If possible, place plants on wagons or move benches outside during the day and bring them in at night, but make sure the area is sheltered from high winds and avoid days where the temperature is below 60°F (16°C).

Seeded pollenizers and standard seeded watermelon transplant production do not need special germinating conditions and can be done directly in the greenhouse. Time the production so that plants are produced and hardened off at the same time as the seedless types. Grow plants slowly to avoid stretch. Follow the same recommendations as for seedless watermelons from seed leaf stage through hardening off, *i.e.*, stages 4 to 6 above.

Planting and Spacing

Transplants: Transplant container-grown plants through plastic mulch when daily mean temperatures have reached 60°F (16°C). Planting dates vary from April 25 in southern areas to June 20 in northern areas. Early plantings should be protected from winds with row covers, or rye windbreak strips.

Direct-seeded: Seed April 20 to June 15 in VA and normally warmer areas, and May 15 to June 10 in PA and normally cooler areas. Seed 3-5 lb/A of seed.

Recommended Spacing: 6-8 ft between rows with 3-4 ft between plants in the row.

Seedless varieties: see the Pollination and Pollenizers section below for planting recommendations.

Mulching

Watermelons are usually grown on black plastic mulch with drip irrigation (see also chapter C Irrigation Management). Weeds under the plastic are controlled by labeled herbicides (see Weed Control below) or by fumigation. Fumigation is also used to control soil borne diseases such as *Fusarium*. Fumigation is necessary when there is a history of soil-borne diseases in the field (recommendations can be found in section E 1.5. Soil Fumigation).

Plastic and fumigant should be applied on well-prepared planting beds 30 days before field planting. Plastic should be 3-4 ft wide and laid on 6-8 ft centers immediately over the fumigated soil. The soil must be moist when laying the plastic. Infra-Red Transmitting (IRT) plastic has been used in cooler areas for additional soil heating. Fertilizer must be applied during bed preparation. At least 50% of the N should be in the nitrate form. Direct seeding through the mulch is possible for seeded watermelons but is not generally recommended for seedless varieties.

Pollination and Pollenizers (see also sections A 12. Pollination and D 6.3.1. Protection of Pollinators)

Watermelon fruit set and enlargement is dependent on growth regulators from the pollen grains and from embryos in developing seeds. Inadequate pollination results in triangular-shaped triploid watermelon fruit of inferior quality. Inadequate pollination may increase the incidence of hollow heart. Triploid watermelon flowers do not produce sufficient viable pollen to induce fruit set and development; pollen from a normal or a special diploid pollenizer variety must be present. Field should be **inter-planted** with triploid and pollenizer plants (the pollenizer variety and the seedless variety should **not** be planted in separate but adjacent blocks!). Three methods can be used: 1) Pollenizer plants may be dedicated to every 3rd row, 2) Plant a pollenizer every 3rd or 4th plant in-row with additional spacing for pollenizers, and 3) Plant the pollenizer between every 3rd and 4th plant in-row without changing plant spacing. Co-planted pollinizers are also available and widely used (pollenizer planted in the same cell as seedless in every 3rd or 4th cell). When the latter methods are chosen, the use of a special pollenizer is recommended, as standard diploid varieties planted in-row may decrease yields of closely associated triploid plants. Special pollenizer varieties (see Recommended Varieties table above) have been developed solely for pollen production and most do not produce marketable fruit. The use of special pollenizers planted in-row allows the field to be 100% seedless.

When using pollenizer plants arranged in dedicated rows if marketing in-row pollenizers, it is important to use a marketable pollenizer variety, because up to one-third of the melons produced in the field will be of this variety. The rind pattern and/or shape of the seeded pollenizer fruit should be easily distinguishable from that of the triploid fruit. Most special pollenizers are distinguishable from triploid fruit by size, however, if mini seedless watermelons are planted rind pattern must be used to distinguish pollenizer and seedless fruit. Selection of a pollenizer variety that will be harvested should also consider the market demand, plant vigor, pollen production, disease resistance, and environmental conditions.

Pollen from the diploid pollenizer variety should be available when the female blossoms on the triploid plants are ready for pollination. Special pollenizer plants should be transplanted at the same time as triploid plants. As a general rule, direct field seeding of the pollenizer variety should be done on the same day the triploid seed is planted in the greenhouse. If transplants are used for pollenizers, they can be seeded a few days after triploid transplants are seeded.

Honey bees, squash bees, bumble bees and other wild bees are essential for proper watermelon pollination and fruit set. Honey bee or bumble bee colonies are commonly rented or purchased. Populations of pollinating insects may be adversely affected by insecticides applied to flowers or weeds in bloom. Apply insecticides only in the evening hours or wait until bloom is completed before application. Bee Toxicity ratings are available in the insecticide tables. Growers should follow insecticide label restrictions for pollinator protection.

Windbreaks

Use windbreaks as necessary. Small grain windbreaks are recommended and may be established between every bed, every 2-3 beds, or in drive row areas (every 6-8 beds). Use windbreaks between every row for the earliest plantings for additional protection. Rye is most commonly used, due to its height and rapid growth. Establish windbreaks in the fall, either as a solid planting, or in windbreak rows. Plant at high density to ensure a good stand. In the spring, for solid plantings, till areas where plastic is to be laid before small grain starts to elongate. Windbreaks may be eliminated with herbicides or mowed out after the crop is well established.

Vine Turning

Move vines in outer rows out of driveways so they are not damaged by vehicle traffic. This reduces disease incidence. Several trips over the field may be necessary. Vines can also be managed in roads by cutting.

Irrigation

Watermelons can be grown under dryland conditions; however, the highest yields are obtained with irrigation. Irrigation is recommended for seedless watermelons. Schedule irrigation so that soil moisture does not drop below 50% of field capacity. At peak, during fruit set and full vine cover, watermelons will use up to 0.30 inches of water per day.

Harvest and Post-Harvest Considerations

Watermelons are hand harvested into bins, trucks, or buses for shed packing. Use every sixth or eighth row as a drive row for field access. Ripeness is indicated by a creamish to slight yellowing of the white background color of the part of the melon that rests on the ground. The drying of the stem tendril nearest the attachment point of the melon and green color tone of the rind are also indicators of ripeness but these vary with cultivar. Melons should be cut from the vine rather than pulled, twisted, or broken off. Rough handling will result in serious losses. Bulk bins with pallets, if used, can speed handling, and minimize melon damage.

Harvested watermelons should be kept at 50-60°F (10-16°C) and a relative humidity of 90% during storage and shipping. Watermelons are not suitable for long storage. At low temperatures, they may develop various chilling injury symptoms and lose quality, and at high temperatures they are susceptible to decay.

Watermelons should be consumed within 2-3 weeks after harvest, primarily because of the gradual loss of crispness. High quality in watermelons is determined largely by high sugar content, deep red fresh color, and a pleasant crisp texture of the edible flesh. These factors are dependent on maturity, cultivar, and handling methods.

Commercial melons for distant markets are usually harvested when mature, but before full ripeness, to minimize handling damage and flesh breakdown. Watermelons are sensitive to high levels of ethylene gas during storage and should not be stored or shipped with fruit that emit substantial amounts of ethylene.

Watermelons are marketed by weight and bin counts: “Large” is 32-35 melons/bin (more than 18 lb/melon), “medium” is 45 melons/bin (14-18 lb/melon) and “small” is 50-60 melons/bin (≤ 14 lb/melon). The wholesale grower is generally paid by the pound. “Personal” (very small) watermelons are marketed by box counts and weight. The trend in consumer preference has been increased demand for smaller sizes.

Watermelon Disorders

Hollow Heart is an internal crack in the flesh of the melon. Hollow heart is generally more severe in seedless varieties and in crown-set fruit. Inadequate pollen has been shown to be one causal factor. Cold weather during fruit set, poor fruit set and low fruit load, excess nutrients (especially N), and factors producing rapid growth have been reported to impact the severity of hollow heart.

Internal Rind Necrosis is indicated by the presence of a corky, red-brown layer of tissue on the inside of the rind of affected fruit without extending into the fruit flesh. The disease occurs sporadically and is thought to be caused by bacteria (*Erwinia*) that are naturally present on fruit. Drought stress has been implicated in this disorder.

Irregular Ripening can be a problem in some years and varieties. Watermelons are classified as non-climacteric since they do not ripen significantly after harvest. However, research has shown that watermelon fruit produce a burst of ethylene at the white fruit stage and factors that reduce ethylene at this stage will slow ripening. Watermelon fruit development and ripening also depend on the accumulation of sugars. Loss of foliage or stem tissue due to diseases such as Gummy Stem Blight or insect or mite feeding can reduce the amount of sugar available to the fruit. Different varieties, low K nutrition, or variability in vine health will lead to variability in fruit ripening.

Misshapen Fruits Poor pollination due to low bee activity, may result in "bottlenecks", or constricted growth at the stem end of the fruit, especially in seeded/elongated watermelons. Research has shown that the distribution of a minimum of 1,000 pollen over the three lobes of the flower stigma are required to produce a uniformly shaped fruit. In seedless watermelons, poor pollination may lead to undesirable “triangular” fruit.

Ozone Injury Ozone is a common air pollutant. When present in high concentrations, ozone will cause chlorosis and upper surface bronzing and scorching in older leaves, which leads to defoliation. ‘Sugar Baby’ is one of the more sensitive varieties.

Splitting during handling occurs in fruit under excessive water pressure as a result of excess irrigation or rainfall.

Sunscald occurs when fruit are exposed to direct sunlight, especially on extremely hot days. Under these conditions, rind surfaces can reach temperatures exceeding 140ºF (60°C), killing cells and resulting in sunburn spots. Fruit with little or no foliar cover are at most risk. Sunscald or sunburn first appears as a gray or white area on the exposed upper surface of the fruit. Fruit with dark rinds are more susceptible to sunscald than those with light colored rinds. Sunscald severity is related directly to fertility regime and foliage cover. Proper fertility and soil management promotes adequate vine growth and coverage of fruit. Sunscald severity is also associated with diseases that reduce foliage cover, such as Anthracnose, Alternaria, Gummy Stem Blight, and Downy Mildew. Recommendations for managing these diseases may be found in the Disease Control section below.

Water Soaking occurs where excess water accumulates at the bottom of the fruit resulting in a water-soaked appearance of internal flesh. Water accumulates during cloudy weather when transpiration from vines is low. Water soaking sometimes appears in fruits where foliage has deteriorated since excess water cannot be transpired.

Weed Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of Chapter F.

Recommended Herbicides

1. Identify the weeds in each field and select recommended herbicides. More information is available in the “Herbicide Effectiveness on Common Weeds in Vegetables” (Table E-3) in Chapter E Pest Management.

2. Minimize herbicide resistance development. Identify the herbicide mode of action group number and follow recommended good management practices; **bolded group numbers in tables below are herbicides at higher risk for selecting resistant weed populations.** Include non-chemical weed control whenever possible.

Labeled Application Sites for Watermelon

Herbicide (*=Restricted Use)	HRAC group number	Plastic mulch production					Bareground production		
		Soil-Applied		Postemergence					
		Under Plastic	Row Middles	Over Plastic	Row Middles	Post-Harvest	Soil-applied	POST	Post-harvest
Sandea	2	YES	YES		YES		YES		
Curbit	3		YES				YES		
Prowl H2O	3		YES						
Treflan	3		YES						
Sinbar	5	YES	YES				YES		
Prefar	8	YES	YES				YES		
Command	13		YES				YES		
Strategy	3 + 13		YES				YES		
Reflex[1]	14	YES	YES		YES		YES		
Dual[1]	15		YES						
Poast	1			YES				YES	
Select / Select Max Shadow 3EC	1			YES				YES	
Gramoxone*[1]	22				YES	YES	YES[2]		YES

[1] Special Local Needs Label 24(c), be sure it is registered for the specific state and for the intended use.

[2] Apply preplant or after seeding but prior to crop emergence.

1. Pre-Transplant Over Plastic

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
10	Rely 280 2.34L	29 to 43 fl oz/A	**glufosinate**	0.53 to 0.79 lb/A	30	12
-**Supplemental Label expires 12/1/2025 for application over plastic prior to transplanting.** -Ammonium sulfate (AMS) can be used at 1.5 lb/A to 3 lb/A. -Control is best when applied to weeds less than 4 inches, temperatures are above 80, high humidity, and bright sunlight. -Transplants can be injured if they come in contact with herbicide remaining on the plastic. Allow at least 3 days between application and transplanting. At least 0.5 inches of precipitation is needed to wash Rely off the plastic. Do not transplant within 27 days of application if no precipitation occurs. -DO NOT transplant into or within 6 inches of holes in the plastic mulch that were present at time of application. -Two applications can be made prior to transplanting. Do not apply more than 64 fl oz/A prior to transplanting; maximum number of applications is three per season. -Rainfastness is 4 h.						
22	Gramoxone SL 2.0* Gramoxone SL 3.0*	2 to 4 pt/A 1.3 to 2.7 pt/A	**paraquat**	0.5 to 1.0 lb/A	--	24
-Gramoxone can be used for preplant weed control over the top of plastic mulch. Sufficient rainfall or sprinkler irrigation is needed to wash off the Gramoxone prior to planting to prevent damage to the crop. -***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load, or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*https://campus.extension.org/enrol/index.php?id=2201*); certified applicators must repeat training every three years. -Do not exceed 8 pt/A per season. Rainfastness is 30 min.						

2. Soil-Applied

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
2	Sandea 75DF	0.5 to 1 oz/A	**halosulfuron**	0.023 to 0.047 lb/A	57	12
-**Plasticulture**: can be applied in a band under the plastic, immediately before laying the mulch; delay seeding or transplanting for 7 days after application. Plasticulture row middles: apply before or after weed emergence; apply as a shielded application to avoid contact with the crop. If weeds have emerged, use a non-ionic surfactant at 0.25% v/v or include a non-selective herbicide. -**Bareground**: apply broadcast after seeding but before crop emergence or no sooner than 7 days before transplanting. -Maximum rate for application in seeded or transplanted row is 0.75 oz/A, and up to 1 oz/A for row middle application. -Limit movement of treated soil into transplant hole during transplanting. -Suppresses or controls yellow nutsedge and certain broadleaf weeds. Sandea provides both residual and postemergence control of susceptible weed species. Effective postemergence control requires an adjuvant. -Sandea is an ALS inhibiting herbicide and resistant weed populations are common in the region. **Do not** use Group 2 herbicides repeatedly in the same field. -**Do not** apply Sandea to crops treated with a soil applied organophosphate insecticide, or use a foliar applied organophosphate insecticide within 21 days before or 7 days after a Sandea application. -Maximum Sandea applications per year is 2 and **do not** exceed 1 oz/A during the crop season.						
3	Curbit 3EC	1 to 3 pt/A	**ethalfluralin**	0.38 to 1.13 lb/A	--	24
-**Plasticulture**, row middles only: apply as a banded spray after crop emergence or after transplanting. **Do not** soil incorporate. -**Bareground**: apply broadcast after direct-seeding but prior to crop emergence; **do not** use on transplanted melons. -Controls annual grasses and certain annual broadleaf weeds, including carpetweed and pigweed sp. -Use lower rate for coarse-textured soils or soils with low organic matter. -Where overhead irrigation is available, activate Curbit with 0.5 inch of irrigation within 2 days after application; if no irrigation or rainfall occurs within 5 days of application, activity of Curbit can be reduced. -Available as a pre-mix herbicide Strategy. Strategy at 3 pt/A= Curbit at 26 fl oz/A (0.6 lb ai) and Command at 8 fl oz/A (0.188 lb ai) -Maximum applications per season: not specified						
3	Prowl H2O 3.8CS	2.1 pt/A	**pendimethalin**	1 lb/A	35	24
-**Plasticulture**: row middles only: apply as a banded spray before seeded crop has emerged or before transplanting. -**Bareground**: apply with shielded sprayer band between rows, leaving 6 inches of untreated area on both sides of the seeded or transplanted row. Apply before seeded crop emerges or before transplanting. -Where overhead irrigation is available, activate Prowl with 0.5 inch of rainfall or sprinkler irrigation within 48 h of application; if no irrigation or rainfall occurs within 5 days of application, activity of Prowl can be reduced -A second application at the same rate may be applied to row middles as a banded spray postemergence a minimum of 21 days after the first application, but before the vines begin to run. **Do not** apply over the top of the crop, or severe injury may occur. -Maximum Prowl H2O applications per season is 2 and **do not** exceed 4.2 pt/A during the crop season.						
3	Treflan 4EC	1 to 2 pt/A	**trifluralin**	0.5 to 1 lb/A	60	12
-**Plasticulture**: row middles only: apply as a directed spray after emergence when plants have reached the 3 to 4 true leaf stage. -**Not labeled for bareground production.** Primarily controls annual grasses with a few broadleaf weeds. -**Do not** use (or reduce the rate) when cold, wet soil conditions are expected, or crop injury may result. -Maximum applications per season: not specified.						

2. Soil-Applied - continued next page

2. Soil-Applied - continued

3 + 13	Strategy 2.1SC	1.5 to 6 pt/A	**ethalfluralin *plus* clomazone**	0.39 to 1.58 lb/A	45	24
-**Plasticulture**: row middles application. -**Bareground**: apply broadcast just before planting or after planting but before crop emergence. -Strategy is a prepackage mixture of Curbit 3EC and Command 3ME. -Clomazone spray or vapor drift may injure susceptible crops and other vegetation, refer to Command 3ME for comments. -**Do not** apply prior to planting the crop. **Do not** soil incorporate. -Refer to individual products for comments. Maximum applications per season: not specified.						
5	Sinbar 80WDG	2 to 4 oz/A	**terbacil**	0.1 to 0.2 lb/A	70	12
-**Plasticulture**: can be applied in a band under the plastic, immediately before laying the mulch. Sinbar can be broadcast over the plastic before transplanting or before holes are made in the plastic; but must be washed off with a minimum of 0.5 inches for rainfall or irrigation before transplanting. Plasticulture row middles: apply before or after weed emergence; apply as a shielded application to avoid contact with the crop. If weeds have emerged include a non-selective herbicide. -**Bareground**: apply broadcast after seeding but before crop emergence. -**Do not** apply over the top of the crop or allow spray to contact crop foliage, or injury may result. -Controls many annual broadleaf weeds but may be weak on pigweed species. Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. -Maximum Sinbar applications per year is 2 and **do not** exceed 4 oz/A during the crop season						
8	Prefar 4E	5 to 6 qt/A	**bensulide**	5 to 6 lb/A	--	12
-**Plasticulture**: under plastic: apply in a band under the plastic, immediately before laying the mulch. Allow 7 days before making transplant holes to allow condensation to incorporate the herbicide. Plasticulture: row middles application is labeled. -**Bareground**: apply preemergence or preplant incorporated. -Preemergence applications should be followed by irrigation within 36 h (apply enough water to wet the soil at least 2 to 4 inches deep). Preplant incorporated applications should be incorporated 1 to 2 inches deep (deeper than 2 inches will result in reduced weed control). -Prefar provides control/suppression of some annual grass weeds and some broadleaves including pigweeds, purslane, and lambsquarters. -**Do not** apply more than 6 lb ai/A per season.						
13	Command 3ME	0.4 to 0.67 pt/A	**clomazone**	0.15 to 0.25 lb/A	--	12
-**Plasticulture**: row middles application only. -**Bareground**: apply broadcast just before planting or after planting but before crop emergence. Use the lower rate when used on coarse-textured soils low in organic matter, when weed pressure is light, or to minimize herbicide carryover that could affect subsequent crops. -Controls annual grasses and many broadleaf weeds including common lambsquarters, velvetleaf, spurred anoda, and jimsonweed. Carpetweed, morningglory sp., pigweed sp., and yellow nutsedge will **not** be controlled. Higher rates will improve control (or expand number of species controlled) such as common cocklebur, common ragweed, or jimsonweed (refer to label for specific weeds and rates). -**WARNINGS**: Command spray *or* vapor drift may injure sensitive crops and other vegetation up to several hundred yards from the point of application. **Do not** apply adjacent to sensitive crops (see label) or vegetation, or under unfavorable wind or weather conditions. Command may limit subsequent cropping options, see the label. -Available as a pre-mix herbicide Strategy: Strategy at 3 pt/A= Command at 8 fl oz/A (0.188 lb ai) and Curbit at 26 fl oz/A (0.6 lb ai) -Maximum Command applications per year is 1.						
14	Reflex 2SL	Rates vary, refer to the specific label	**fomesafen**	0.16 to 0.25 lb/A	35	24
-Special Local Needs Label 24(c) for the use of Reflex 2SL to control weeds in watermelon in DE and NJ and pending in PA (expires 12/31/2025 for DE and 12/31/2027 for NJ). The use of this product is legal ONLY if a waiver of liability has been completed, see: *https://www.syngenta-us.com/labels/indemnified-label-login*). **-Rates vary by state and application method; refer to label to determine correct rates.** -**Plasticulture**: can be applied in a band under the plastic at 10 to 12 fl oz, immediately before laying the mulch. -Plasticulture: Reflex at 10 to 12 fl oz/A can be broadcast over the plastic before transplanting or before holes are made in the plastic; but must be washed off with a minimum of 0.5 inches for rainfall or irrigation before transplanting. -Plasticulture row middles: before emergence of seeded crop or before transplanting; apply up to 12 fl oz/A in VA or up to 16 fl oz/A in DE. Plasticulture row middles with shielded/hood sprayers after transplanting; apply 16 to 24 fl oz/A in DE prior to vines "running" off the plastic. Severe crop injury can occur if spray comes in contact with crop foliage. -**Bareground direct-seeded**: apply broadcast within 24 h after seeding followed by 0.2 to 0.5 inch of overhead irrigation at least 36 h before watermelon crack the soil surface. -**Bareground transplants**: apply as broadcast spray followed by irrigation of 0.2 to 0.5 inches. Then prepare holes and transplant; avoid moving herbicide-treated soil into transplant holes. -Reflex provides both residual and postemergence control of susceptible weed species. Effective postemergence control requires an adjuvant. -**Watermelon varieties may vary in their response to Reflex**. Treat small acreages first to determine crop tolerance, especially when applying to a new variety. -Consider rotational crops when applying fomesafen. If the crop is replanted **do not** re-apply Reflex. Rotational restrictions are dependent on whether fomesafen was applied under the plastic, bare ground, or over plastic mulch, refer to 24(c) label for specifics. -Maximum Reflex per season is 24 fl oz/A **IN ALTERNATE YEARS**						

2. Soil-Applied - continued next page

2. Soil-Applied - continued

15	Dual Magnum 7.62E	0.67 to 1.27 pt/A	**s-metolachlor**	0.64 to 1.21 lb/A	60	24
-Special Local Needs Label 24(c) for the use of Dual Magnum 7.62E to control weeds between the rows of plastic mulch in watermelon in DE (expires 2/24/2025). The use of this product is legal ONLY if a waiver of liability is completed (see: *https://www.syngenta-us.com/labels/indemnified-label-login*). -**Plasticulture**: row middle application only. -**Do not** apply Dual Magnum to the plastic mulch or allow the spray to contact watermelon foliage. **Do not** soil incorporate. -Suppresses or controls annual grasses, yellow nutsedge, and certain annual broadleaf weeds including nightshade species. Use the lower rate on fields with coarse-textured soils low in organic matter. Use the higher rates on fields with fine-textured soil and those with high organic matter. -Maximum number of Dual Magnum applications per year is one and **do not** exceed 1.27 pt/A during the crop season.						
27	Optogen 1.67	3.5 fl oz/A	**bicyclopyrone**	0.046 lb/A	14	24
-Apply before transplanting. Limited local data on crop safety when used under plastic layer (use under plastic is not addressed on the label). Optogen will provide control of only a limited number of weed species, use in combination with other herbicides. -Do not make more than one application per crop year.						

3. Postemergence

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
1	Shadow 3EC Select 2EC Select Max 0.97EC	4 to 5.33 fl oz/A 6 to 8 fl oz/A 9 to 16 fl oz/A	**clethodim**	0.07 to 0.125 lb/A	14	24
	Poast 1.5EC	1 to 1.5 pt/A	**sethoxydim**	0.19 to 0.28 lb/A	14	12
-**Select 2EC**: use crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution). **Select Max**: use nonionic surfactant (NIS) at 0.25% v/v (1 qt/100 gal of spray solution). **Shadow 3EC**: use crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution) for large or stressed grasses; use nonionic surfactant (NIS) at 0.25% v/v (1 qt/100 gal of spray solution) when crop safety is a concern. **Poast**: use COC at 1.0% v/v. -**The use of COC may increase the risk of crop injury when hot or humid conditions prevail.** To reduce the risk of crop injury, omit additives or switch to NIS when grasses are small and soil moisture is adequate. -Use lower labeled rates for annual grass control and higher labeled rates for perennial grass control. -Yellow nutsedge, wild onion, wild garlic, and broadleaf weeds will **not** be controlled. Controls many annual and certain perennial grasses, including annual bluegrass, but Poast is preferred for goosegrass control. For best results, treat annual grasses when they are actively growing and before tillers are present. Control may be reduced if grasses are large or under hot or dry weather conditions. -Repeated applications may be necessary to control certain perennial grasses. If repeat applications are necessary, allow 14 days between applications. Rainfastness is 1 h. -**Do not** tank mix with or apply within 2 to 3 days of any other pesticide, unless labeled, as this may increase the risk of crop injury or reduce the control of grasses. **Do not** apply more than 8 fl oz/A of Select 2EC in a single application and **do not** exceed 32 fl oz/A for the season; **do not** apply more than 16 fl oz/A of Select Max in a single application and **do not** exceed 64 fl oz/A for the season. -**Do not** apply more than 5.33 fl oz/A of Shadow 3EC in a single application and **do not** exceed 21.33 fl oz/A for the season. -**Do not** apply more than 1.5 pt/A Poast in a single application and **do not** exceed 3 pt/A for the season.						
10	Rely 280 2.34L	29 to 62 fl oz/A	**glufosinate**	0.53 to 1.13 lb/A	30	12
-**Supplemental Label expires 12/1/2025 for hooded spray application between the rows**. If the crop is planted without plastic, do not spray within 6 inches of running vines. -Ammonium sulfate (AMS) can be used at 1.5 lb/A to 3 lb/A. -**Do not allow spray to come in contact with crop foliage or damage will occur.** -Control is best when applied to weeds less than 4 inches, temperatures are above 80, high humidity, and bright sunlight. -Separate sequential applications by at least 14 days. -Do not apply more than 62 fl oz/A in a single application, do not apply more than 87 fl oz/A per season; maximum number of applications is three per season. -Rainfastness is 4 h.						
14	Reflex 2SL	Rates vary, refer to the specific label	**fomesafen**	0.25 to 0.375 lb/A	35	24
-**Special Local Needs Label 24(c) for the use of Reflex 2SL for Post-Transplant control of weeds in watermelon in DE (expires 12/31/2025). The use of this product is legal ONLY if a waiver of liability has been completed (see: *https://www.syngenta-us.com/labels/indemnified-label-login*). Rates vary by state and application method; refer to label to determine correct rates.** -See soil applied section for application prior to planting or transplanting. -**Plasticulture** row middles with shielded/hood sprayers after transplanting; apply prior to vines "running" off the plastic. Severe crop injury can occur if spray comes in contact with crop foliage. Foliar application of Reflex will severely damage or kill watermelon. -**Watermelon varieties may vary in their response to Reflex**. Treat small acreages first to determine crop tolerance, especially when applying to a new variety. -Reflex provides both residual and postemergence control of susceptible weed species. Effective postemergence control requires an adjuvant. Consider rotational crops when applying fomesafen. Rotational restrictions are dependent on whether fomesafen was applied under the plastic, bare ground, or over plastic mulch, refer to 24(c) label for specifics. -Consider rotational crops when applying fomesafen. If the crop is replanted **do not** re-apply Reflex. Rotational restrictions are dependent on whether fomesafen was applied under the plastic, bare ground, or over plastic mulch, refer to 24(c) label for specifics. -Maximum Reflex application in DE, MD, NJ, and VA: 24 fl oz/A **IN ALTERNATE YEARS**						

3. Postemergence - continued next page

3. Postemergence - continued

22	Gramoxone SL 2.0* Gramoxone SL 3.0*	1.95 pt/A 1.3 pt/A	**paraquat**	0.49 lb/A	14	24
-**Supplemental Label for the use of both Gramoxone formulations for postemergence weed control in DE, MD, NJ, PA, and VA. Row middles** as a shielded application. Apply as a directed spray in a minimum of 20 gal spray mix/A to control emerged weeds between the rows after crop establishment. Include a nonionic surfactant at 0.25% v/v. Use shields or hoods to prevent spray contact with the crop and low spray pressure (maximum of 30 psi) to reduce small droplets that are prone to drift. See the label for additional information and warnings. -Rainfastness is 30 min. A maximum of 3 applications per year are allowed. -***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load, or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*https://campus.extension.org/enrol/index.php?id=2201*); certified applicators must repeat training every three years.						
27	Optogen 1.67	2.6 to 3.5 fl oz/A	**bicyclopyrone**	0.034 to 0.046 lb/A	14	24
-Row middle application only. -Apply as either row middle treatment or as a directed spray. Hooded or shielded sprayers will reduce the risk of injury for row middle or directed sprays. -**Contact with foliage will cause injury.** -Use nonionic surfactant (NIS) at 0.25% v/v (1qt/100 gal of spray solution) or crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution). Ammonium sulfate (AMS) at 8.5 to 17 lb/100 gal spray solution may be added for improved control of emerged weeds -Apply to small weeds (less than 2" tall). Optogen provides control for only a few weed species, should be used in combination with other herbicides. -Rainfastness is not specified on the label. -Do not make more than one application per year.						

4. Postharvest

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
22	Gramoxone SL 2.0* Gramoxone SL 3.0*	2.25 to 3 pt/A 1.5 to 2 pt/A	**paraquat**	0.56 to 0.75 lb/A	--	24
-**Supplemental Label in DE for the use of both Gramoxone formulations for postharvest application to desiccate the crop.** -Apply after the last harvest for bareground or plasticulture. Always include an adjuvant. -Spray coverage is essential for optimum effectiveness. See the label for additional information and warnings. -Rainfastness 30 min. -A maximum of 2 applications for crop desiccation are allowed. -***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load, or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*https://campus.extension.org/enrol/index.php?id=2201*); certified applicators must repeat training every three years.						

5. Other Labeled Herbicides These products are labeled but limited local data are available; and/or are labeled but not recommended in our region due to potential crop injury concerns.

Group	Product Name (*=Restricted Use)	Active Ingredient
2	League	**imazosulfuron**
3	Dacthal	**DCPA**
14	Aim	**carfentrazone**
14	Arterio 4F	**sulfentrazone**
14	Vida	**pyraflufen**
14	Valkos 51 WDG	**flumioxazin**

Insect Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of Chapter F. Recommended Insecticides

Seed Corn Maggots

See also Maggots in section E 3.1. Soil Pests - Detection and Control.

Maggot problems can occur in the field and in transplant bedding trays in the greenhouse. An application of a soil-incorporated insecticide may be needed immediately before planting.

FarMore FI400 as a commercially applied seed treatment which contains thiamethoxam (Group 4A).

Verimark (cyantraniliprole, Group 28) is also labeled but should be applied no earlier than 72 hours prior to planting. Rescue treatments are not effective.

Note: The use of neonicotinoid insecticides (Group 4A) at planting will help reduce seedcorn maggot damage

Aphids

Aphids found in cucurbits include green peach aphid and melon aphid. Aphids may infest plants at any point during the season, even including transplant production facilities. Scout for aphids searching undersides of leaves on runners. During the summer, consider treating if 20 percent of runners or more have live aphids. Good coverage of the undersides of leaves is needed for control. Use selective insecticides for other pests to conserve natural enemies (ladybird beetle and green lacewing larvae).

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl - **melon aphid only**	1-3	48	H
1B	Dimethoate 400	0.5 to 1.0 pt/A	dimethoate	3	48	H
1B	Malathion 57 EC	1.5 pt/A	malathion	1	12	H
4A	Neonicotinoid insecticides registered for use on Watermelons: see table at the end of Insect Control.					
4C	Transform WG	0.75 oz/A	sulfoxaflor	1	24	H
4C + 3A	Ridgeback*	5.5 to 13.8 fl oz/A	sulfoxaflor + bifenthrin	3	24	H
4D	Sivanto Prime or 200SL	21.0 to 28.0 fl oz/A	flupyradifurone - **soil/drip**	21	4	M
4D	Sivanto Prime or 200SL	7.0 to 14.0 fl oz/A	flupyradifurone - **foliar**	1	4	M
9B	Fulfill	2.75 oz/A	pymetrozine	0	12	L
9B	PQZ	2.4 to 3.2 fl oz/A	pyrifluquinazon	1	12	L
9D	Sefina	3.0 fl oz/A	afidopyropen	0	12	L
21A	Torac	17.0 to 21.0 fl oz/A	tolfenpyrad	1	12	H
28	Exirel	13.5 to 20.5 fl oz/A	cyantraniliprole	1	12	H
28	Verimark	6.75 to 13.5 fl oz/A	cyantraniliprole	1	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28 + 6	Minecto Pro*	10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H
29	Beleaf 50 SG	2.0 to 2.8 oz/A	flonicamid	0	12	L

Armyworms and Cabbage Loopers

Various armyworm species and cabbage loopers can be found feeding on melon leaves. Their damage seldom requires treatment. Defoliation exceeding 25% may justify control measures. Insecticide sprays for cucumber beetles often will control these pests.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl	1-3	48	H
3A	Pyrethroid insecticides registered for use on Watermelons: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	4.0 to 8.0 fl oz/A	spinosad	3	4	M
5	Radiant SC (not for yellow striped armyworm)	5.0 to 10.0 fl oz/A	spinetoram	3	4	M
6	Proclaim 5SG*	3.0 to 4.8 oz/A	emamectin benzoate	7	12	H
11A	Dipel DF, others (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis kurstaki*	0	4	N
11A	XenTari (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis aizawai*	0	4	N
15	Rimon 0.83EC	9.0 to 12.0 fl oz/A	novaluron	1	12	M
18	Intrepid 2F	4.0 to 10.0 fl oz/A	methoxyfenozide	3	4	L
22	Avaunt 30WDG, Avaunt eVo	2.5 to 6.0 oz/A	indoxacarb	3	12	H
28	Coragen 1.67SC Coragen eVo	3.5 to 7.5 fl oz/A 1.2 to 2.5 fl oz/A	chlorantraniliprole	1	4	L
28	Exirel	7.0 to 17.0 fl oz/A	cyantraniliprole	1	12	H
28	Verimark	6.75 to 13.5 fl oz/A	cyantraniliprole	1	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28 + 4A	Voliam Flexi (cabbage looper only)	4.0 to 7.0 oz/A	thiamethoxam + chlorantraniliprole	1	12	H
28 + 6	Minecto Pro*	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H

Cucumber Beetles

Both striped (*Acalymma vittatum*) and spotted (*Diabrotica undecimpuctata howardii*) cucumber beetles are found in the Mid-Atlantic states. Watermelons are resistant to bacterial wilt; however, control may be needed to prevent feeding damage to seedlings. Seeds pretreated with a neonicotinoid seed treatment such as Farmore DI-400 should provide up to 14 days of control of cucumber beetle. Transplant tray treatments may also be done prior to planting.

Check labels for rates and guidance. Treat when on average 2 beetles per plant are found.
Management of adult cucumber beetles early in the season may help reduce first generation beetle populations which could feed on rinds. Larvae damage rinds along with white grubs, primarily on ground spot. Adults begin emerging in late June to early July. Kaolin clay (Surround WP) does not kill the beetles but instead acts as a physical deterrent to early season beetle feeding.
Note: some populations of striped cucumber beetles on Delmarva may exhibit reduced susceptibility to pyrethroids.

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl	1-3	48	H
1A	Sevin XLR Plus	1.0 qt/A	carbaryl	3	12	H
1B	Malathion 57 EC	2.0 pt/A	malathion	1	12	H
3A	Pyrethroid insecticides registered for use on Watermelons: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Watermelons: see table at the end of Insect Control.					
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H

Cutworms

See also section E 3.1. Soil Pests - Detection and Control.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV* (variegated cutworm)	1.5 pt/A	methomyl	1	48	H
1A	Lannate LV* (granulate cutworm)	1.5 to 3.0 pt/A	methomyl	1-3	48	H
3A	Pyrethroid insecticides registered for use on Watermelons: see table at the end of Insect Control.					

Leafminers

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1B	Dimethoate 400	0.5 to 1.0 pt/A	dimethoate	3	48	H
3A	Pyrethroid insecticides registered for use on Watermelons: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Watermelons: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	6.0 to 8.0 fl oz/A	spinosad	3	4	M
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetoram	3	4	M
6	Agri-Mek SC*	1.75 to 3.5 fl oz/A	abamectin	7	12	H
15	Rimon 0.83EC	9.0 to 12.0 fl oz/A	novaluron	1	12	M
17	Trigard 75WSP	2.66 oz/A	cyromazine	0	12	H
28	Coragen 1.67SC Coragen eVo	5.0 to 7.5 fl oz/A 1.7 to 2.5 fl oz/A	chlorantraniliprole	1	4	L
28	Exirel	13.5 to 20.5 fl oz/A	cyantraniliprole	1	12	H
28	Verimark	6.75 to 13.5 fl oz/A	cyantraniliprole	1	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28 + 6	Minecto Pro*	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H

Mites

Mite infestations generally begin around field margins and grassy areas. **DO NOT mow or maintain these areas after midsummer** as this causes mites into the crop. Localized infestations can be spot treated. Begin treatment when 10-15 % of the crown leaves are infested early in the season, or when 50% of the terminal leaves are infested later in the season. **Note:** Continuous use of carbaryl or pyrethroids may result in mite outbreaks.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
6	Agri-Mek SC*	1.75 to 3.5 fl oz/A	abamectin	7	12	H
10B	Zeal Miticide	2.0 to 3.0 oz/A	etoxazole	7	12	L
10B	Zeal SC	4.0 to 6.0 fl oz/A	etoxazole	7	12	L
20B	Kanemite 15SC	31.0 fl oz/A	acequinocyl	1	12	L
21A	Magister SC	24.0 to 36.0 fl oz/A	fenazaquin	3	12	H
21A	Portal	2.0 pt/A	fenpyroximate	3	12	L
23	Oberon 2SC	7.0 to 8.5 fl oz/A	spiromesifen	7	12	M

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Mites - continued

28 + 6	Minecto Pro*	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H
20D	Acramite 50WS	0.75 to 1.0 lb/A	bifenazate	3	12	M
N/A	Sulfur 80WG (OMRI)	5 to 25 lb/A	sulfur	0	24	M

Melonworms and Pickleworms

Apply one of the following formulations. If foliar materials are used, make one treatment prior to fruit set, and then treat weekly. If soil or drip applications are used, check the label for instructions on treatment frequency.						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl	1-3	48	H
1A	Sevin XLR Plus	0.5 to 1.0 qt/A	carbaryl	3	12	H
1B	Malathion 57 EC	2.0 pt/A	malathion	1	12	H
3A	Pyrethroid insecticides registered for use on Watermelons: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	4.0 to 8.0 fl oz/A	spinosad	3	4	M
5	Radiant SC	5.0 to 10.0 fl oz/A	spinetoram	3	4	M
6	Proclaim 5SG*	3.5 to 4.8 oz/A	emamectin benzoate	7	12	H
11A	XenTari (OMRI) **(MW)**	0.5 to 1.0 lb/A	*Bacillus thuringiensis aizawai*	0	4	N
11A	Dipel DF (OMRI) **(MW)**	0.5 to 2.0 lb/A	*Bacillus thuringiensis kurstaki*	0	4	N
15	Rimon 0.83EC	12.0 fl oz/A	novaluron	1	12	M
18	Intrepid 2F	4.0 to 10.0 fl oz/A	methoxyfenozide	3	4	L
22	Avaunt 30WDG, Avaunt eVo	2.5 to 6.0 oz/A	indoxacarb	3	12	H
28	Coragen 1.67SC Coragen eVo	2.0 to 7.5 fl oz/A 0.7 to 2.5 fl oz/A	chlorantraniliprole	1	4	L
28	Exirel	7.0 to 13.5 fl oz/A	cyantraniliprole	1	12	H
28	Verimark	5.0 to 10.0 fl oz/A	cyantraniliprole	1	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28 + 4A	Durivo	10.0 to 13.0 fl oz/A	thiamethoxam + chlorantraniliprole	30	12	H
28 + 4A	Voliam Flexi	4.0 to 7.0 oz/A	thiamethoxam + chlorantraniliprole	1	12	H
28 + 6	Minecto Pro*	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H

Rindworms In addition to the above specified Lepidopteran pests, various species feed on rinds, including, but not limited to corn earworm, leafrollers, webworms, and beet armyworm. Proper pest identification is important because not all species that cause rind feeding damage are susceptible to pyrethroids.

For Lepidopteran Rindworms, use one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
3A[1]	Pyrethroid insecticides registered for use on Watermelons: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	4.0 to 8.0 fl oz/A	spinosad	3	4	M
5	Radiant SC	5.0 to 10.0 fl oz/A	spinetoram	3	4	M
6	Proclaim	3.0 to 4.8 oz/A	emamectin benzoate	7	12	H
11A	XenTari (OMRI)	0.5 to 1.0 lb/A	*Bacillus thuringiensis aizawai*	0	4	N
11A	Dipel DF, others (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis kurstaki*	0	4	N
18	Intrepid 2F	4.0 to 10.0 fl oz/A	methoxyfenozide	3	4	L
28 + 3A	Besiege*	6.0 to 9.0 fl oz/A	chlorantraniliprole + lambda-cyhalothrin	1	24	H

[1]**Resistance concerns with beet armyworm and corn earworm**

Thrips

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
3A[1]	Pyrethroid insecticides registered for use on Watermelons: see table at the end of Insect Control.					
4A[2]	Neonicotinoid insecticides registered for use on Watermelons: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	6.0 to 8.0 fl oz/A	spinosad	3	4	M
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetoram	3	4	M
15	Rimon 0.83EC	12.0 fl oz/A	novaluron	1	12	M
21A	Torac	21.0 fl oz/A	tolfenpyrad	1	12	H
28 + 6	Minecto Pro*	10.0 fl oz/A	cyantraniliprole + abamectin - s*uppression only*	7	12	H

[1]**Resistance concerns with western flower thrips**
[2]**Resistance concerns with tobacco thrips**

Group 3A Pyrethroid Insecticides Registered for Use on Watermelons

Apply one of the following formulations (check if the product label lists the insect you intend to spray; the label is the law):

Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Asana XL*	5.8 to 9.6 fl oz/A	esfenvalerate	3	12	H
Baythroid XL*	0.8 to 2.8 fl oz/A	beta-cyfluthrin	0	12	H
Brigade 2EC*, others	2.6 to 6.4 fl oz/A	bifenthrin	3	12	H
Danitol 2.4EC*	10.67 to 16.00 fl oz/A	fenpropathrin	7	24	H
Declare*	1.54 fl oz/A	gamma-cyhalothrin	1	24	H
Hero*	4.0 to 10.3 fl oz/A	zeta-cypermethrin + bifenthrin	3	12	H
Lambda-Cy 1EC*, others	2.56 to 3.84 fl oz/A	lambda-cyhalothrin	1	24	H
Mustang Maxx*	1.28 to 4.0 fl oz/A	zeta-cypermethrin	1	12	H
Permethrin 3.2EC*, others	4.0 to 8.0 fl oz/A	permethrin	0	12	H
Tombstone*	0.8 to 2.8 fl oz/A	cyfluthrin	0	12	H
Warrior II*	1.28 to 1.92 fl oz/A	lambda-cyhalothrin	1	24	H
Combo products containing a pyrethroid					
Besiege*	6.0 to 9.0 fl oz/A	lambda-cyhalothrin + chlorantraniliprole (Group 28)	1	24	H
Endigo ZC* and ZCX*	4.0 to 4.5 fl oz/A	lambda-cyhalothrin + thiamethoxam (Group 4A)	1	24	H
Ridgeback*	5.5 to 13.8 fl oz/A	bifenthrin + sulfoxaflor (Group 4C)	3	24	H
Savoy EC*	6.0 to 12.9 fl oz/A	bifenthrin + acetamiprid (Group 4A)	7	12	H

Group 4A Neonicotinoid Insecticides Registered for Use on Watermelons

Apply one of the following formulations (check if the product label lists the insect you intend to spray; the label is the law):

Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Admire Pro	7.0 to 10.5 fl oz/A	imidacloprid - **soil**	21	12	H
Assail 30SG	2.5 to 5.3 oz/A	acetamiprid	0	12	M
Actara 25WDG	1.5 to 5.5 oz/A	thiamethoxam	0	12	H
Belay 2.13SC	9.0 to 12.0 fl oz/A	clothianidin - **soil/drip**	21	12	H
Belay 2.13SC	3.0 to 4.0 fl oz/A	clothianidin - **foliar** (note: PHI: do not make application after 4th true leaf has unfolded)	see note	12	H
Platinum 75SG	1.66 to 3.67 oz/A	thiamethoxam	30	12	H
Scorpion 35SL	9.0 to 10.5 fl oz/A	dinotefuran - **soil/drip**	21	12	H
Scorpion 35SL	2.0 to 7.0 fl oz/A	dinotefuran - **foliar**	1	12	H
Venom 70SG	5.0 to 7.5 oz/A	dinotefuran - **soil/drip**	21	12	H
Venom 70SG	1.0 to 4.0 oz/A	dinotefuran - **foliar**	1	12	H
Combo products containing a neonicotinoid					
Durivo	10.0 to 13.0 fl oz/A	thiamethoxam + chlorantraniliprole (Group 28)	30	12	H
Endigo ZC* and ZCX*	4.0 to 4.5 fl oz/A	thiamethoxam + lambda-cyhalothrin (Group 3A)	1	24	H
Savoy EC*	6.0 to 12.9 fl oz/A	acetamiprid + bifenthrin (Group 3A)	7	12	H
Voliam Flexi	4.0 to 7.0 oz/A	thiamethoxam + chlorantraniliprole (Group 28)	1	12	H

Disease Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of Chapter F. Recommended Fungicides

Nematodes See also sections E 1.5. Soil Fumigation and E 1.6. Nematode Control.

Use fumigants listed in section E 1.5., or apply one of the following:

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
1A	Vydate L*	1.0 to 2.0 gal/A Incorporate into top 2-4 inches of soil, *OR* 2.0 to 4.0 pt/A apply 2 w after planting and repeat 2-3 w later.	oxamyl	1	48	H
7	Velum Prime 4.16SC	6.5 to 6.84 fl oz/A	fluopyram	0	12	--
--	Nimitz 4EC	3.5 to 5.0 pt/A Incorporate or drip-apply 7 d before planting.	fluensulfone	n/a	12	N

Seed Treatment Check with your seed company if the seed has been treated with an insecticide and fungicide. For untreated seed, use a mixture of Thiram 480DP (4.5 fl oz/100 lb seed) and an approved commercially available insecticide.

Damping-off caused by *Phytophthora*, *Pythium*, and *Rhizoctonia*

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Apply one of the following at-planting (see label for application timing, methods, and restrictions):						
Phytophthora and Pythium Root Rot:						
4	Ridomil Gold 4SL	1.0 to 2.0 pt/A	mefenoxam	5	48	N
4	Ultra Flourish 2E	2.0 to 4.0 pt/A	mefenoxam	5	48	N
4	MetaStar 2E AG	4.0 to 8.0 pt/A	metalaxyl	AP	48	N
49 + **4**	Orondis Gold[1]	28.0 to 55.0 fl oz/A	oxathiapiprolin + mefenoxam	AP	48	N
Phytophthora, Pythium, and Rhizoctonia Root Rot:						
4 + 11	Uniform 3.66SE	0.34 fl oz/1000 ft row. Avoid direct seed contact, which may cause delayed emergence.	mefenoxam + azoxystrobin	AP	0	N
Rhizoctonia root rot only:						
11	azoxystrobin 2.08F	0.40 to 0.80 fl oz/1000 ft row	azoxystrobin	1	4	N
Pythium root rot only:						
28	Previcur Flex 6F	1.2 pt/A in transplant water, drip irrigation, or direct spray at base of plant and soil	propamocarb hydrochloride	2	12	N

[1] may cause some yellowing in cucurbit leaves

Bacterial and Fungal Diseases

Alternaria Leaf Blight

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Begin sprays when vines begin to run. ALTERNATE one of the following:						
M03	mancozeb 75DF	2.0 to 3.0 lb/A	mancozeb	5	24	N
M05	chlorothalonil 6F	2.0 to 3.0 pt/A[1]	chlorothalonil	0	12	N
WITH A TANK MIX of one of the following fungicides PLUS chlorothalonil 6F 2.0 to 3.0 pt/A every 14 days						
3 + 9	Inspire Super 2.82EW	16.0 to 20.0 fl oz/A	difenoconazole + cyprodinil	7	12	--
3 + **11**	Topguard EQ 4.29SC[2,3,4]	5.0 to 8.0 fl oz/A	flutriafol + azoxystrobin	1	12	--
3 + **11**	Quadris Top 1.67SC[2,4]	12.0 to 14.0 fl oz/A	difenoconazole + azoxystrobin	1	12	--
3 + 7	Aprovia Top 1.62EC	10.5 to 13.5 fl oz/A	difenoconazole + benzovindiflupyr	0	12	--
7 + **11**	Luna Sensation 4.25SC[2,5]	7.6 fl oz/A	fluopyram + trifloxystrobin	0	12	--
7 + **11**	Pristine 38WG[6]	12.5 to 18.5 oz/A	boscalid + pyraclostrobin	0	12	--
7 + **11**	Merivon 2.09SC[2,6]	4 to 5.5 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
11	azoxystrobin 2.08F[2,3,4]	11.0 to 15.5 fl oz/A[3]	azoxystrobin	1	4	N
11	Cabrio 20EG[2,6]	12.0 to 16.0 oz/A	pyraclostrobin	0	12	N
11	Reason 500SC[2]	5.5 fl oz/A	fenamidone	14	12	--

[1]Low rate early in the season. [2]**Do not** use if resistance to FRAC code 11 fungicides exists in the area. [3]Do not tank mix with crop oil concentrates, methylated spray oil, or silicon adjuvants. Do not tank mix with Malathion, Thiodan, Lannate, MPede, or Botran. [4]**Do not apply near apples**, see label. [5]A mild yellowing on leaf margins is sometimes seen following application of Luna Sensation in cucurbits. [6]Tank mixes of additives, adjuvants, and/or other products may result in crop injury.

Angular Leaf Spot

At first sign of disease, apply the labeled rates of fixed copper plus mancozeb. Repeat every 7 d. To minimize the spread of disease, avoid working in the field while foliage is wet.

Anthracnose

Excellent resistance is available in some varieties and those should be used when possible. Begin fungicide applications when vines run or earlier if symptoms are detected. **If resistance to FRAC code 11 (strobilurin) fungicides has been detected in the area, do not use azoxystrobin, Quadris Top, Merivon or Cabrio.**

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Under LIGHT or MODERATE disease pressure, ALTERNATE:						
M05	chlorothalonil 6F	1.5 to 2.0 pt/A (low rate early in the season)	chlorothalonil	0	12	N
WITH a TANK MIX the following fungicide PLUS mancozeb 80 DF 2.0 to 3.0 lb/A OR chlorothalonil 6F 2.0 to 3.0 pt/A:						
1	Topsin M WSB	0.5 lb/A	thiophanate-methyl	1	24	N

Anthracnose - continued next page

Anthracnose - continued

Under HIGH disease pressure, TANK-MIX one of the following fungicides WITH chlorothalonil 6F 2.0 to 3.0 pt/A:						
3 + **11**	Quadris Top 1.67SC[1]	12.0 to 14.0 fl oz/A	difenoconazole + azoxystrobin	1	12	--
3 + **11**	Topguard EQ 4.29SC[1,2]	5.0 to 8.0 fl oz/A	flutriafol + azoxystrobin	1	12	--
7 + **11**	Merivon 2.09SC[3]	5.5 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
7 + **11**	Pristine 38WG[3]	18.5 oz/A	boscalid + pyraclostrobin	0	12	--
11	azoxystrobin 2.08F[1,2]	11.0 to 15.5 fl oz/A	azoxystrobin	1	4	N
11	Cabrio 20EG[3]	12.0 to 16.0 fl oz/A	pyraclostrobin	0	12	N
AND ROTATE with a TANK MIX of the following fungicide PLUS mancozeb 75DF 2.0 to 3.0 lb/A OR chlorothalonil 6F 2.0 to 3.0 pt/A every 7 days:						
1	Topsin M WSB	0.5 lb/A	thiophanate-methyl	1	24	N

[1]**Do not apply near apples**, see label. [2]Do not tank mix with crop oil concentrates, methylated spray oil, or silicon adjuvants. Do not tank mix with Malathion, Thiodan, Lannate, MPede, or Botran. [3]Tank mixes of additives, adjuvants, and/or other products may result in crop injury.

Bacterial Fruit Blotch (BFB)

Obtain seed or seedlings that were tested and found to have "no evidence" of the pathogen, which will reduce the risk of BFB development. Practice good sanitation during transplant production. Segregate different seed lots in the transplant house to reduce the chance of cross contamination. Scout seedlings daily, have suspect plants tested and destroy all diseased plants. Use only transplants from houses in which there were no seedling symptoms of BFB. If BFB is detected after transplanting, always work infested fields at the end of the day. Rotate to allow 2 years between watermelon plantings and control volunteers during those years.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Apply one of the following fungicide schedules beginning before the first flower is open and continuing until 3 weeks after flowering. Subsequent fruit sets must also be protected.						
M01	copper (OMRI)	at labeled rates	copper	0	see label	N
P01	Actigard 50WG (must apply 1 or 2 weeks prior to flowering to be effective)	0.5 to 1.0 oz/A	acibenzolar-S-methyl	0	12	N

Downy Mildew

Scout fields for disease incidence regularly. Begin targeted sprays when disease occurrence is predicted for the region (check the Cucurbit Downy Mildew Forecasting website at *https://cdm.ipmpipe.org*). Strains of Downy Mildew that infect one cucurbit crop may not affect watermelon. Unnecessary fungicide application can be avoided by not spraying until disease is predicted in the region on watermelon. **Preventative applications are much more effective than applications made after detection. Materials with different Modes of Action (FRAC codes) should be alternated.** The following are the most effective products.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Sprays should be applied on a 7-day schedule when disease is forecast or present in the region. Under severe disease conditions and conducive weather, spray interval may be reduced IF the label allows. TANK-MIX one of these products WITH a protectant fungicide such as chlorothalonil 1.5 to 2.0 pt 6F/A:						
49 + 40	Orondis Ultra 2.33SC	5.5 to 8.0 fl oz/A	oxathiapiprolin + mandipropamid	0	4	--
49+M05	Orondis Opti[1]	1.75 to 2.5 pt/A	oxathiapiprolin + chlorothalonil	0	12	--
21	Ranman 400SC	2.10 to 2.75 fl oz/A (**Do not apply with copper**; see label for details)[2]	cyazofamid	0	12	L
Other materials for use in rotation as tank mix partners with a protectant:						
43	Presidio 4SC	4.0 fl oz/A	fluopicolide	2	12	L
28	Previcur Flex 6F	1.2 pt/A	propamocarb hydrochloride	2	12	N
40 + 45	Zampro 525SC	14.0 fl oz/A	dimethomorph + ametoctradin	0	12	--
22	Elumin 4SC	8.0 fl oz/A	ethaboxam	2	12	--
M03+22	Gavel 75DF	1.5 to 2.0 lb/A **contains protectant**	mancozeb + zoxamide	5	48	--
M05+22	Zing! 4.9SC[1]	36.0 fl oz/A **contains protectant**	chlorothalonil + zoxamide	0	12	N
M05+27	Ariston 42SC[1]	1.9 to 3.0 pt/A **contains protectant**	chlorothalonil + cymoxanil	3	12	--
11 + 27	Tanos 50DF	8.0 oz/A	famoxadone + cymoxanil	3	12	--
27	Curzate 60DF	3.2 to 5.0 oz/A	cymoxanil	3	12	N
29	Omega 500F	12.0 to 24.0 fl oz/A	fluazinam	30	12	N
40	Forum 4.17SC	6.0 fl oz/A	dimethomorph	0	12	N

[1]Tank mixes of additives, adjuvants, and/or other products may result in crop injury. [2]Ranman should be tank mixed with an organosilicone surfactant when disease is severe, or a non-ionic surfactant or blend of organosilicone and non-ionic surfactant disease is moderate or light.

Fusarium Wilt

Use a rotation of at least 5 years and resistant varieties when possible. Several newly released *seedless* varieties have resistance to Fusarium Wilt caused by race 1. However, their level of resistance is lower than that of resistant *seeded* varieties and race 2 also occurs in our region. Some *pollinizers* have good resistance to Fusarium Wilt caused by race 1.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Application of Proline through drip irrigation or as a post-plant drench followed by two foliar applications may reduce Fusarium Wilt early season. NOTE: only one soil application of Proline is allowed per season.						
3	Proline 480SC[1]	5.7 fl oz /A	prothioconazole	7	12	--
3	Rhyme 2.08SC[2,3]	7.0 fl oz/A	flutriafol	0	12	--

[1]Only one soil application of Proline is allowed per season. [2]FIFRA 2(ee) label for chemigation of Rhyme to suppress Fusarium Wilt has been approved in DE, MD, PA, NJ. VA, and WV. See label for details. [3]Do not use organosilicone adjuvants, or crop oil concentrate surfactants. Under certain environmental conditions, may result in phytotoxicity symptoms. FMC recommends the grower and/or user test this product to determine its suitability for use in watermelon.

Gummy Stem Blight

Fungicide solo products within the FRAC code 11 (Cabrio, azoxystrobin and Flint Extra 500SC) are not recommended in the Mid-Atlantic region. Pristine or Luna Sensation, which contain both FRAC code 11 and 7 components should always be tank-mixed with a protectant fungicide to reduce the chances for resistance development (see Table E-10). **When tank-mixing, use at least the minimum labeled rate of each fungicide. Do not apply FRAC code 11 fungicides more than 4 times total per season.**

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Begin sprays when vines begin to run. Apply the following under LOW disease pressure every 7 days:						
M05	chlorothalonil 6F	2.0 to 3.0 pt/A	chlorothalonil	0	12	N
Under HIGH disease pressure, ALTERNATE:						
M05	chlorothalonil 6F	2.0 to 3.0 pt/A	chlorothalonil	0	12	N
WITH a TANK-MIX containing chlorothalonil or mancozeb PLUS one of the following fungicides:						
3	Proline 480SC	5.7 fl oz/A	prothioconazole	7	12	--
3	tebuconazole 3.6F[1]	8.0 fl oz/A[1]	tebuconazole	7	12	N
3	Rhyme 2.08SC[2]	5.0 to 7.0 fl oz/A	flutriafol	0	12	--
3 + 7	Luna Experience 3.34SC[3]	10.0 to 17.0 fl oz/A	tebuconazole + fluopyram	7	12	--
3 + 9	Inspire Super 2.82EW	16.0 to 20.0 fl oz/A	difenoconazole + cyprodinil	7	12	--
3 + 7	Aprovia Top 1.62EC	10.5 to 13.5 fl oz/A	difenoconazole + benzovindiflupyr	0	12	--
7 + **11**	Merivon 2.09SC[4]	5.5 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
7 + **11**	Pristine 38WG[4]	12.5 to 18.5 oz/A	boscalid + pyraclostrobin	0	12	--
9 + 12	Switch 62.5WG	11.0 to 14.0 oz/A	cyprodinil + fludioxonil	1	12	L
7 + 12	Miravis Prime	9.2 to 11.4 fl oz/A	pydiflumetofen + fludioxonil	1	12	--

[1]Note: reduced sensitivity of the pathogen to tebuconazole 3.6F has occurred in the Southern U.S. [2]Do not use organosilicone adjuvants, or crop oil concentrate surfactants. Under certain environmental conditions, may result in phytotoxicity symptoms. FMC recommends the grower and/or user test this product to determine its suitability for use in watermelon. [3]A mild yellowing on leaf margins is sometimes seen following application of Luna Experience in cucurbits. [4]Tank mixes of additives, adjuvants, and/or other products may result in crop injury.

Phytophthora Crown and Fruit Rot

Multiple practices should be used to minimize the occurrence of this disease. Grow watermelons on raised beds and drain fields adequately so that water will not accumulate around the base of the plants. Rotate away from susceptible crops (cucurbits, peppers, lima beans and beans, eggplants, and tomatoes) for as long as possible. Apply pre-plant fumigants to suppress disease. When the vines begin to run, subsoil between rows to allow for faster drainage following rainfall. Fruit are susceptible at all growth stages and must be protected season-long.

Phytophthora Crown and Fruit Rot - continued

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Apply one of the following fungicides and tank mix with fixed copper at labeled rates when conditions favor disease development (for suppression only). Materials with different modes of action (FRAC codes) should always be alternated to reduce the chances for fungicide resistance development:						
49 + 40	Orondis Ultra 2.33SC	5.5 to 8.0 fl oz/A	oxathiapiprolin + mandipropamid	0	4	--

Phytophthora Crown and Fruit Rot- continued next page

Phytophthora Crown and Fruit Rot - continued

49+M05	Orondis Opti[1]	1.75 to 2.5 pt/A	oxathiapiprolin + chlorothalonil	0	12	--
40	Revus 2.08F	8.0 fl oz/A	mandipropamid	0	4	--
40 + 45	Zampro 525SC	14.0 fl oz/A	dimethomorph + ametoctradin	0	12	--
43	Presidio 4SC[2]	4.0 fl oz/A	fluopicolide	2	12	L
M03+22	Gavel 75DF	1.5 to 2.0 lb/A	mancozeb + zoxamide (**note:** some cultivars are sensitive to mancozeb)	5	48	--
21	Ranman 400SC	2.75 fl oz/A (**Do not apply with copper,** see label for details)[2]	cyazofamid	0	12	L
40	Forum 4.17SC	6.0 fl oz/A	dimethomorph	0	12	N
22	Elumin 4SC	8 fl oz/A	ethaboxam	2	12	--
M05+22	Zing! 4.9SC[1]	36.0 fl oz/A	chlorothalonil + zoxamide	0	12	N

[1]Tank mixes of additives, adjuvants, and/or other products may result in crop injury. [2]Presidio may also be applied through the drip irrigation (see supplemental label). [3]Ranman should be tank mixed with an organosilicone surfactant when disease is severe, or a non-ionic surfactant or blend of organosilicone and non-ionic surfactant disease is moderate or light.

Powdery mildew

Detection of Powdery mildew is more difficult in watermelons than in other cucurbits because sporulation is sparse and masked by leaf color. Look for chlorotic spots on the upper surface of young, fully expanded leaves, and then inspect the corresponding lower surface with a hand lens to confirm presence of the fungus.

The fungus that causes cucurbit Powdery Mildew can develop resistance to high risk fungicides. Resistance to strobilurin (FRAC code 11) and DMI (FRAC code 3) fungicides have been reported in the Eastern U.S. Proper fungicide resistance management should be followed. **Materials with different modes of action (FRAC codes) should always be alternated.**

Powdery Mildew generally occurs from mid-July until the end of the season. Observe fields for its presence. mildew. If 1 lesion is found on the underside of 45 old leaves per acre, begin the following fungicide program:

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
TANK MIX one of these products with a protectant such as chlorothalonil 6F 2.0 to 3.0 pt/A:						
50	Vivando 2.5SC[1]	15.4 fl oz/A	metrafenone	0	12	--
13	Quintec 2.08SC	4.0 to 6.0 fl oz/A	quinoxyfen	3	12	--
3 + 7	Luna Experience 3.34SC[2]	6.0 to 17.0 fl oz/A	tebuconazole + fluopyram	7	12	--
7 + **11**	Luna Sensation 4.25SC[2]	4.0 to 7.6 fl oz/A	fluopyram + trifloxystrobin	0	12	--
AND ALTERNATE with a TANK MIX of one of the following and a protectant such as chlorothalonil 6F 2.0 to 3.0 pt/A:						
3	Proline 480SC	5.7 fl oz/A	prothioconazole	7	12	--
3	Procure 480SC	4.0 to 8.0 fl oz/A	triflumizole	0	12	N
3	Rally 40WSP	2.5 to 5.0 oz/A	myclobutanil	0	24	N
3	tebuconazole 3.6F	4.0 to 6.0 fl oz/A	tebuconazole	7	12	N
3	Rhyme 2.08SC[3]	5.0 to 7.0 fl oz/A	flutriafol	0	12	--
3 + 7	Aprovia Top 1.62EC	10.5 to 13.5 fl oz/A	difenoconazole + benzovindiflupyr	0	12	--
7	Fontelis 1.67 SC	12.0 to 16.0 fl oz/A	penthiopyrad	1	12	L
P05	Regalia (OMRI)	4.0 qt/A	Extract of *Reynoutria sachalinensis*	0	4	--
39	Magister 1.6SC[4]	24.0 to 36.0 fl oz/A	fenazaquin	3	12	H
7 + 12	Miravis Prime	9.2 to 11.4 fl oz/A	pydiflumetofen + fludioxonil	1	12	--
U06	Torino 0.85SC	3.4 fl oz/A	cyflufenamid	0	4	--

[1]Do not mix Vivando with horticultural oils. [2]A mild yellowing on leaf margins is sometimes seen following application of Luna Experience and Luna Sensation in cucurbits. [3]Do not use organosilicone adjuvants, or crop oil concentrate surfactants. Under certain environmental conditions, may result in phytotoxicity symptoms. FMC recommends the grower and/or user test this product to determine its suitability for use in watermelon. [4]Do not make more than one application per year of Magister.

Viruses (WMV, PRSV, ZYMV, and CMV)

The most prevalent virus in the Mid-Atlantic region is WMV followed by PRSV, ZYMV, and CMV. Plant fields as far away from existing cucurbit plantings as possible to help reduce the chances of aphid transmission of viruses from existing fields to new fields.

If you are having a medical emergency after using pesticides, always call 911 immediately.

POISON Help®
1-800-222-1222

In Case of an Accident

- Remove the person from exposure
- Get away from the treated or contaminated area immediately
- Remove contaminated clothing
- Wash with soap and clean water
- Call a physician and/or the National Poison Control Center (1-800-222-1222). Your call will be routed to your State Poison Control Center.
- Have the pesticide label with you!
- Be prepared to give the EPA registration number to the responding center/agency