

with tolerance to ripe fruit rots include Hypeel 696 and H-9423. For fields in mountainous areas, fields not rotated away from tomatoes, and in late planted fields, begin sprays shortly after transplanting. In all other areas, either follow a regular (7-day) spray schedule starting when crown fruit are one-third their final size, or time sprays based on a locally-verified forecaster such as Tomcast® or TomFAST®.

Rotate the following fungicides to help delay the development of resistant pathogen strains:

**Alternate:**

chlorothalonil--2.0-3.0 pt 6F/A or OLF (also for gray leaf spot, black mold and soil rot), or  
mancozeb--3.0 lb 75DF/A or OLF (also for gray leaf spot and leaf mold), or  
Gavel--1.5-2.0 lb 75DF/A

**With:**

Quadris--5.0–6.2 fl oz 2.08SC/A (Also for buckeye rot and black mold. Do not apply near apples: see label for details), or  
Cabrio--8.0-12.0 oz 20EG/A, or  
Endura--2.5-3.5 oz 70W/A (also for Botrytis at 9.0-12.5 oz/A), or  
Flint--4.0 oz 50WDG/A, (Do not apply near Concord grapes), or  
Revus Top--5.5-7.0 fl oz 4.16SC/A, or  
Tanos--8.0 oz 50W/A *plus* protectant fungicide (also for buckeye rot suppression and gray leaf spot).

To provide effective late-season control, one additional may be necessary after the application of a fruit-ripening agent.

Materials in different FRAC codes should be alternated to reduce the chances for fungicide resistance development.

**Late Blight**

New strains of the fungus that cause Late blight are present in the mid-Atlantic region. These strains are aggressive on tomato and have developed mefenoxam-insensitivity. When plants are 6 inches tall, apply one of the following protectant fungicides and repeat every 7 days, or follow a locally-verified disease forecasting system such as BLITECAST® to schedule the fungicide applications:

chlorothalonil--1.0-3.0 pt 6F/A or OLF, or  
Gavel--1.5-2.0 lb 75DF/A, or  
mancozeb--3.0 lb 75DF/A or OLF.

Once late blight is detected in your area, switch to one of the following translaminar fungicides which can move into and through leaves. Rotate between the following tank mixtures:

Forum--6.0 fl oz 4.18SC/A *plus* a protectant fungicide, or  
Previcur Flex--1.5 pt 6F/A *plus* a protectant fungicide, or  
Ranman--2.1-2.75 fl oz 400SC/A *plus* a protectant fungicide, or  
Tanos--8.0 oz 50WG/A *plus* a protectant fungicide.

Return to the use of protectant fungicides when conditions no longer favor the development of late blight.

**Fruit Rot caused by Pythium and Buckeye Rot caused by Phytophthora**

Apply mefenoxam (Ridomil Gold at 1.0 pint 4EC per acre or Ultra Flourish at 1.0 quart 2E per acre) as a soil surface application under the vines 4 to 8 weeks before harvest. Apply broadcast or banded (see Chapter E the section on "Calibrating Granular Application Equipment" for the amount needed per acre). Irrigate after application. An alternative to soil application of mefenoxam is to apply the following as a foliar spray beginning when crown fruit are one-third their final size and repeat every 14 days up to a total of 3 times:

mefenoxam + chlorothalonil (Flouronil, Ridomil Gold Bravo)--2.0 lb 76WP/A, or  
Ridomil Gold Copper--2.0 lb 65WP/A

If weather and soil conditions continue to favor disease development apply one of the following between applications of the above listed fungicides:

Gavel--1.5-2.0 lb 75DF/A, or  
Tanos--8.0 oz 50WG/A

**Botrytis Fruit Rot (Gray Mold)**

Gray mold is a problem during the fall in fields with dense foliage and poor drainage. For fall production, select fields with good drainage. Shortly before harvest when conditions are wet and cool, apply the following:

chlorothalonil--2.0-2.75 pt 6F/A or OLF (also very good for late blight), or  
Endura--9.0-12.5 oz 70WG/A (also very good for early blight; not for use in greenhouses)

**Tomato Spotted Wilt Virus (TSWV)**

TSWV can be serious and result in severely stunted plants. The virus is spread by thrips from ornamental plants (flowers) and weeds to tomatoes. Use resistant varieties when available. Do not grow any ornamental bedding plants in the same greenhouse as tomato transplants. Control weeds in and around greenhouses. Monitor greenhouses and tomato fields for thrips and begin an insecticide control program once thrips are observed. In the field, use of reflective mulch can help repel thrips and can reduce the incidence of spotted wilt.

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## WATERMELONS

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### Varieties

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**Varieties<sup>1</sup>**

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**Seeded**

Crimson Sweet (AR,FR1, OS)	These varieties are recommended for
Royal Majesty* (FR1,2)	DE, MD, NJ
Sangria*	PA, VA, WV
Jamboree*(AT,FT)	
Royal Star (FR1)	
Mardi Gras* (FR 1, AR)	
StarBrite (AR, FR1,OS)	
Top Gun*	

**Seedless (all seedless varieties are hybrids)**

Imagination (Sugarbaby Type)	These varieties are recommended for
Gypsy	DE, MD, NJ,
Crisp N Sweet	PA, VA, WV
Millionaire (OT)	

*(table continued on next page)*

**Varieties** *(continued)*

<b>Varieties<sup>1</sup></b>	
<b>Seedless (all seedless varieties are hybrids)</b>	
Sugarheart	
SS5244 (OT)	
Tri-X 212	
Tri-X-313 (OT)	
Tri-X Palomar	These varieties are recommended for DE, MD, NJ, PA, VA, WV
Premier (trial)	
Super Crisp (trial)	
5244	
Matrix (oblong)	
Revolution (oblong) (OT)	
Amarillo (yellow)	
Crunchy Red	
SS7187	
<b>Seedless Personal (3-7 lbs) (all seedless varieties are hybrids)</b>	
Solitaire	These varieties are recommended for DE, MD, NJ, PA, VA, WV
Vanessa	
Pixie	
Petite Envy 85 (trial)	
<b>Triplois Pollenizers</b>	
SP-4	
Jenny	These varieties are recommended for DE, MD, NJ, PA, VA, WV
Patron	
Pinnacle	
Sidekick	

<sup>1</sup> Varieties listed by maturity, earliest first.  
 \* Indicates hybrid varieties.  
 Letters in parentheses indicate disease resistance possessed by varieties. See the "Abbreviations" section in front portion of this publication.

**Recommended Nutrients Based on Soil Tests**

Before using the table below, refer to important notes in Plant Nutrient Recommendations in Section B, Soil And Nutrient Information. These notes provide additional suggestions to adjust rate, timing and placement of nutrients depending on soil type cation exchange capacity and existing fertility levels

Watermelons	Nitrogen (N) Pounds per Acre	Soil Phosphorus Level			Soil Potassium Level		
		Low Pounds P <sub>2</sub> O <sub>5</sub> per Acre	Med Pounds P <sub>2</sub> O <sub>5</sub> per Acre	Opt. Pounds P <sub>2</sub> O <sub>5</sub> per Acre	Low Pounds K <sub>2</sub> O per Acre	Med Pounds K <sub>2</sub> O per Acre	Opt. Pounds K <sub>2</sub> O per Acre
Nonirrigated	80-100 <sup>1</sup>	150 <sup>1</sup>	100 <sup>1</sup>	50 <sup>1</sup>	200 <sup>1</sup>	150 <sup>1</sup>	100 <sup>1</sup>
	50 <sup>2</sup>	150 <sup>2</sup>	100 <sup>2</sup>	50 <sup>2</sup>	200 <sup>2</sup>	150 <sup>2</sup>	100 <sup>2</sup>
	25-50 <sup>3</sup>	0	0	0	0	0	0
Irrigated	125-150 <sup>1</sup>	150 <sup>1</sup>	100 <sup>1</sup>	50 <sup>1</sup>	200 <sup>1</sup>	150 <sup>1</sup>	100 <sup>1</sup>
	50 <sup>2</sup>	150 <sup>2</sup>	100 <sup>2</sup>	50 <sup>2</sup>	200 <sup>2</sup>	150 <sup>2</sup>	100 <sup>2</sup>
	25-50 <sup>3</sup>	0	0	0	0	0	0
	25-50 <sup>4</sup>	0	0	0	0	0	0

<sup>1</sup> Total amount nutrient recommended  
<sup>2</sup> Broadcast and disk-in  
<sup>3</sup> Topdress when vines start to run  
<sup>4</sup> Topdress after first harvest

**Note:** For seedless watermelons, apply 125 pounds of N per acre. Higher rates of N may increase hollow heart in seedless watermelons.

**Drip/Trickle Fertilization:** see below for drip/trickle fertilization guides.

**Seed Treatment**

Check with seedsman to determine if seed has been

treated with an insecticide and fungicide. If it has not been treated, use a mixture of thiram 75WP (½ teaspoon per pound or 3 ounces per 100 pounds) and an approved commercially available insecticide.

**Plant Production**

Transplants should be grown in pots or flats that provide a space of at least 1.52 inches by 2.02 inches for each plant. Smaller pots or cells will restrict root growth and provide less protection to the newly set transplant. If the seed is of good quality with a high germination test, one seed per pot is sufficient. The seed coat of seedless watermelons tends to adhere to the seedling as it emerges, at times slowing growth or reducing stand. Temperatures in the greenhouse should be maintained at 80° to 85°F (26.7° to 29.4°C). Seeded trays should be kept slightly drier than normal until 25 percent emergence, then resume normal watering.

The required amount of seed can then be estimated using Table R-2 and knowing how many seeds make up an ounce of the desired variety. See Table R-1 (Vegetable Seed Sizes).

**Planting and Spacing**

**Transplants:** Transplant container-grown plants through plastic mulch when daily mean temperatures have reached 60°F (15.6°C). Planting dates vary from May 1 in southern regions to June 20 in northern areas. Early plantings should be protected from winds with hot caps, tents, row covers, or rye strips.

**Direct-seeded:** Seed April 20 to May 15 in Virginia and normally warmer areas, and May 15 to June 10 in Pennsylvania and normally cooler areas. Seed 3 to 5 pounds of seed per acre.

The recommended spacing for watermelons is 6 to 8 feet between rows with 3 to 4 feet between plants in the row.

**Seedless Varieties:** Plant every third row with a pollinizers variety to provide a 2:1 ratio of seedless to pollinizers and assure good fruit.

**Drip/Trickle Fertilization**

Before mulching, adjust soil pH to around 6.5, apply enough farm-grade fertilizer to supply 50 pounds per acre of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O, then thoroughly incorporate into the soil.

After mulching and installing the trickle irrigation system, apply completely soluble fertilizers to supply 25 pounds (5 to 15 pounds in Pennsylvania) of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O per fertilized-mulched acre during each application. On soils testing low and low to medium in boron, also apply 0.25 pound of actual boron per fertilized-mulched acre in each soluble fertilizer application. **For convenience, rates of fertilizer nutrients can be converted from a mulched acre to linear foot basis. See Table C-8.**

The first soluble fertilizer application should be applied through the trickle irrigation system within 1 week after field transplanting the watermelons. The same rate of soluble fertilizer should be applied 2 weeks later. The third application should be made when the first fruit set. A fourth application needs to be applied 2 weeks before the first harvest. The fifth application should be applied right after the first harvest. To maintain good production late into the season, apply another application three weeks after the fifth complete fertilizer application. In Pennsylvania, do not exceed 80 pounds of nitrogen per acre per season.

**Mulching**

Fumigated soil aids in the control of weeds and soil-borne

diseases. Clear, plastic mulch laid before field planting conserves moisture, increases soil temperature, and increases early and total yield. Plastic and fumigant--Vapam HL (30 to 37 gallons per acre) should be applied on well-prepared planting beds 30 days before field planting. Plastic should be 4 feet wide (4,000-foot rolls) and laid on 6- or 8-foot centers immediately over the fumigated soil. The soil must be moist when laying the plastic. Fumigation alone may not provide satisfactory weed control under clear plastic. Herbicides labeled and recommended for use on watermelons may not provide satisfactory weed control when used under clear plastic mulch on nonfumigated soil. Consult your county agent for latest recommendations. Black plastic or paper can be used without a herbicide. Fertilizer must be applied during bed preparation. At least 50 percent of the nitrogen (N) should be in the nitrate (NO<sub>3</sub>) form.

Direct seeding through the mulch is recommended for maximum virus protection. Transplants should not be used with foil or other repellent mulches. Also, a herbicide is not necessary. Fumigation will be necessary when there is a history of soil-borne diseases in the field.

### Pollination and Pollenizers

Watermelon fruit set and enlargement is dependent upon growth regulators from the pollen grains and from embryos in developing seeds within the fruit. Inadequate pollination results in triploid watermelon fruit that are triangular in shape and of inferior quality. Inadequate pollination may increase the incidence of hollowheart. Triploid watermelon flowers do not produce sufficient viable pollen to induce fruit set and development. Therefore, pollen from a normal or a special diploid pollenizer watermelon variety must be present. Fields should be inter-planted with pollenizer plants, diploid watermelon plants to provide viable pollen. There are two methods that can be used to incorporate pollenizer plants into the field. Dedicated row pollenizer plantings place the pollenizer variety in the outside row and then every third row. An alternative is to plant the pollenizer between every third and fourth plant in-row without changing plant spacing.

When this method is chosen, the use of a special pollenizer is recommended. The use of standard diploid varieties planted in-row may decrease yields of closely associated triploid plants. Special pollenizer varieties 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. Special pollenizer varieties found to perform well are listed below. Follow suppliers' instructions. **Under no circumstances should the pollenizer variety and the seedless variety be planted in separate but adjacent blocks!**

When using pollenizer plants arranged in dedicated rows, it is important to use a pollenizer variety that is marketable because up to one-third of all melons produced in the field will be of this variety. The rind pattern and/or shape of the seeded pollenizer fruit should be easily distinguished from that of the triploid fruit to reduce confusion at harvest. 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 take into account the market demand, plant vigor, pollen production, disease resistance, and environmental conditions.

It is important that pollen from the diploid pollenizer

variety be available when the female blossoms on the triploid plants are open and ready for pollination. The following recommendations pertain only to pollenizers planted in dedicated rows, special pollenizer plants should be transplanted at the same times 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 before triploid transplants are scheduled to be seeded.

### Weed Control

Section 18 Emergency Label requests may be submitted to supplement weed control recommendations in watermelons.

Identify the weeds in each field and select recommended herbicides that control those weeds. See Tables E-2 and E-3.

Match preplant incorporated and preemergence herbicide rates to soil type and percent organic matter in each field. See "Mulching" section above for further information on weed control under clear plastic mulch.

Apply postemergence herbicides when crop and weeds are within the recommended size and/or leaf stage.

### For Weed Control Under Plastic Mulch

Black plastic mulch effectively controls most annual weeds by preventing light from reaching the germinated seedling. Herbicides are used under plastic mulch to control weeds around the planting hole, and under the mulch when clear plastic is used. Trickle irrigation tube left on the soil surface may cause weed problems by leaching herbicide away at the emitters. The problem is most serious when clear plastic mulch is used. Bury the trickle tube several inches deep in the bed to reduce this problem.

1. Complete soil tillage, and form raised beds, if desired, prior to applying herbicide(s). Do not apply residual herbicides before forming beds, or herbicide rate and depth of incorporation may be increased, raising the risk of crop injury. When beds are formed and plastic mulch laid in a single pass, the herbicide should be applied after the bed is formed, as a part of the same operation.
2. Apply herbicide(s) recommended for use under plastic mulch in a band as wide as the mulch. Condensation that forms on the underside of the mulch will activate the herbicide. Use the trickle irrigation to provide moisture if the soil is too dry for condensation to form on the underside of the mulch.
3. Complete by laying the plastic mulch and trickle irrigation tubing, if used, immediately after the herbicide application. Delay punching the planting holes until seeding or transplanting.

**Note:** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

Bensulide--5-6 lb/A. Apply 5 to 6 quarts per acre Prefar 4E preemergence in a band under the plastic, immediately before laying the mulch. Condensation that forms on the underside of the mulch will activate the herbicide. Annual grasses and certain annual broadleaf weeds will be suppressed or controlled under the mulch and around the plant hole. Use the maximum recommended rate to improve control of annual broadleaf weeds including common lambsquarter, smooth pigweed, and common purslane.

Halosulfuron--0.023-0.031 lb/A. Apply 0.5 to 0.75 a dry ounce Sandea 75WG to suppress or control yellow nutsedge and broadleaf weeds including common cocklebur, redroot, pigweed, smooth pigweed, ragweed species, and galinsoga. 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. Condensation that forms on the underside of the mulch will activate the herbicide. Delay seeding or transplanting the crop for 7 days after the application of Sandea under plastic mulch. Occasionally, slight stunting may be observed following Sandea use early in the season. When observed, recovery is rapid with no effect on yield or maturity. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. **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. **DO NOT exceed a total of 0.031 pound per acre, equal to 0.75 dry ounces of Sandea, applied preemergence, per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2 dry ounces of Sandea, applied preemergence and postemergence to multiple crops in a single year. Observe a 57 day PHI (PreHarvest Interval).**

Terbacil—0.1-0.2 lb/A. Apply 2 to 4 dry ounces of Sinbar 80WP preemergence in a band under the plastic, immediately before laying the mulch, to control many annual broadleaf weeds under the mulch and around the planting hole. Sinbar will not control pigweed species. Condensation that forms on the underside of the mulch will activate the herbicide. 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. Sinbar may be used for direct seeded or transplanted watermelons. **Do NOT apply “over the top” or allow spray to contact crop foliage, or injury may result. Observe a 70 day PHI (PreHarvest Interval).**

#### **For Soil Strips Between Rows of Plastic Mulch (Directed and Shielded Band Applications)**

Use the following land preparation, treatment, planting sequences, and herbicides labeled for the crop to treat **Soil Strips Between Rows of Plastic Mulch**, or crop injury and/or poor weed control may result. Complete soil preparation, apply herbicide(s) under the mulch (see above), and lay plastic and trickle irrigation (optional) before herbicide application between the rows.

1. Spray preemergence herbicide(s), registered and recommended for use on the crop in bands onto the soil and the shoulders of the plastic mulch before planting and weeds germinate, **OR** apply after planting as a shielded spray combined with a postemergence herbicide to control emerged weeds. **DO NOT broadcast spray over the plastic mulch at any time!**
2. Incorporate preemergence herbicide into the soil with ½ to

1 inch of rainfall or overhead irrigation within 48 hours of application.

3. Apply Gramoxone in bands to the soil strips between the plastic mulch before the crop emerges or is transplanted, **AND/OR** as a shielded spray postemergence to control emerged weeds. Use in combination with residual herbicides that are registered for use.

**Note.** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

#### **Preemergence**

Bensulide--5-6 lb/A. Apply 5 to 6 quarts per acre Prefar 4E as a banded directed shielded spray preemergence to the weeds and activate with one-half inch of sprinkler irrigation within 36 hours to control most annual grasses. Use the maximum recommended rate preemergence followed by irrigation to suppress certain annual broadleaf weeds including common lambsquarter, smooth pigweed, and common purslane.

Naptalam--2 lb/A. Apply 1 gallon per acre Alanap 2SC preemergence as a banded directed shielded spray before seeding or transplanting. Weed control may not be satisfactory on sandy soils with less than 1 percent organic matter.

Bensulide *plus* naptalam--5-6 lb/A *plus* 2 lb/A. Apply 5 to 6 quarts Prefar 4EC plus 1 gallon Alanap 2SC as a banded directed shielded spray preemergence before seeding or transplanting. Tank-mix is approved.

Clomazone--0.094-0.188 lb/A. Apply 4 to 8 fluid ounces per acre Command 3ME as a banded directed shielded spray preemergence to the weeds to control annual grasses and many broadleaf weeds including common lambsquarter, velvetleaf, spurred anoda, and jimsonweed. Mustards, morningglory species, and pigweed species will not be controlled. Use lowest recommended rate on coarse-textured, sandy soils low in organic matter. Higher rates should only be used on medium- and fine-textured soils and sites that have been heavily manured. Combine with Curbit 3EC to control pigweed species where Curbit is registered for use, or use Strategy, the jug-mix that contains clomazone (Command) and ethalfluralin (Curbit).

**WARNING: 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 when wind or weather conditions favor herbicide drift. Do not apply to fields adjacent to horticultural, fruit, vegetable, or other sensitive crops (see label). Drift injury from offsite Command movement is extremely apparent; therefore, do not use Command on fields near sensitive locations.**

Herbicide residues may limit subsequent cropping options when Command is used for weed control in cucumbers. See planting restrictions on the label or consult your local Cooperative Extension office for information regarding subsequent cropping options when Command is used.

Ethalfluralin--0.38-0.75 lb/A. Apply 1 to 2 pints per acre Curbit 3E as a banded directed shielded spray preemergence to control annual grasses and certain annual broadleaf weeds, including carpetweed and pigweed sp. Control of many other broadleaf weeds, including common lambsquarter, jimsonweed, morningglory sp., ragweed sp., mustard sp., and

others may not be acceptable. Dry weather following application may reduce weed control. Cultivate to control emerged weeds if rainfall or irrigation does not occur prior to weed emergence. DO NOT preplant incorporate. DO NOT apply under plastic mulch or tunnels. DO NOT use when soils are cold or wet. Crop injury may result!

Ethalfuralin *plus* Clomazone (jug-mix)--0.394-1.575 lb/A. Apply 1.5 to 6 pints per acre of Strategy 2.1SC as a banded directed shielded spray preemergence to control annual grasses and many annual broadleaf weeds. Use the lowest recommended rates on coarse-textured sandy soils low in organic matter. Higher rates should only be used on medium- and fine-textured soils and sites that have been heavily manured.

Strategy is a **jug-mix** of ethalfuralin (Curbit 3E) and clomazone (Command 3ME). Refer to the chart below to determine the amount of each herbicide at commonly used rates:

**Curbit and Command Active Ingredients (ai) in Commonly Used Strategy Rates**

Strategy pints/A	Ethalfuralin (Curbit) lb ai/A	Clomazone (Command) lb ai/A
1.5	0.3	0.094
2	0.4	0.125
3	0.6	0.188
4	0.8	0.25
5	1.0	0.312
6	1.2	0.375

Labeled for use in all the mid-Atlantic states. Read and follow all the recommendations and warnings (above) for ethalfuralin (Curbit) and clomazone (Command).

Halosulfuron--0.023-0.047 lb/A. Apply 0.5 to 1.0 dry ounce Sandea 75WG as a banded directed shielded spray between rows of plastic mulch to suppress or control broadleaf weeds including common cocklebur, redroot, pigweed, smooth pigweed, ragweed species, and galinsoga. 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. Rainfall or irrigation after application is necessary before weeds emerge to obtain good control. Occasionally, slight stunting may be observed following Sandea use early in the season. When observed, recovery is rapid with no effect on yield or maturity. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. 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. **DO NOT exceed a total of 0.047 pound per acre, equal to 1 dry ounce of Sandea, applied preemergence. Do NOT exceed total of 0.094 pounds per acre, equal to 2.0 dry ounces of Sandea per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2 dry ounces of Sandea, in a 1**

**year (12 month) period.**

Terbacil--0.1-0.2 lb/A. Apply 2 to 4 dry ounces of Sinbar 80WP preemergence as a banded, shielded, directed spray between rows of plastic mulch to control many annual broadleaf weeds. Sinbar will not control pigweed 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. Sinbar may be used for direct seeded or transplanted watermelons. **DO NOT apply "over the top" or allow spray to contact crop foliage, or injury may result. Observe a 70 day PHI (PreHarvest Interval).**

**Postemergence**

Halosulfuron--0.023-0.031 lb/A. Apply 0.5 to 0.66 dry ounce Sandea 75WG as a banded, shielded, directed spray between rows of plastic mulch to suppress or control yellow nutsedge and broadleaf weeds including common cocklebur, redroot pigweed, smooth pigweed, ragweed species, and galinsoga when the crop has 2 to 5 true leaves but has not yet begun to bloom or run. Sandea applied postemergence will not control common lambsquarter or eastern black nightshade. Add nonionic surfactant to be 0.25 percent of the spray solution (1 quart per 100 gallons of spray solution). DO NOT use oil concentrate. Susceptible broadleaf weeds usually exhibit injury symptoms within 1 to 2 weeks of treatment. Typical symptoms begin as yellowing in the growing point that spreads to the entire plant and is followed by death of the weed. Injury symptoms are similar when yellow nutsedge is treated but may require 2 to 3 weeks to become evident and up to a month for the weed to die. Occasionally, slight yellowing of the crop may be observed within a week of Sandea application. When observed, recovery is rapid with no effect on yield or maturity. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. DO NOT apply Sandea to crops treated with a soil applied organophosphate (OP) insecticide, or use a foliar applied organophosphate (OP) insecticide within 21 days before or 7 days after a Sandea application. **DO NOT exceed a total of 0.031 pound per acre, equal to 0.66 dry ounces of Sandea, applied postemergence. DO NOT exceed total of 0.094 pounds per acre, equal to 2.0 dry ounces of Sandea per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2 dry ounces of Sandea, in a 1 year (12 month) period.**

Paraquat--0.6 lb/A. **A Special Local-Needs 24(c) label has been approved for the use of Gramoxone Inteon 2SC postemergence as a banded directed shielded spray between the rows of plastic mulch in Delaware, Maryland, New Jersey, Pennsylvania, and Virginia.** Apply 2.4 pints per acre Gramoxone Inteon 2SC as a banded directed shielded spray to control emerged weeds between the rows after crop establishment. Add nonionic surfactant according to the labeled instructions. Do not allow spray or spray drift to contact the crop or injury may result.

Use shields to prevent spray contact with the crop plants. Do not exceed a spray pressure of 30 psi. See the label for additional information and warnings.

Clethodim--0.094-0.125 lb/A. Apply 6 to 8 fluid ounces per acre Select 2EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) or 12 to 16 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray solution (1 quart per 100 gallons of spray solution) postemergence to control many annual and certain perennial grasses, including annual bluegrass. Select will not consistently control goosegrass. The use of oil concentrate with Select 2EC 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 nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 14 days.

Sethoxydim--0.2-0.3 lb/A. Apply 1 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) postemergence as a banded directed shielded spray to control annual grasses and certain perennial grasses. **The use of oil concentrate 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 nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 14 days and apply no more than 3 pints per acre in one season.

#### **For Seeding Into Soil Without Plastic Mulch (Broadcast Applications)**

Use the following land preparation, treatment, planting sequences, and herbicides labeled for the crop when **Seeding into Soil Without Plastic Mulch**, or crop injury and/or poor weed control may result.

1. Complete soil tillage, apply preplant incorporated herbicide(s), and incorporate. Use a finishing disk or field cultivator that sweeps at least 100% of the soil surface twice, at right angles, operated at a minimum of 7 miles per hour (mph), OR a PTO driven implement once, operated at less than 2 miles per hour (mph).
2. Seed and apply preemergence herbicide(s) immediately after completing soil tillage, and mechanical incorporation of preplant herbicides. If rainfall does not

occur, irrigate to move the herbicide into the soil and improve availability to germinating weed seeds within 2 days of when the field was last tilled, or plan to control escaped weeds by other methods.

**Note.** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

#### **Preplant Incorporated or Preemergence**

Bensulide--5-6 lb/A. Apply 5 to 6 quarts per acre Prefar 4E before planting and incorporate 1 to 2 inches deep with power-driven rotary cultivators, or apply preemergence and activate with one-half inch of sprinkler irrigation within 36 hours to control most annual grasses. Use the maximum recommended rate preemergence followed by irrigation to suppress certain annual broadleaf weeds including common lambsquarter, smooth pigweed, and common purslane.

Naptalam--2 lb/A. Apply 1 gallon per acre Alanap 2SC as a preplant incorporated (2 inches) treatment before seeding or transplanting or as a preemergence treatment after seeding. Weed control may not be satisfactory on sandy soils with less than 1 percent organic matter.

Bensulide *plus* naptalam--5-6 lb/A *plus* 2 lb/A. Apply 5 to 6 quarts Prefar 4EC *plus* 1 gallon Alanap 2SC as a preplant incorporated (2 inches or less) treatment before seeding or transplanting or as a preemergence treatment after seeding. Tank-mix is approved.

#### **Preemergence**

Clomazone--0.094-0.188 lb/A. Apply 4 to 8 fluid ounces per acre Command 3ME preemergence to a direct-seeded crop to control annual grasses and many broadleaf weeds including common lambsquarter, velvetleaf, spurred anoda, and jimsonweed. Mustards, morningglory species, and pigweed species will not be controlled. Use lowest recommended rate on coarse-textured, sandy soils low in organic matter. Higher rates should only be used on medium- and fine-textured soils and sites that have been heavily manured. Combine with Curbit 3EC to control pigweed species where Curbit is registered for use. Some temporary crop injury (partial whitening of leaf or stem tissue) may be apparent after crop emergence. Complete recovery will occur from minor early injury without affecting yield or earliness. Banding the herbicide reduces the risk of crop injury and offsite movement due to vapor drift.

**WARNING: 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 when wind or weather conditions favor herbicide drift. Do not apply to fields adjacent to horticultural, fruit, vegetable, or other sensitive crops (see label). Drift injury from offsite Command movement is extremely apparent; therefore, do not use Command on fields near sensitive locations.**

**Herbicide residues may limit subsequent cropping options when Command is used for weed control in cucumbers. See planting restrictions on the label or consult your local Cooperative Extension office for information regarding subsequent cropping options when Command is used.**

Ethalfuralin--0.38-0.75 lb/A. Apply 1 to 2 pints per acre Curbit 3E preemergence to control annual grasses and certain annual broadleaf weeds, including carpetweed and pigweed

sp. Control of many other broadleaf weeds, including common lambsquarter, jimsonweed, morningglory sp., ragweed sp., mustard sp., and others may not be acceptable. Dry weather following application may reduce weed control. Cultivate to control emerged weeds if rainfall or irrigation does not occur prior to weed emergence. DO NOT preplant incorporate. DO NOT apply under plastic mulch or tunnels. DO NOT use when soils are cold or wet. Crop injury may result!

Ethalfuralin *plus* Clomazone (jug-mix)--0.394-1.575 lb/A. Apply 1.5 to 6 pints per acre of Strategy 2.1SC preemergence to control annual grasses and many annual broadleaf weeds. Use the lowest recommended rates on coarse-textured sandy soils low in organic matter. Higher rates should only be used on medium- and fine-textured soils and sites that have been heavily manured.

Strategy is a **jug-mix** of ethalfuralin (Curbit 3E) and clomazone (Command 3ME). Refer to the chart under Ethalfuralin *plus* clomazone (jug-mix) in the section **For Soil Strips Between Rows of Plastic Mulch** to determine the amount of each herbicide at commonly used rates.

Read and follow all the recommendations and warnings (above) for ethalfuralin (Curbit) and clomazone (Command).

Halosulfuron--0.023-0.031 lb/A. Apply 0.5 to 0.75 dry ounce Sandea 75WG to suppress or control yellow nutsedge and broadleaf weeds including common cocklebur, redroot, pigweed, smooth pigweed, ragweed species, and galinsoga. 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. Rainfall or irrigation after application is necessary before weeds emerge to obtain good control. Occasionally, slight stunting may be observed following Sandea use early in the season. When observed, recovery is rapid with no effect on yield or maturity. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. 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. **DO NOT exceed a total of 0.031 pound per acre, equal to 0.75 dry ounces of Sandea, applied preemergence, per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2 dry ounces of Sandea, applied preemergence and postemergence to multiple crops in a single year.**

Terbacil—0.1-0.2 lb/A. Apply 2 to 4 dry ounces of Sinbar 80WP preemergence to control many annual broadleaf weeds under the mulch and around the planting hole. Sinbar will not control pigweed 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. Sinbar may be used for direct seeded or transplanted watermelons. Apply to seeded watermelons after planting, but before emergence. Apply to transplanted watermelons before transplanting (PRE-

transplant). **Do NOT apply “over the top” or allow spray to contact crop foliage, or injury may result. Observe a 70 day PHI (PreHarvest Interval).**

### Postemergence

Clethodim--0.094-0.125 lb/A. Apply 6 to 8 fluid ounces per acre Select 2EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) or 12 to 16 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray solution (1 quart per 100 gallons of spray solution) postemergence to control many annual and certain perennial grasses, including annual bluegrass. Select will not consistently control goosegrass. The use of oil concentrate with Select 2EC 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 nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 14 days.

Sethoxydim--0.2-0.3 lb/A. Apply 1 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) postemergence to control annual grasses and certain perennial grasses. The use of oil concentrate 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 nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 14 days and apply no more than 3 pints per acre in one season.

### Postharvest

#### With or Without Plastic Mulch

Paraquat--0.6 lb/A. A **Special Local-Needs 24(c) label has been approved for the use of Gramoxone Inteon 2SC for postharvest desiccation of the crop in Delaware, New Jersey and Virginia.** Apply 2.4 pints per acre Gramoxone Inteon 2SC as a broadcast spray after the last harvest. Add nonionic surfactant according to the labeled instructions. Use to prepare plastic mulch for replanting, or to aid in the removal of the mulch. See the label for additional information and warnings.

**Note.** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

### Pollinators and Pesticides

Honeybees, squash bees, bumblebees and other wild bees are important for proper set and pollination. 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. See section on "Pollination" in the General Production Recommendations and/or Table D-6 for relative toxicity of various pesticides for hazard to bees.

### Insect Control

**NOTE:** Copies of specific insecticide product labels can be downloaded by visiting the websites [www.CDMS.org](http://www.CDMS.org) or [www.Greenbook.org](http://www.Greenbook.org). Also, specific labels can be obtained via web search engines.

### Seed Corn Maggot

Maggot problems can occur in the field and in transplant bedding trays in the greenhouse. Commercial seed treated with lindane/capthion will not be protected from maggot infestations. An application of a soil-incorporated insecticide may be needed immediately before planting. Also, see Chapter E "Maggots" section in "Soil Pests--Their Detection and Control". **Note:** The use of imidacloprid at planting may reduce seed corn maggot populations.

### Cucumber Beetle

Watermelons are resistant to bacterial wilt; however, control may be needed to prevent feeding damage to seedlings. Treat when an average of two beetles per plant is found.

acetamiprid (Assail 30SG or OLF)  
 beta-cyfluthrin (Baythroid XL)  
 bifenthrin (Brigade EC, Sniper, or OLF)  
 carbaryl (Sevin 80S or OLF)  
 carbofuran (Furadan 4F- A Special Local-Needs Label 24(c) is in effect for carbofuran at planting.) **Note:** Use of carbofuran at planting frequently leads to spider mite outbreaks later in the season.  
 cyfluthrin (Renounce 20WP, Tombstone or OLF)  
 dinotefuron (Venom 70SG or OLF)  
 endosulfan (Thionex 3E or OLF)  
 esfenvalerate (Asana XL)  
 fenpropathrin (Danitol 2.4EC)  
 imidacloprid (at plant/chemigation/in-furrow/hill drench/postseeding-Admire 2F, Admire PRO or OLF)  
 lambda-cyhalothrin (Lambda-Cy, LambdaT, Silencer, Warrior, Warrior II or OLF)  
 methomyl (Lannate LV or OLF)  
 permethrin (Perm-Up, Pounce 3.2EC or OLF)  
 thiamethoxam (soil- Platinum 2SG or OLF)

**Cutworms** (Also see the "Cutworms" section in Soil Pests--Their Detection and Control.)

beta-cyfluthrin (Baythroid XL)  
 bifenthrin (Brigade EC, Sniper, or OLF)  
 esfenvalerate (Asana XL)  
 methomyl (Lannate LV or OLF)  
 permethrin (Perm-Up, Pounce 3.2EC or OLF)

### Pickleworm, Melonworm

Make one treatment prior to fruit set, and then treat weekly.

beta-cyfluthrin (Baythroid XL)  
 bifenthrin (Brigade EC, Sniper, or OLF)  
 carbaryl (Sevin 80S or OLF)

endosulfan (Thionex 3EC or OLF)  
 esfenvalerate (Asana XL) (**pickleworm only**)  
 indoxacarb (Avaunt 30WDG)  
 lambda-cyhalothrin (Lambda-Cy, LambdaT, Silencer, Warrior, Warrior II or OLF)  
 methomyl (Lannate LV or OLF)  
 methoxyfenozide (Intrepid 2F)  
 permethrin (Perm-Up, Pounce 3.2EC or OLF)  
 spinetoram (Radiant 2SC)  
 spinosad (Entrust 80W, SpinTor 2SC or OLF)

### Aphids

**Note:** Aphids transmit mosaic virus. Thorough spray coverage beneath leaves is important. For further information on aphid controls, see the preceding "Mulching" section. Treat seedlings every 5 to 7 days or as needed.

dinotefuron (soil or foliar- Venom 70SG or OLF)  
 endosulfan (Thionex 3EC OLF)  
 flonicamid (Beleaf 50 SG)  
 imidacloprid (at plant/chemigation/in-furrow/hill drench/postseeding-Admire 2F, Admire PRO or OLF)  
 methomyl (Lannate LV or OLF) (**Melon Aphid only**)  
 oxydemeton (Metasystox-R 2SC) (**Green Peach Aphid only**)  
 pymetrozine (Fulfill 50WP)  
 thiomethoxam (soil-Platinum 2SG or OLF; foliar-Actara 25WDG)

### Leafminers

abamectin (Agri-Mek EC, Abba EC, Temprano or OLF)  
 dimethoate (Dimate 4EC or OLF)  
 dinotefuran (soil or foliar- Venom 70SG or OLF)  
 oxamyl (Vydate L)  
 permethrin (Perm-Up, Pounce 3.2EC or OLF)  
 spinetoram (Radiant 2SC)  
 spinosad (Entrust 80W, SpinTor 2SC or OLF)

### Rindworms (Cucumber Beetle Larvae.)

Damage to the rinds may result from a complex of insects including cucumber beetle, wireworms, and a number of "worm" species, (beet army worm, etc). Management of adult cucumber beetles early in the season may help reduce damage. See cucumber beetle and beet armyworm sections for labeled products.

### Beet Armyworm

methoxyfenozide (Intrepid 2F)  
 spinosad (Entrust 80W, SpinTor 2SC or OLF)

### Cabbage Looper

*Bacillus thuringiensis*-(Biobit, Dipel, Dipel 2X, Javelin, XenTari or OLF)  
 beta-cyfluthrin (Baythroid XL)  
 bifenthrin (Brigade EC, Sniper, or OLF)  
 esfenvalerate (Asana XL)  
 lambda-cyhalothrin (Lambda-Cy, LambdaT, Silencer, Warrior, Warrior II or OLF)  
 methomyl (Lannate LV or OLF)  
 methoxyfenozide (Intrepid 2F)  
 permethrin (Perm-Up, Pounce 3.2EC or OLF)  
 spinetoram (Radiant 2SC)  
 spinosad (Entrust 80W, SpinTor 2SC or OLF)

### Mites

Mite infestations generally begin around field margins and

grassy areas. **CAUTION:** DO NOT mow or maintain these areas after midsummer since this forces mites into the crop. Localized infestations can be spot treated. Begin treatment when 10 to 15 percent of the crown leaves are infested early in the season, or when 50 percent of the terminal leaves are infested later in the season.

**Note:** Continuous use of Furadan, Sevin, or the pyrethroids may result in mite outbreaks.

- abamectin (Agri-Mek EC, Abba EC, Temprano, or OLF)
- bifenthrin (Brigade EC, Sniper, or OLF)
- bifentate (Acramite 50WS)
- etoxazole (Zeal)
- fenpropathrin (Danitol 2.4EC)
- spiromesifen (Oberon 2SC)

**Note:** Use of dimethoate for leafminer control will reduce the mite population.

**Thrips**

- dinotefuran (soil/foiar-Venom 70SG or OLF)
- lambda-cyhalothrin (Lambda-Cy, LambdaT, Silencer, Warrior, Warrior II or OLF)
- oxamyl (Vydate L)
- spinetoram (Radiant 2SC)
- spinosad (Entrust 80W, SpinTor 2SC or OLF)

Pesticide	Use Category <sup>1</sup>	Hours to Reentry <sup>2</sup>	Days to Harvest <sup>3</sup>
<b>INSECTICIDE</b>			
abamectin	R	12	7
<i>Bacillus thuringiensis</i>	G	4	0
beta-cyfluthrin	R	12	0
bifenthrin	R	12	3
bifentate	G	12	3
carbaryl	G	12	3
dimethoate	R	48	3
dinotefuran (soil/foiar)	G	12	21/1
endosulfan	R	24	2
esfenvalerate	R	12	3
etoxazole	G	12	7
fenpropathrin	R	24	7
flonicamid	G	12	0
imidacloprid	G	12	21
indoxacarb	G	12	3
lambda-cyhalothrin	R	24	1
methomyl	R	48	3
oxamyl	R	48	1
oxydemeton-methyl	R	48	7
permethrin	R	12	0
pymetrozine	G	12	0
spinetoram	G	4	3
spinosad	G	4	3
spiromesifen	G	12	7
thiamethoxam (soil/foiar)	G	12	30/0
<b>FUNGICIDE (FRAC code)</b>			
Cabrio (Group 11)	G	12	0
chlorothalonil (Group M5)	G	12	0
copper, fixed (Group M1)	G	24	0
Curzate (Group 27)	G	12	3
Flouronil (Groups 4 + M5)	G	48	14
Forum (Group 40)	G	12	0
Gavel (Groups 22 + M3)	G	48	5
mancozeb (Group M3)	G	12,24	5
MetaStar (Group 4)	G	48	AP
Presidio (Group 43)	G	12	2
Previcur Flex (Group 28)	G	12	2
Pristine (Groups 11 + 7)	G	48	0

(table continued next page)

Pesticide (continued)	Use Category <sup>1</sup>	Hours to Reentry <sup>2</sup>	Days to Harvest <sup>3</sup>
<b>FUNGICIDE (FRAC code) (continued)</b>			
Procure (Group 3)	G	12	0
Quadris (Group 11)	G	4	1
Quintec (Group 13)	G	12	3
Rally (Group 3)	G	24	0
Ranman (Group 21)	G	12	0
Reason (Group 11)	G	12	14
Ridomil Gold (Group 4)	G	48	0
Ridomil Gold Bravo (Groups 4 + M5)	G	48	0
Ridomil Gold Copper (Groups 4 + M1)	G	48	5
Tanos (Groups 11 + 7)	G	12	3
thiophanate-methyl Group 1)	G	12	0
Ultra Flourish (Group 4)	G	48	0

See Table D-6.

<sup>1</sup> G = general, R = restricted

<sup>2</sup> Chemicals with multiple designations are based on product and/or formulation differences. CONSULT LABEL

<sup>3</sup> AP = At plant

**Nematode Control**

See Chapter E "Nematodes" section of Soil Pests-Their Detection and Control. Use fumigants listed in the "Soil Fumigation" section

Apply Vydate L--1.0-2.0 gal 2L/A. Incorporate into the top 2 to 4 inches of soil or 2 to 4 pints 2L per acre applied 2 weeks after planting and repeat 2 to 3 weeks later.

**Disease Control**

**Damping-Off**

Apply the following in a 7-inch band at planting. Use formula in the "Calibration for Changing from Broadcast to Band Application" section of Calibrating Granular Application Equipment to determine amount of Ridomil Gold, Ultra Flourish, or MetaStar needed per acre:

mefenoxam (Ridomil Gold--1.0-2.0 pt 4E/A or 2.0-4.0 pt Ultra Flourish 2E/A), or metalaxyl (MetaStar)--4.0-8.0 pt 2E/A

**Bacterial Fruit Blotch**

Obtain disease-free seed or seedlings. Practice good sanitation during transplant production. Segregate different seed lots in the transplant house to reduce the chance of cross contamination. Use of infected transplants is risky. If possible, use only transplants from houses in which there were no seedling symptoms of the fruit blotch disease. Rotate to allow 2 years between watermelon plantings and control volunteers during those years. Apply one of the following fungicides beginning at first bloom and rotate every 7 days:

copper, fixed--at labeled rates, or Tanos--8.0-10.0 oz 50WDG/A (for suppression only)

**Viruses (CMV, WMV2, PRSV [WMV1], and ZYMV)**

Plant fields as far away from existing cucurbit plantings as possible to prevent aphid transmission of viruses from existing fields to new fields.

**Ozone Injury**

Ozone will cause chlorosis and upper surface bronzing and scorching on the older leaves, which leads to defoliation. 'Sugar Baby' is one of the more sensitive varieties.

**Fusarium Wilt**

Use a long rotation of at least 5 years and resistant varieties when possible. The varieties 'Seedless Sangria' and 'Revolution' are the only seedless varieties that have been tested in the region that are tolerant to Fusarium wilt resulting from race 2. 'Royal Majesty' is a seeded variety with tolerance to race 2. Do not plant other watermelon varieties in fields where race 2 is present.

**Anthraco**

Excellent resistance is available in some varieties. Use resistant varieties when possible. Begin fungicide applications when vines run or earlier if symptoms are detected.

**Under light or moderate disease pressure:****Alternate:**

chlorothalonil--2.0-3.0 pt 6F/A or OLF (Use low rate early in season),

**With:**

chlorothalonil--2.0-3.0 pt/A *plus* thiophanate-methyl--0.5 lb 70WP/A

**Under high disease pressure, tank-mix:**

chlorothalonil--2.0-3.0 pt 6F/A

with one of the following FRAC code 11 fungicides:

Pristine--18.5 oz 38WG/A, or

Quadris--11.0-15.5 fl oz 2.08SC/A, or

Cabrio--12.0-16.0 oz 20EG/A, or

Tanos--8.0 oz 50DF/A (must be tank-mixed with either chlorothalonil, mancozeb, or copper)

**And rotate every 7 days with:**

chlorothalonil--2.0-3.0 pt/A *plus* thiophanate-methyl--0.5 lb 70WP/A

**If resistance to FRAC code 11 (strobilurin) fungicides has been detected in the area, do not use Quadris, Tanos or Cabrio.**

**Downy Mildew**

Scout fields for disease incidence on a regular basis. Begin sprays when vines run or if disease occurrence is predicted for the region. Refer to the Cucurbit Downy Mildew Forecasting website ([www.ces.ncsu.edu/depts/pp/cucurbit/](http://www.ces.ncsu.edu/depts/pp/cucurbit/)) for current status of the disease. Preventative applications are much more effective than applications made after disease is detected. The following are the most effective materials (tank-mix these products with a protectant fungicide such as chlorothalonil--1.5-2.0 pt 6F/A or OLF):

Ranman--2.1-2.75 fl oz. 400SC/A, or

Presidio--3.0-4.0 fl oz 4SC//A, or

Previcur Flex--1.2 pt 6F/A, or

Tanos--8.0 oz 50DF/A, or

Gavel--1.5-2.0 lb 75DF/A (Gavel contains mancozeb, which is a protectant, and does not need a tank-mix partner.), or

Curzate--3.2 oz 60DF/A

Materials with different Modes of Action (FRAC groups) should be alternated.

Sprays should be applied on a 7-day schedule. Cabrio, Pristine and Tanos should not be alternated with each other or used consecutively. Under severe disease conditions spray may be reduced if label allows.

**Alternaria Leaf Blight**

Begin sprays when vines begin to run.

**Alternate one of the following:**

Chlorothalonil--2.0-3.0 pt 6F/A, or OLF (Use low rate early in season), or mancozeb--2.0-3.0 lb 75 DF/A

**With:**

Pristine--12.5-18.5 oz 38W/A, or

a tank-mix of chlorothalonil *plus* one of the following every 14 days:

Quadris--11.0-15.5 fl oz 2.08SC/A (do not apply near apples, see label for details), or

Cabrio--12.0-16.0 oz 20EG/A, or

Reason--5.5 fl oz 500SC/A

**If resistance to FRAC code 11 fungicides exist in the area, do not use Cabrio, Pristine or Quadris. Use a fungicide from a different FRAC code.**

**Gummy Stem Blight**

Gummy stem blight occurs primarily in the late summer. Fungicides with a high-risk for resistance development such as FRAC code 11 fungicides (Cabrio, Pristine and Quadris) should be tank-mixed with a protectant fungicide to reduce the chances for resistance development (see Table E-8). When tank-mixing use at least the minimum labeled rate of each fungicide in the tank mix. Do not apply FRAC code 11 fungicides more than 4 times total per season. If resistance to FRAC code 11 fungicides exists in the area, do not apply. Use fungicides from a different FRAC code.

Begin sprays when vines begin to run, apply the following

**Under low disease pressure:**

chlorothalonil--2.0-3.0 pt 6F/A every 7 days at 2.0-3.0 pt/A

**Under high disease pressure:****Alternate:**

chlorothalonil--2.0-3.0 pt 6F/A

**With:**

Pristine--12.5-18.5 oz 38W/A *plus* chlorothalonil--2.0-3.0 pt 6F/A

**Phytophthora Blight**

To minimize the occurrence of this disease, watermelon should be grown on raised beds and fields should be adequately drained to ensure that water does not accumulate around the base of the plants. Rotate away from susceptible crops (such as cucurbits, peppers, lima and snap beans, eggplants and tomatoes) for as long as possible. In addition, when the vines begin to run, subsoil between rows to allow for faster drainage following rainfall. Apply one of the following with fixed copper at labeled rates when conditions favor disease development for suppression only:

Forum--6.0 fl oz 4.18SC/A or

Gavel--1.5-2.0 lb 75DF/A, or

Tanos--8.0-10.0 oz 50DF/A *plus* mancozeb, or

Ranman--2.75 fl oz 400SC/A (*plus* an adjuvant see label for details)

**Powdery mildew**

This disease was observed for the past few seasons in Delaware and Maryland and could occur in other States. 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 upper leaf surface of young, fully expanded leaves, and then inspect the corresponding lower leaf 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.

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

***Alternate:***

Rally--5.0 oz 40WSP/A *plus* chlorothalonil, or  
Procure--4.0-8.0 oz 50WS/A *plus* chlorothalonil

***With:***

Quintec--6.0 fl oz 2.08SC *plus* chlorothalonil, or  
Pristine--12.5-18.5 oz 38WG/A *plus* chlorothalonil

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