This is a section from the
2016
Mid-Atlantic
Commercial Vegetable Production Recommendations

The manual, which is published annually, is NOT for home gardener use.

The full manual, containing recommendations specific to New Jersey, can be found on the Rutgers NJAES website in the Publications section njaes.rutgers.edu

The label is a legally-binding contract between the 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.
with good drainage. Shortly before harvest when conditions are wet and cool, apply one of the following:
chlorothalonil—2.0 to 2.75 pt 6F/A or OLF (also very good for late blight),
Endura—9.0 to 12.5 oz 70WG/A (also very good for early blight; not for use in greenhouses),
Switch—11.0 to 14.0 oz 62.5WG/A

**Leaf Mold (Passalora/Fulvia/Cladosporium fulva)**
Leaf mold may occur during periods of high moisture particularly within the canopy. The disease is primarily damaging in greenhouse and high tunnel tomato settings. In both settings, if the disease is present, precautions should be taken to minimize canopy moisture. For field outbreaks, the following fungicide can be used:
Revus Top—5.5 to 7.0 fl oz 4.16SC/A
Catamaran—4.5 to 7.0 pt 5.3F/A

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**WATERMELONS**

**Recommended Watermelon Varieties**

<table>
<thead>
<tr>
<th>Seeded</th>
<th>Reported Disease Resistance</th>
<th>Size (lbs)</th>
<th>Shape</th>
<th>Flesh Color</th>
<th>Rind Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crimson Sweet</td>
<td>Fon Gen Fon 0 Fon 1 Fon 2 Co Px</td>
<td>16-20 globe red</td>
<td>medium green with dark green stripes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jamboree</td>
<td>I I</td>
<td>24-28 oblong red</td>
<td>dark green with broken light green stripes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mardi Gras</td>
<td>I</td>
<td>20-24 oblong red</td>
<td>dark green with broken light green stripes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sangria</td>
<td>I</td>
<td>20-24 oblong red</td>
<td>dark green with broken light green stripes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starbrite</td>
<td>R</td>
<td>22-31 oblong red</td>
<td>medium green with dark green stripes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top Gun</td>
<td>I I</td>
<td>21-24 globe red</td>
<td>medium green with dark green stripes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Seedless, Early**
Melody 14-16 globe red medium green with dark green stripes
Sweet Gem 13-16 globe red dark green
Sweet Eat'n I I 15-20 oval red light green with broad, medium green stripes
Secretariat 16-20 oval red light green with broad, medium green stripes
Amarillo 13-15 globe yellow light green with narrow dark green stripes
Vagabond 14-17 oval red medium green with dark green stripes

**Seedless, Mid Season**
Charismatic 13-16 globe red medium green with dark green stripes
SS 7167 16-20 oval red medium green with dark green stripes

(Table continued next page)
## Recommended Watermelon Varieties (continued)

<table>
<thead>
<tr>
<th>Seedless, Mid Season</th>
<th>Reported Disease Resistance</th>
<th>Size (lbs)</th>
<th>Shape</th>
<th>Flesh Color</th>
<th>Rind Description</th>
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</thead>
<tbody>
<tr>
<td>Gypsy</td>
<td>I</td>
<td>13-17</td>
<td>globe</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Fascination</td>
<td>I</td>
<td>16-20</td>
<td>oval</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Crisp N Sweet</td>
<td></td>
<td>16-20</td>
<td>oval</td>
<td>red</td>
<td>light green with broad, medium green stripes</td>
</tr>
<tr>
<td>Sugar Heart</td>
<td></td>
<td>16-20</td>
<td>oval</td>
<td>red</td>
<td>light green with broad, medium green stripes</td>
</tr>
<tr>
<td>Tri-X 212</td>
<td></td>
<td>13-16</td>
<td>oval</td>
<td>red</td>
<td>light green with broad, medium green stripes</td>
</tr>
<tr>
<td>Tri-X 313</td>
<td>I</td>
<td>15-18</td>
<td>oval</td>
<td>red</td>
<td>light green with broad, medium green stripes</td>
</tr>
<tr>
<td>Liberty</td>
<td></td>
<td>18-20</td>
<td>oval</td>
<td>red</td>
<td>light green with broad, medium green stripes</td>
</tr>
<tr>
<td>SS 7187</td>
<td>I</td>
<td>16-20</td>
<td>oval</td>
<td>red</td>
<td>light green with broad, medium green stripes</td>
</tr>
<tr>
<td>ACX 6177 Plus</td>
<td>I</td>
<td>16-20</td>
<td>oval</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Revolution</td>
<td>I</td>
<td>18-24</td>
<td>oblong</td>
<td>red</td>
<td>medium green with dark green stripes</td>
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<tr>
<td>Declaration</td>
<td></td>
<td>16-18</td>
<td>oval</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Sweet Delight</td>
<td></td>
<td>16-19</td>
<td>oval</td>
<td>red</td>
<td>light green with broad, medium green stripes</td>
</tr>
<tr>
<td>Unbridled</td>
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<td>13-16</td>
<td>globe</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Kingman</td>
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<td>16-20</td>
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<td>red</td>
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<tr>
<td>Embassy</td>
<td>I</td>
<td>14-18</td>
<td>oval</td>
<td>red</td>
<td>light green with broad, medium green stripes</td>
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<td>SV0258WA</td>
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<td>15-20</td>
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<td>red</td>
<td>light green with broad, medium green stripes</td>
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<tr>
<td>SV0241WA</td>
<td>I</td>
<td>12-15</td>
<td>oval</td>
<td>red</td>
<td>light green with medium green stripes</td>
</tr>
<tr>
<td>Harvest Moon</td>
<td>R</td>
<td>16-20</td>
<td>oval</td>
<td>red</td>
<td>dark green with random yellow dots</td>
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<tr>
<td>Butterball</td>
<td>I</td>
<td>12-18</td>
<td>globe</td>
<td>yellow</td>
<td>light green with narrow dark green stripes</td>
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<tr>
<td><strong>Seedless, Late</strong></td>
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<td></td>
</tr>
<tr>
<td>Sugar Fresh</td>
<td></td>
<td>15-18</td>
<td>oval</td>
<td>red</td>
<td>light green with broad, medium green stripes</td>
</tr>
<tr>
<td>Traveler</td>
<td>R</td>
<td>12-17</td>
<td>globe</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Troubadour</td>
<td>R</td>
<td>14-17</td>
<td>oval</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>SS 7197</td>
<td>I</td>
<td>16-20</td>
<td>oval</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Sweet Polly</td>
<td></td>
<td>15-18</td>
<td>oval</td>
<td>red</td>
<td>medium green with dark green stripes</td>
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</tbody>
</table>
### Recommended Watermelon Varieties (continued)

<table>
<thead>
<tr>
<th>Seedless, Late</th>
<th>Reported Disease Resistance</th>
<th>Size (lbs)</th>
<th>Shape</th>
<th>Color</th>
<th>Rind Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captivation</td>
<td>I</td>
<td>14.17</td>
<td>oval</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Maxima</td>
<td>19-22</td>
<td>globe</td>
<td>red</td>
<td></td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>SugaRed</td>
<td>16-18</td>
<td>oval</td>
<td>red</td>
<td></td>
<td>light green with broad, medium green stripes</td>
</tr>
<tr>
<td>Exclamation</td>
<td>I</td>
<td>17-21</td>
<td>oval</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Crunchy Red</td>
<td>R</td>
<td>16-20</td>
<td>oval</td>
<td>red</td>
<td>light green with broad, medium green stripes</td>
</tr>
</tbody>
</table>

### Seedless Personal Melon

<table>
<thead>
<tr>
<th>Variety</th>
<th>Size (lbs)</th>
<th>Shape</th>
<th>Color</th>
<th>Rind Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extazy</td>
<td>4-7</td>
<td>globe</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Ladybelle</td>
<td>4-8</td>
<td>globe</td>
<td>red</td>
<td>dark green with thin darker stripes</td>
</tr>
<tr>
<td>Solitaire</td>
<td>3-5</td>
<td>globe</td>
<td>red</td>
<td>medium green with dark green stripes</td>
</tr>
<tr>
<td>Vanessa</td>
<td>5-7</td>
<td>globe</td>
<td>red</td>
<td>dark green</td>
</tr>
</tbody>
</table>

### Edible Pollenizers

<table>
<thead>
<tr>
<th>Variety</th>
<th>Size (lbs)</th>
<th>Shape</th>
<th>Color</th>
<th>Rind Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estrella</td>
<td>20-24</td>
<td>oblong</td>
<td>red</td>
<td>dark green with broken, light green stripes</td>
</tr>
<tr>
<td>Jade Star</td>
<td>13-16</td>
<td>globe</td>
<td>red</td>
<td>dark green</td>
</tr>
<tr>
<td>Mickeylee</td>
<td>8-12</td>
<td>globe</td>
<td>red</td>
<td>light green</td>
</tr>
<tr>
<td>Pata Negra</td>
<td>12-15</td>
<td>globe</td>
<td>red</td>
<td>dark green</td>
</tr>
<tr>
<td>Sangria</td>
<td>20-24</td>
<td>oblong</td>
<td>red</td>
<td>dark green with broken light green stripes</td>
</tr>
<tr>
<td>SF 800</td>
<td>24-28</td>
<td>oblong</td>
<td>red</td>
<td>dark green with broken light green stripes</td>
</tr>
<tr>
<td>Stargazer</td>
<td>24-26</td>
<td>oblong</td>
<td>red</td>
<td>dark green with broken light green stripes</td>
</tr>
</tbody>
</table>

### Inedible Special Pollenizers

<table>
<thead>
<tr>
<th>Variety</th>
<th>Size (lbs)</th>
<th>Shape</th>
<th>Color</th>
<th>Rind Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accomplice</td>
<td>I</td>
<td>I</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Pollen Pro</td>
<td>I</td>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polimax</td>
<td>I</td>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sidekick</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP 6</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>Wild Card</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td></td>
</tr>
</tbody>
</table>

1 Reported disease resistance from source seed companies and University trials. *R=*Resistance; *I=*intermediate/partial resistance
2 Fon Gen = general resistance to Fon; Co = Anthracnose caused by Colletotrichum orbiculare; Px = Powery mildew caused by Podosphaeria xanthii
Fon = Fusarium wilt caused by Fusarium oxysporum f. sp. niveum Race 1, 2, or 3.
R = Resistance or I = intermediate/partial resistance to race Fon1, Fon2, or Fon3.
**Recommended Nutrients Based on Soil Tests**

Before using the table below, refer to important notes in the Soil and Nutrient Management chapter in Section B and your soil test report. These notes and soil test reports provide additional suggestions to adjust rate, timing, and placement of nutrients. Your state’s soil test report recommendations and/or your farm’s nutrient management plan supercede recommendations found below.

<table>
<thead>
<tr>
<th>Watermelons</th>
<th>Soil Phosphorus Level</th>
<th>Soil Potassium Level</th>
<th>Nutrient Timing and Method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pounds N per Acre</td>
<td>Pounds P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt; per Acre</td>
<td>Total nutrient recommended.</td>
</tr>
<tr>
<td>Nonirrigated</td>
<td>80-100</td>
<td>150 100 50 0&lt;sup&gt;1&lt;/sup&gt;</td>
<td>200 150 100 0&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>150 100 50 0&lt;sup&gt;1&lt;/sup&gt;</td>
<td>200 150 100 0&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>25-50</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td>Irrigated</td>
<td>125-150</td>
<td>150 100 50 0&lt;sup&gt;1&lt;/sup&gt;</td>
<td>200 150 100 0&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>25-50</td>
<td>150 100 50 0&lt;sup&gt;1&lt;/sup&gt;</td>
<td>200 150 100 0&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>25-50</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td></td>
<td>25-50</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
</tr>
</tbody>
</table>

For seedless watermelons, high rates of nitrogen may increase the risk of hollow heart.

<sup>1</sup>In Virginia, crop replacement values of 25 lbs. P<sub>2</sub>O<sub>5</sub> and 50 lbs. K<sub>2</sub>O per acre are recommended on soils testing Very High.

**Plant Tissue Testing and Petiole Sap Analysis**

Plant tissue testing and petiole sap analysis are useful tools to monitor watermelon plant nutrient status, especially for nitrogen and potassium. For tissue testing, take the most recent fully expanded leaves at early bloom and send to a laboratory for testing according to their instructions. Sufficiency ranges for nitrogen are between 2.5 to 3.5% and for potassium are between 2.7 to 3.5%.

Petiole sap testing can be performed with portable meters. See section B-6 for sampling details for petiole sap testing.
When vines are 6 inches in length, sap nitrate-N should be between 1200-1500 ppm and potassium between 4000-5000 ppm. When fruits are 2 inches in length, nitrate-N should be 1000-1200 ppm and potassium 4000-5000 ppm. When fruits are one-half mature, nitrate-N should be 800-1000 ppm and K should be 3500-4000 ppm and at first harvest, nitrate-N should be 600-800 ppm and potassium 3000-3500 ppm.

### Critical watermelon tissue test values.

<table>
<thead>
<tr>
<th>Timing</th>
<th>Value</th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>S</th>
<th>Fe</th>
<th>Mn</th>
<th>Zn</th>
<th>B</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most recently matured leaf when vines touch</td>
<td>Deficient</td>
<td>&lt;3.0</td>
<td>0.3</td>
<td>3</td>
<td>1</td>
<td>0.25</td>
<td>0.2</td>
<td>&lt;30</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Adequate range</td>
<td></td>
<td>3</td>
<td>0.3</td>
<td>3</td>
<td>1</td>
<td>0.25</td>
<td>0.2</td>
<td>30</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0.5</td>
<td>4</td>
<td>2</td>
<td>0.5</td>
<td>0.4</td>
<td>100</td>
<td>100</td>
<td>40</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>&gt;4.0</td>
<td>0.5</td>
<td>4</td>
<td>2</td>
<td>0.5</td>
<td>0.4</td>
<td>&gt;100</td>
<td>100</td>
<td>40</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Toxic (&gt;5)</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Most recently matured leaves at first flower</td>
<td>Deficient</td>
<td>&lt;2.5</td>
<td>0.3</td>
<td>2.7</td>
<td>1</td>
<td>0.25</td>
<td>0.2</td>
<td>&lt;30</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Adequate range</td>
<td></td>
<td>2.5</td>
<td>0.3</td>
<td>2.7</td>
<td>1</td>
<td>0.25</td>
<td>0.2</td>
<td>30</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5</td>
<td>0.5</td>
<td>3.5</td>
<td>2</td>
<td>0.5</td>
<td>0.4</td>
<td>100</td>
<td>100</td>
<td>40</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>&gt;3.5</td>
<td>0.5</td>
<td>3.5</td>
<td>2</td>
<td>0.5</td>
<td>0.4</td>
<td>&gt;100</td>
<td>100</td>
<td>40</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Toxic (&gt;5)</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Most recently matured leaf at first fruit</td>
<td>Deficient</td>
<td>&lt;2.0</td>
<td>0.3</td>
<td>2.3</td>
<td>1</td>
<td>0.25</td>
<td>0.2</td>
<td>&lt;30</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Adequate range</td>
<td></td>
<td>2</td>
<td>0.3</td>
<td>2.3</td>
<td>1</td>
<td>0.25</td>
<td>0.2</td>
<td>30</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>0.5</td>
<td>3.5</td>
<td>2</td>
<td>0.5</td>
<td>0.4</td>
<td>100</td>
<td>100</td>
<td>40</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>&gt;3.0</td>
<td>0.5</td>
<td>3.5</td>
<td>2</td>
<td>0.5</td>
<td>0.4</td>
<td>&gt;100</td>
<td>100</td>
<td>40</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Toxic (&gt;5)</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</table>

### Seed Treatment

Check with your seed company to determine if seed has been treated with an insecticide and fungicide. See the Disease section for more information to prevent disease.

### Plant Production

Transplants should be grown in plug trays with cell size at least 1.5 inches in diameter and 2 inches deep for each plant. Smaller pots or cells will restrict root growth and provide less protection to the newly set transplant. Plant one seed per cell.

Triploid (seedless) watermelon seeds require a special regime to germinate well. The seed coat of seedless watermelons 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 plant production can be broken into 6 phases: sowing, initial germination, emergence, seed leaf stage to first true leaf, first true leaf to second true leaf, and hardening-off.

### Seeding

Trays should be evenly filled with a general commercial greenhouse growing medium like Pro-Mix BX®, Fafard®, or Sunshine® #1 (these all have 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 off excess for 24 hours. During this 24 hour period, trays should be placed in a heated area so that the media reaches a temperature of 85°F. Make planting holes 1 inch deep and plant seeds with the “pointed” side up. Cover with a small amount of warm moist media just enough to fill over seeds in the holes. Do not water after seeding. Seeding should be done in a way that trays stay at 85°F (do not allow trays to get cold).

### Initial Germination

Germination should be done in a room or chamber where temperatures can be maintained at 85-90°F and where there is high humidity. Uniform tray temperature is critical. This phase will last 48 hours. To insure even germination, it may be necessary to move trays around after 24 hours. High humidity. Uniform tray temperature is critical. This phase will last 48 hours. To insure even germination, it may be necessary to move trays around after 24 hours (trays on bottom shelves moved to top shelves and vice versa) to ensure even temperature exposure. In this phase the seed root will emerge but the epicotyl (“crook”) that will carry the seed leaves above the surface should not be visible. If you see crooks, you have left trays in the germination area too long and you may experience plant “stretch” during emergence (if plants have emerged you are too late – stretch has already occurred). Stretching results in poor transplant quality.

### Emergence

After initial germination, it is critical to move plants immediately from germination areas to the greenhouse for emergence. If you are having another grower germinate your seeds, it is important to schedule pickup or delivery so that there are no delays. Greenhouses should be set for 72-75°F day temperatures and 65°F night temperatures. Do not water until after you observe crook emergence. Thereafter, water sparingly as needed to keep trays and emerging seedlings from drying out. Excess water and high greenhouse temperatures during the emergence phase will lead to stretch.

### Seed Leaf Stage to First True Leaf

Maintain greenhouse temperatures in the 72-75°F day and 65°F night range during this period. Water moderately to
keep plants from drying out but do not fertilize during this period if you are growing in a medium that has starter fertilizer. Plants should grow slowly for highest quality.

First True Leaf to Second True Leaf
Continue maintaining greenhouse temperatures in the 72-75°F day and 65°F night range during this period. You can fertilize once the first true leaf emerges. Generally 2 fertilizations of 100 ppm nitrogen concentration one at first true leaf and one at second true leaf will be sufficient. If a constant feed system is used, set for 50 ppm nitrogen for each watering once the first true leaf has emerged. These fertilization rates are for the media listed in the seeding section that contain a starter fertilizer charge. Avoid using fertilizers with high amounts of ammonium N as the nitrogen source as this can lead to stretch (use fertilizers with calcium nitrate and potassium nitrate as the main nitrogen sources). Avoid over-watering. Some growers use media with no starter fertilizer charge. If that is the case, a different fertilizer program will be needed. Use fertilizers with calcium nitrate and potassium nitrate as nitrogen sources. Use 50 ppm N from emergence to first true leaf every 3 days, 200 ppm N every other day from first true leaf to second true leaf.

Hardening Off
It will take 4 to 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 time temperatures in the greenhouse (if greenhouses have side curtains roll them up during days if temperatures are not too cool). Reduce watering and stop fertilization. Some growers have the ability to place plants on wagons or move benches outside during the day, bringing them in at night. This is advised where possible but make sure the area is sheltered from high winds and avoid days where the temperature is below 60°F.

Pollinizers
The above information is for growing the seedless watermelons. Seeded pollinizers and standard seeded watermelons do not need special germinating conditions and can be grown directly in the greenhouse. It is of crucial importance to time the production so that plants are produced and hardened off at the same time as the seedless types. They also should be grown slowly and attention should be paid to avoid stretch. Follow the same recommendations from seed leaf stage through hardening off.

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 windbreak 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: See Pollination and Pollenizers section for planting recommendations.

Mulching
The majority of watermelons are grown on black plastic mulch with drip irrigation (see Chapter C). Weed control under the plastic is performed by using labeled herbicides (see Weed Control section) or by fumigation. Fumigation is also used to control soil borne diseases such as Fusarium. See section E6 for fumigation recommendations. Fumigation will be necessary when there is a history of soil-borne diseases in the field.

Plastic and fumigant should be applied on well-prepared planting beds 30 days before field planting. Plastic should be 3-4 feet wide and laid on 6- to 8-foot centers immediately over the fumigated soil. The soil must be moist when laying the plastic. IRT plastic has been used in cooler areas for additional soil heating. Fertilizer must be applied during bed preparation. At least 50% of the nitrogen (N) should be in the nitrate (NO₃⁻) form. Direct seeding through the mulch is possible for seeded types but is not generally recommended for seedless varieties.

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 fruits 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 triploid and pollenizer plants. There are three methods that can be used to incorporate pollenizer plants into the field. Pollenizer plants may be dedicated to every third row. A second alternative is to plant a pollenizer every third or fourth plant in-row with additional spacing for pollenizers. A third 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 above in the “variety” table. 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 pollinizers planted in dedicated rows, special pollinizer plants should be transplanted at the same times as triploid plants. As a general rule, direct field seeding of the pollinizer variety should be done on the same day the triploid seed is planted in the greenhouse. If transplants are used for pollinizers, they can be seeded a few days after triploid transplants are scheduled to be seeded.

Honeybees, squash bees, bumblebees and other wild bees are essential for proper watermelon pollination and fruit set. Honeybee or bumblebee 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. See the section on "Pollination" in Chapter A, the General Production Recommendations, and/or Table D-6 for relative toxicity of various pesticides for hazards to bees.

Windbreaks
Use windbreaks as necessary especially in windy areas. 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 earliest plantings for additional protection. Rye is the most common small grain used for windbreaks due to height and rapid growth. Establish windbreaks in the fall, either as a solid planting or spacing windbreak rows at intervals the width of the rows. Plant at high density to insure 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
It is important to 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.

Irrigation
Watermelons can be grown under dryland conditions, however 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. Drying of the stem tendril nearest the attachment point of the watermelon 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.

Harvested watermelons should be stored at 50° to 60°F and a relative humidity of 90% during storage and shipping. Watermelons are not adapted to long storage. At low temperatures, they are subject to various symptoms of chilling injury and loss of quality, and at high temperatures they are subject to decay.

Watermelons should be consumed within 2 to 3 weeks after harvest, primarily because of the gradual loss of crispness. Quality in watermelons is determined largely by high sugar content, a 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 market 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, watermelons should not be stored or shipped with fruits that emit substantial amounts of ethylene.

Rough handling will result in serious losses. Bulk bins with pallets, if used, can speed handling and minimize melon damage.

Watermelons are marketed by weight and bin counts: large, or 32-35 (more than 18 lbs per melon) per bin, medium, or 45 per bin (14-18 lbs) and smaller, or 50-60 per bin (14 lbs or less). 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

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 a minimum of 1,000 grains of pollen are necessary to set fruit. Inadequate pollen has been reported to impact the severity of hollow heart.

Inadequate pollination may lead to undesirable “triangular” fruits.

Sunsclad
Sunsclad occurs when fruits are exposed to direct sunlight, especially on extremely hot days. Under these conditions, rind surfaces can reach temperatures exceeding 140° F killing cells and resulting in sunburn spots. Fruits 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.

Hollow Heart
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 nitrogen), and factors producing rapid growth have been reported to impact the severity of hollow heart.
Water Melons

**Water Soaking**
This disorder occurs when 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.

**Splitting**
Splitting during handling occurs in fruits under excessive water pressure. Excess irrigation or rainfall are the usual causes.

**Irregular Ripening**
Irregular ripening can be a problem in some years and varieties. Watermelons are classified as non-climacteric since they do not continue to ripen significantly after harvest. However, recent research has shown that watermelon fruit produce a burst of ethylene at the white fruit stage and factors that reduce ethylene will slow ripening. Watermelon fruit development and ripening are also dependent 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 sugars available to the fruit. Different varieties, low potassium nutrition, or variability in vine health will lead to variability in fruit ripening.

**Internal Rind Necrosis**
Internal rind necrosis is indicated by the presence of a corky, red-brown layer of tissue that occurs on the inside of the rind of affected fruit but that does not extend 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.

**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-3 and E-4.

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 plastic mulch.

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

Determine the preharvest interval (PHI) for the crop. See Table E-4 and consult the herbicide label.

Find the herbicides you plan to use in the Herbicide Resistance Action Committee’s (HRAC) Herbicide Site of Action Table E-8 and follow the recommended good management practices to minimize the risk of herbicide resistance development by weeds in your fields.

**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 plastic mulch is used. Trickle irrigation tubing 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 tubing 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 ft²).

Bensulide—5.0 to 6.0 lb/A. Apply 5.0 to 6.0 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 lambsquarters, smooth pigweed, and common purslane.

Fomesafen—0.16 to 0.19 lb/A. A Special Local-Needs Label 24(c) has been approved for the use of Reflex 2E to control weeds in watermelon in Delaware, Maryland, and Virginia. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, “farmassist.com”. Go to the website “farmassist.com” and register (or sign in if previously registered), then under “products” on the toolbar, click on indemnified labels and follow the instructions. Apply 10 to 12 fl oz/A immediately prior to laying plastic, and lay plastic without disturbing the treated soil. Foliar application of Reflex will severely damage or kill watermelon. The potential of crop injury is greater on lighter textured soils combined with intensive irrigation programs or high amounts of rainfall, therefore, adjust use rates accordingly. Watermelon varieties may vary in their response to Reflex; therefore, treat small acreages first to determine crop tolerance, especially when applying to a new variety. A maximum of 1.5 pint of Reflex (or a maximum of 0.375 lb ai/A of fomesafen from any product containing fomesafen) may be applied per acre in ALTERNATE years in Delaware, Maryland, and Virginia, be sure to consider rotational crops when deciding to apply fomesafen. If 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.
Halosulfuron--0.023 to 0.031 lb/A. Apply 0.5 to 0.75 a
 dry ounce Sandea 75WG to suppress or control yellow
 nutseedge 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
 sowing 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 2.0 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 to 0.2 lb/A. Apply 2.0 to 4.0 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 ft²).

 Preemergence
 Bensulide--5.0 to 6.0 lb/A. Apply 5.0 to 6.0 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 lambsquarters,
 smooth pigweed, and common purslane.

 Clomazone--0.094 to 0.188 lb/A. Apply 4.0 to 8.0 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
 lambsquarters, 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 outsite 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 to 1.12 lb/A. Apply 1.0 to 3.0 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
 lambsquarters, 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!

 Ethalfluralin plus Clomazone (jug-mix)--0.394 to 1.575
 lb/A. Apply 1.5 to 6.0 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 ethalfluralin (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**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Ethalfluralin (Curbit) lb ai/A</th>
<th>Clomazone (Command) lb ai/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>0.3</td>
<td>0.094</td>
</tr>
<tr>
<td>2.0</td>
<td>0.4</td>
<td>0.125</td>
</tr>
<tr>
<td>3.0</td>
<td>0.6</td>
<td>0.188</td>
</tr>
<tr>
<td>4.0</td>
<td>0.8</td>
<td>0.250</td>
</tr>
<tr>
<td>5.0</td>
<td>1.0</td>
<td>0.312</td>
</tr>
<tr>
<td>6.0</td>
<td>1.2</td>
<td>0.375</td>
</tr>
</tbody>
</table>

Labeled for use in all the Mid-Atlantic States. Read and follow all the recommendations and warnings (above) for ethalfluralin (Curbit) and clomazone (Command).

Flumioxazin 0.125 lbs. A Special Local-Needs Label 24(c) has been approved for the use of Chateau SW in watermelons in Delaware only. This label is administered through the Delaware Fruit/Vegetable Association and requires a signed authorization and waiver of liability. Without a signed authorization and waiver this is a misuse of the product. Apply Chateau SW up to 4 oz product to row middles of raised plastic-mulched beds that are at least 4 inches higher than the treated row middle and the mulched bed must be a minimum of a 24-inch bed width. Spray must remain between raised beds and contact no more than the bottom 1 inch of the side of the raised bed Do not apply after crops are transplanted/seeded. All applications must be made with shielded or hooded equipment. For control of emerged weeds, a burn down herbicide may be tank-mixed. Do not apply more than 4 oz during any single application. Tank-mixtures with labeled residual grass herbicides are allowed.

Fomesafen--0.16 to 0.25 lb/A. A Special Local-Needs Label 24(c) has been approved for the use of Reflex 2E to control weeds in watermelon in Delaware, Maryland, and Virginia. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, “farmassist.com”. Go to the website “farmassist.com” and register (or sign in if previously registered), then under “products” on the toolbar, click on immunified labels and follow the instructions. Apply 10 to 12 fl oz/A in Virginia and 10 to 16 fl oz/A in Delaware or Maryland to row middles only prior to watermelon transplanting. If applying overttop of plastic mulch (broadcast) rate is 10 to 12 fl oz; and it is critical that top of mulch bed is shaped to shed water and water does not accumulate in the transplant row. Foliar application or contact of Reflex will severely damage or kill watermelon. The potential of crop injury is greater on lighter textured soils combined with intensive irrigation programs or high amounts of rainfall, therefore, adjust use rates accordingly. Watermelon varieties may vary in their response to Reflex; therefore, treat small acreages first to determine crop tolerance, especially when applying to a new variety. A maximum of 1.5 pint of Reflex (or a maximum of 0.375 lb ai/A of fomesafen from any product containing fomesafen) may be applied per acre in ALTERNATE years in Delaware, Maryland, and Virginia, be sure to consider rotational crops when deciding to apply fomesafen. If 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.

Halosulfuron--0.023 to 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-cyle. DO NOT exceed a total of 0.094 pound per acre, equal to 2.0 dry ounces of Sandea, in a 1 year (12 month) period.

Pendimethalin--1.0 lb/A. Apply 2.1 pints per acre Prowl H2O as a banded directed shielded spray before transplanting, or before seeded crop has emerged. Activate with one-half inch of rainfall or sprinkler irrigation within 48 hours of application to control most annual grasses and certain broadleaf weeds. A second treatment at the same rate may be applied as a banded directed shielded 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. Observe a 35 day PHI (PreHarvest Interval).

S-metolachlor--0.64 to 1.21 lb/A. A Special Local-Needs Label 24(c) has been approved for the use of Dual Magnum 7.62E to control weeds between the rows of plastic mulch in watermelons in Delaware. The use of this product is legal ONLY if a waiver of liability is completed. The waiver of liability can be completed on the Syngenta website, “farmassist.com”. Go to the website “farmassist.com” and register (or sign in if previously registered), then under “products” on the
toolbar, click on indemnified labels and follow the instructions. Apply 0.67 to 1.27 pints per acre Dual Magnum 7.62E to control annual grasses, galinsoga, and certain other broadleaf weeds, and to suppress or control yellow nutsedge. Use as a surface-applied shielded and directed spray preemergence to the weeds before crop emergence or before transplanting. DO NOT apply Dual Magnum to the plastic mulch, or allow the spray to contact watermelon foliage. DO NOT preplant- incorporate Dual Magnum into the soil. 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. Other generic versions of metolachlor and s-metolachlor may be available, and may or may not be labeled for use in the crop. Observe a minimum preharvest interval of 60 days.

Terbacil--0.1 to 0.2 lb/A. Apply 2.0 to 4.0 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 (PostHarvest Interval).

Postemergence
Fomesafen--0.25 to 0.38 lb/A. A Special Local-Needs Label 24(c) has been approved for this specific application timing of Reflex 2E to control weeds in watermelon in Delaware and Maryland ONLY. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, “farmassist.com”. Go to the website “farmassist.com” and register (or sign in if previously registered), then under “products” on the toolbar, click on indemnified labels and follow the instructions. Apply 16 to 24 fl oz/A in Delaware or Maryland to row middles with shielded or hooded sprayers. Make application before the vines begin to “run” off the plastic. Fomesafen should be tankmixed with additional herbicides 1.) to improve control of emerged weeds since it is weak on common lambsquarters and grass species and/or, 2.) if grass weeds are expected to emerge after application. Foliar application of Reflex will severely damage or kill watermelon. The potential of crop injury is greater on lighter textured soils combined with intensive irrigation programs or high amounts of rainfall, therefore, adjust use rates accordingly. Watermelon varieties may vary in their response to Reflex; therefore, treat small acreages first to determine crop tolerance, especially when applying to a new variety. A maximum of 1.5 pint of Reflex (or a maximum of 0.375 lb ai/A of fomesafen from any product containing fomesafen) may be applied per acre in ALTERNATE years in Delaware and Maryland, be sure to consider rotational crops when deciding to apply 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. Do not apply within 35 days of harvest.

Halosulfuron--0.023 to 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 lambsquarters 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 2.0 dry ounces of Sandea, in a 1 year (12 month) period.

Pendimethalin--1.0 lb/A. Apply 2.1 pints per acre Prowl H2O as a banded directed shielded spray before transplanting, or before seeded crop has emerged. Activate with one-half inch of rainfall or sprinkler irrigation within 48 hours of application to control most annual grasses and certain broadleaf weeds emerging from seed (preemergence). Tank-mix with Gramoxone plus a nonionic surfactant or another recommended postemergence herbicide to control emerged weeds. DO NOT apply “over the top” of the crop, or severe injury may occur. Observe a 35 day PHI (PostHarvest Interval).

Paraquat--0.6 lb/A. A Special Local-Needs 24(c) label has been approved for the use of Gramoxone SL 2.0 or OLF 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 SL 2.0 or OLF 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 to 0.125 lb/A. Apply 6.0 to 8.0 fluid ounces per acre Select 2EC with oil concentrate to be 1 percent of the spray solution (1.0 gallon per 100 gallons of spray solution) or 12.0 to 16.0 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray solution (1.0 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 to 0.3 lb/A. Apply 1.0 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1.0 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 least 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 ft²).

Preplant Incorporated or Preemergence

Bensulide—5.0 to 6.0 lb/A. Apply 5.0 to 6.0 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 lambsquarters, smooth pigweed, and common purslane.

Preemergence

Clomazone—0.094 to 0.188 lb/A. Apply 4.0 to 8.0 fluid ounces per acre Command 3ME preemergence to a directly seeded crop to control annual grasses and many broadleaf weeds including common lambsquarters, 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 hilly 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.

Ethalfluralin—0.38 to 0.94 lb/A. Apply 1.0 to 2.5 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 lambsquarters, 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!

Ethalfluralin plus Clomazone (jug-mix)—0.394 to 1.575 lb/A. Apply 1.5 to 6.0 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
herbicides with this mode of action have a high risk of developing resistant weed populations when only one site of activity is used. The use of ALS inhibitors is among the most common methods of weed control. A maximum of 1.5 pint of Reflex will severely damage or kill watermelons. Do NOT apply "over the top" or allow spray solution to contact crop foliage, or injury may result. Observe a 70 day PHI (PreHarvest Interval).

**Postemergence**

Clodethomim--0.094 to 0.125 lb/A. Apply 6.0 to 8.0 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 12.0 to 16.0 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray solution (1.0 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 to 0.3 lb/A. Apply 1.0 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1.0 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 SL 2.0 or OLF for postharvest desiccation of the crop in Delaware, New Jersey and Virginia. Apply 2.4 pints per acre Gramoxone SL 2.0 or OLF 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 ft²).

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
THE LABEL IS THE LAW. PLEASE REFER TO THE LABEL FOR UP TO DATE RATES AND RESTRICTIONS
NOTE: Copies of specific insecticide product labels can be downloaded by visiting the websites www.CDMS.net or www.greenbook.net. 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. 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.

 Aphids
NOTE. Aphids transmit multiple viruses. Cultivars that are resistant to multiple aphid-transmitted viruses are available. For chemical control of aphids, apply one of the following formulations:

acetamiprid--2.5 to 4.0 oz/A Assail 30G
clothianidin--soil 9.0 to 12.0 fl oz/A Belay 2.13SC; foliar 3.0 to 4.0 fl oz/A Belay 2.13SC
dimethoate--0.5 to 1.0 pt/A Dimethoate 400 (or OLF)
flonicamid--2.0 to 2.8 oz/A Beleaf 50 SG
flupyridifurone--7.0 to 12.0 fl oz/A Sivanto 200SL
imidacloprid--soil only 7.0 to 10.5 fl oz/A Admire PRO 4.6SC (or OLF)
lambda cyhalothrin+thiamethoxam--4.5 fl oz/A Endigo ZC
methomyl--(melon aphid only) 1.5 to 3.0 pts/A Lannate LV
oxamyl--2.0 to 4.0 pts/A Vydate 2L
pyrimethanil--2.75 oz/A Fulfill 50WDG
thiamethoxam--soil 1.66 to 3.67 oz/A Platinum 75SG; foliar 1.5 to 3.0 oz/A Actara 25WDG (or other labeled mixtures containing thiamethoxam like Durivo and Voluma Flexi)
zeta-cypermethrin+a vermectin B1-19.0 fl oz/A Gladiator

Beet Armyworm
chlorantraniliprole--soil/drip/foliar 3.5 to 5.0 fl oz/A Coragen 1.67SC
flubendiamide--1.5 fl oz/A Belt 4SC (or other labeled mixtures containing flubendiamide like Vetica)
indoxacarb--3.5 to 6.0 oz/A Avaunt 30WDG
lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voluma Xpress
methomyl--1.5 to 3.0 pts/A Lannate LV
methoxyfenozide--4.0 to 10.0 fl oz/A Intrepid 2F
spinetoram--5.0 to 10.0 fl oz/A Radiant 1SC
spinosad--4.0 to 8.0 fl oz/A Entrust 2SC OMRI listed
zeta-cypermethrin+a vermectin B1-19.0 fl oz/A Gladiator

Cabbage Looper
Apply one of the following formulations:

Bacillus thuringiensis--0.5 to 2.0 lb/A DiPel (or OLF)
beta-cyfluthrin--1.6 to 2.4 fl oz/A Baythroid XL 1EC
bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
chlorantraniliprole--soil/drip/foliar 3.5 to 5.0 fl oz/A Coragen 1.67SC (or other labeled mixtures containing chlorantraniliprole like Voluma Flexi)
cyfluthrin--1.6 to 2.4 fl oz/A Tomborne 2EC (or OLF)
esfenvalerate--5.8 to 9.6 fl oz/A Asana XL
fenpropathrin--10.67 to 16.0 fl oz/A Danitol 2.4EC
flubendiamide--1.5 fl oz/A Belt 4SC (or other labeled mixtures containing flubendiamide like Vetica)
indoxacarb--2.5 to 6.0 oz/A Avaunt 30WDG
lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy EC (Lambda T CS, or OLF)
lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voluma Xpress
lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo ZC
methomyl--1.5 to 3.0 pts/A Lannate LV
methoxyfenozide--4.0 to 10.0 fl oz/A Intrepid 2F
permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2EC (or OLF)
spinetoram--5.0 to 10.0 fl oz/A Radiant 1SC
spinosad--4.0 to 8.0 fl oz/A Entrust 2SC OMRI listed
zeta-cypermethrin--2.8 to 4.0 fl oz/A Mustang Maxx 0.8EC
zeta-cypermethrin+a vermectin B1-14.0 to 19.0 fl oz/A Gladiator
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

Cucumber Beetle
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 Farmore DI-400 should provide up to 21 days of control of cucumber beetle. Otherwise, treat with one of the following formulations when an average of two beetles per plant is found.

acetamiprid--2.5 to 5.3 oz/A Assail 30SG
beta-cyfluthrin--2.4 to 2.8 fl oz/A Baythroid XL 1EC
bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
Apply one of the following formulations:

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

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. Apply one of the following formulations:

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

Leafminers
Apply one of the following formulations:

Leafminers
Apply one of the following formulations:

abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7 SC (or OLF)
abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7 SC (or OLF)
carbaryl--1.0 qt/A Sevin XLR Plus
clothianidin--soil 9.0 to 12.0 fl oz/A Belay 2.13SC, foliar 3.0 to 4.0 fl oz/A Belay 2.13SC
cyfluthrin--2.4 to 2.8 fl oz/A Tombstone 2EC (or OLF)
dinotefuran--soil 9.0 to 10.5 fl oz/A Scorpion 35SL; foliar 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 fl oz/A Venom 70SG
esfenvalerate--5.8 to 9.6 fl oz/A Asana XL
fenpropathrin--10.67 to 16.0 fl oz/A Danitol 2.4EC
imidacloprid--soil only 7.0 to 10.5 fl oz/A Admire PRO 4.6SC (or OLF)
lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy EC(LambdaT CS, or OLF)
lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress
methomyl--1.5 to 3.0 pts/A Lannate LV
permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2EC (or OLF)
thiamethoxam-soil 1.66 to 3.67 fl oz/A Platinum 75SG, foliar 3.0 to 5.5 oz/A Actara 25WDG
thiamethoxam+chlorantraniliprole-soil 10.0 to 13.0 fl oz/A Durivo, foliar 4.0 to 7.0 oz/A Voliam Flexi
zye-cypermethrin+avermectin B1--14.0 to 19.0 fl oz/A Gladiator
zye-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

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

Apply one of the following formulations:

beta-cyfluthrin--0.8 to 1.6 oz/A Baythroid XL 1EC
bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
cyfluthrin--0.8 to 1.6 fl oz/A Tombstone 2EC (or OLF)
esfenvalerate--5.8 to 9.6 fl oz/A Asana XL
flubendiamide--1.5 fl oz/A Belt 4SC (or other labelled mixtures containing flubendiamide like Vetica)
lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy EC(LambdaT CS, or OLF)
lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress
methomyl--(granulate cutworm) 1.5 to 3.0 pts/A Lannate LV
permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2EC (or OLF)
zeta-cypermethrin--1.28 to 4.00 fl oz/A Mustang Maxx 0.8EC
zeta-cypermethrin+avermectin B1--6.0 to 19.0 fl oz/A Gladiator
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

Leafminers
Apply one of the following formulations:

abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7 SC (or OLF)
clothianidin--soil 9.0 to 12.0 fl oz/A Belay 2.13SC, foliar 3.0 to 4.0 fl oz/A Belay 2.13SC
cyfluthrin--2.4 to 2.8 fl oz/A Tombstone 2EC (or OLF)
dinotefuran--soil 9.0 to 10.5 fl oz/A Scorpion 35SL or 5.0 to 6.0 oz/A Venom 70SG; foliar 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 fl oz/A Venom
lambda-cyhalothrin+chlorantraniliprole--9.0 fl oz/A Voliam Xpress
lambda-cyhalothrin+thiamethoxam--4.5 fl oz/A Endigo ZC
oxamyl--2.0 to 4.0 pts/A Vydate 2L
spinetoram--6.0 to 10.0 fl oz/A Radiant 1SC
spinosad--6.0 to 8.0 fl oz/A Entrust 2SC OMRI listed
thiamethoxam-soil 1.66 to 3.67 fl oz/A Platinum 75SG, foliar 3.0 to 5.5 oz/A Actara 25WDG
thiamethoxam+chlorantraniliprole-soil 10.0 to 13.0 fl oz/A Durivo, foliar 4.0 to 7.0 oz/A Voliam Flexi
zye-cypermethrin+avermectin B1--19.0 fl oz/A Gladiator

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. Apply one of the following formulations:

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

abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7 SC (or OLF)
bifenazate--0.75 to 1.00 lbs/A Acramite 50WS
etoxazoline--2.0 to 3.0 oz/A Zeal Miticid1
fenpyroximate--2.0 pts/A Portal XLO
spiromesifen--7.0 to 8.5 fl oz/A Oberon 2SC
zye-cypermethrin+avermectin B1--19.0 fl oz/A Gladiator

Pickleworm, Melonworm
Make one treatment prior to fruit set, and then treat weekly. Use one of the following formulations:

acetamiprid--2.5 to 5.3 oz/A Assail 30SG
beta-cyfluthrin--1.6 to 2.4 fl oz/A Baythroid XL 1EC
bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
carbaryl--0.5 to 1.0 qt/A Sevin XLR Plus
chlorantraniliprole--(melonworm) drip 2.0 to 3.5 fl oz/A Coragen 1.67SC, foliar 2.0 to 5.0 fl oz/A Coragen 1.67SC; (pickleworm) drip/foliar 3.5 to 5.0 fl oz/A Coragen 1.67SC (or other labeled mixtures containing chlorantraniliprole like Voliam flexi)
cyfluthrin--1.6 to 2.4 fl oz/A Tombstone 2EC (or OLF)
esfenvalerate--(pickleworm only) 5.8 to 9.6 fl oz/A Asana XL
flubendiamide--1.5 fl oz/A Belt 4SC (or other labeled mixtures containing flubendiamide like Vetica)
indoxacarb--2.5 to 6.0 oz/A Avarant 30WDG
lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy EC(LambdaT CS, or OLF)
lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress
lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo ZC
methomyl--(granulate cutworm) 1.5 to 3.0 pts/A Lannate LV
permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2EC (or OLF)
zeta-cypermethrin--1.28 to 4.00 fl oz/A Mustang Maxx 0.8EC
zeta-cypermethrin+avermectin B1--6.0 to 19.0 fl oz/A Gladiator
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

Leafminers
Apply one of the following formulations:

abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7 SC (or OLF)
clothianidin--soil 9.0 to 12.0 fl oz/A Belay 2.13SC, foliar 3.0 to 4.0 fl oz/A Belay 2.13SC
cyfluthrin--2.4 to 2.8 fl oz/A Tombstone 2EC (or OLF)
dinotefuran--soil 9.0 to 10.5 fl oz/A Scorpion 35SL or 5.0 to 6.0 oz/A Venom 70SG; foliar 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 fl oz/A Venom
Rindworms

Damage to the rinds may result from a complex of insect pests 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 section for labeled products.

For lepidopteran rindworms, use one of the following formulations:

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Use Category</th>
<th>Hours to Reentry</th>
<th>Days to Harvest</th>
</tr>
</thead>
<tbody>
<tr>
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<td>3</td>
</tr>
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<tr>
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<td>1</td>
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<td>thiamethoxam+avermectin B1</td>
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<td>12</td>
<td>7</td>
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</tr>
<tr>
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<tr>
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</tr>
<tr>
<td>Cabrio (Group 11)</td>
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<td>chlorothalonil (Group M5)</td>
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<tr>
<td>Curate (Group 27)</td>
<td>G</td>
<td>12</td>
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<td>Fentilis (Group 7)</td>
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<td>Forum (Group 40)</td>
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<tr>
<td>Gavel (Groups 22 + M3)</td>
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</tr>
<tr>
<td>Inspire Super (Groups 3 + 9)</td>
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<td>7</td>
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<tr>
<td>Luna Experience (Groups 7 + 3)</td>
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<td>7</td>
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<td>Luna Sensation (Groups 7 + 11)</td>
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<tr>
<td>mancozeb (Group M3)</td>
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<tr>
<td>Merivan (Groups 11 + 7)</td>
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<td>7</td>
</tr>
<tr>
<td>MetaStar (Group 4)</td>
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<td>Presidio (Group 43)</td>
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<td>Previcur Flex (Group 28)</td>
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<tr>
<td>Pristine (Groups 11 + 7)</td>
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<td>Procure (Group 3)</td>
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<td>Quadris Top (Groups 11 + 3)</td>
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<tr>
<td>Quintec (Group 13)</td>
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<tr>
<td>Rally (Group 3)</td>
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<tr>
<td>Ranman (Group 21)</td>
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Thrips

Apply one of the following formulations:

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<tr>
<th>Pesticide</th>
<th>Use Category</th>
<th>Hours to Reentry</th>
<th>Days to Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actigard (Group P1)</td>
<td>G</td>
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<td>0</td>
</tr>
<tr>
<td>Aprovia Top (Groups 11 + 3)</td>
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<td>0</td>
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<tr>
<td>Atrion (Groups M5 + 27)</td>
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</tr>
<tr>
<td>azoxyctrobin (Group 11)</td>
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<tr>
<td>Cabrio (Group 11)</td>
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<tr>
<td>chlorothalonil (Group M5)</td>
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<tr>
<td>copper, fixed (Group M1)</td>
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</tr>
<tr>
<td>Curate (Group 27)</td>
<td>G</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Fentilis (Group 7)</td>
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<tr>
<td>Forum (Group 40)</td>
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<td>0</td>
</tr>
<tr>
<td>Gavel (Groups 22 + M3)</td>
<td>G</td>
<td>48</td>
<td>5</td>
</tr>
<tr>
<td>Inspire Super (Groups 3 + 9)</td>
<td>G</td>
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<td>7</td>
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<td>Luna Experience (Groups 7 + 3)</td>
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<td>7</td>
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<td>mancozeb (Group M3)</td>
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<td>Merivan (Groups 11 + 7)</td>
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<tr>
<td>MetaStar (Group 4)</td>
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<tr>
<td>Presidio (Group 43)</td>
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<tr>
<td>Previcur Flex (Group 28)</td>
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<tr>
<td>Pristine (Groups 11 + 7)</td>
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</tr>
<tr>
<td>Procure (Group 3)</td>
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<tr>
<td>Proline (Group 3)</td>
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<td>7</td>
</tr>
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<td>Quadris Top (Groups 11 + 3)</td>
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<tr>
<td>Quintec (Group 13)</td>
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<td>Rally (Group 3)</td>
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<tr>
<td>Ranman (Group 21)</td>
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</tbody>
</table>
Nematode Control

See Chapter E "Nematodes" section of Soil Pests-Their Detection and Control. Use fumigants listed in the "Soil Fumigation" in the same section or apply one of the following:

Vydate L--1.0 to 2.0 gal 2L/A. Incorporate into the top 2 to 4 inches of soil or 2.0 to 4.0 pints 2L per acre applied 2 weeks after planting and repeat 2 to 3 weeks later.

Nimitz 4EC--3.5 to 5.0 pt 4EC/A. Incorporate or drip-apply 7 days before planting.

Disease Control

Seed Treatment

Check with your seed company to determine if seed has been treated with an insecticide and fungicide. If it has not been treated, use a mixture of thiram 4.5 fl oz 480DP/100 pounds) and an approved commercially available insecticide.

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 to 2.0 pt 4SL/A or Ultra Flourish--2.0 to 4.0 pt 2E/A)
methoxyfen (MetaStar)--4.0 to 8.0 pt 2E/A
Uniform--0.34 fl oz 3.66SE/1000 ft row
Previcur Flex--1.2 6F applied in transplant water, drip irrigation, or directed to the base of the plants and soil.

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 seeding symptoms or fruit blotch disease. 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. Apply one of the following fungicide schedules beginning before the first flower is open and continuing until three weeks after flowering. Subsequent fruit sets must also be protected.

copper, fixed--at labeled rates

AngularLeaf Spot

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

Viruses (WMV2, PRSV, ZYMV, and CMV)

The most prevalent virus in the mid-Atlantic region is WMV2 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.

Ozone Injury

Ozone is a common air pollutant. When present in high concentrations in the atmosphere, 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. Several newly released seedless varieties have resistance to Fusarium wilt caused by race 1. However, their level of resistance is lower than in resistant seeded varieties varieties and race 2 also occurs in our region. Some pollinizers have good resistance to Fusarium wilt caused by race 1.

Application of Proline--5.7 fl oz 480 SC/A through drip irrigation or as a post-plant drench, may reduce Fusarium wilt early season.

Anthracnose

Excellent resistance is available in some varieties and should be used when possible. Begin fungicide applications when vines run or earlier if symptoms are detected.

Under light or moderate disease pressure:

Alternate:

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

With:

chlorothalonil--2.0 to 3.0 pt 6F/A plus thiophanate-methyl--0.5 lb 70WP/A
mancozeb--2.0 to 3.0 lb 80DF/A plus thiophanate-methyl--0.5 lb 70WP/A

Under high disease pressure, tank-mix:

chlorothalonil--2.0 to 3.0 pt 6F/A with one of the following fungicides:

Cabrio--12.0 to 16.0 oz 20EG/A
Fontelis--16 fl oz 1.6SC/A
Pristine--18.5 oz 38WG/A
azoxystrobin--11.0 to 15.5 fl oz 2.08F/A or OLF
Tanos--8.0 oz 50DF/A
Quadris Top--12.0 to 14.0 fl oz 2.7F/A

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**WATERMELONS**

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**WATERMELONS**

*And rotate every 7 days with:*
chlorothalonil--2.0 to 3.0 pt 6F/A *plus* thiophanate-methyl--0.5 lb 70WP/A
mancozeb--2.0 to 3.0 lb 80DF/A or OLF *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, Quadris Top, Tanos or Cabrio.*

**Downy Mildew**
Scout fields for disease incidence on a regular basis. Begin targeted sprays when disease occurrence is predicted for the region. Refer to the Cucurbit Downy Mildew Forecasting website (http://cdm.ipmpipe.org) for current status of the disease. Preventative applications are much more effective than applications made after downy mildew is detected. The following are the most effective materials (tank-mix one of these products with a protectant fungicide such as chlorothalonil--1.5 to 2.0 pt 6F/A or OLF):

Ranman--2.10 to 2.75 fl oz 400SC/A (plus a non-ionic or organosilicon surfactant; do not apply with copper; see label for additional precautions)
Zampro--14.0 fl oz 525SC/A

Other materials for use in rotation as tank mix partners with a protectant:
Previcur Flex--1.2 pt 6F/A
Ariston--3.0 pt 42SC/A (contains chlorothalonil)
Forum 6.0 fl oz 4.17SC/A
Tanos--8.0 oz 50DF/A
Gavel--1.5 to 2.0 lb 75DF/A (Gavel contains mancozeb, which is a protectant, and does not need a tank-mix partner),
Curzate--3.2 oz 60DF/A
Zing!--36 fl oz 4.9 SC/A
Presidio--4.0 fl oz 4SC/A

Materials with different Modes of Action (FRAC groups) should be alternated.
Sprays should be applied on a 7-day schedule when disease is forecast or present in region. Under severe disease conditions and conducive weather, spray interval may be reduced if label allows.

**Alternaria Leaf Blight.**
Begin sprays when vines begin to run.

*Alternate one of the following:*
chlorothalonil--2.0 to 3.0 pt 6F/A, or OLF (Use low rate early in season),
mancozeb--2.0 to 3.0 lb 75 DF/A or OLF

*With:*
Pristine--12.5 to 18.5 oz 38WG/A,
a tank-mix of chlorothalonil *plus* one of the following every 14 days:
aoxyxystrobin--11.0 to 15.5 fl oz 2.08F/A or OLF (do not apply near appels, see label for details)
Cabrio--12.0 to 16.0 oz 20EG/A
Reason--5.5 fl oz 500SC/A
Inspire Super--16.0 to 20.0 fl oz 2.8 F/A
Quadris Top--12.0 to 14.0 fl oz 2.7 F/A
Luna Sensation--7.6 fl oz 4.25SC/A

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

**Gummy Stem Blight**
Fungicide solo products within the FRAC code 11 (Cabrio, Quadris and Flint) 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-12). 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. Begin sprays when vines begin to run, apply the following:

**Under low disease pressure:**
chlorothalonil--2.0 to 3.0 pt 6F/A every 7 days

**Under high disease pressure:**

*Alternate:*
chlorothalonil--2.0 to 3.0 pt 6F/A

*With:*
a tank-mix containing either chlorothalonil or mancozeb

plus one of the following fungicides:
Inspire Super--16.0 to 20.0 fl oz 2.8F/A
Prol ine--5.7 fl oz 480SC/A
tebuconazole--8.0 fl oz 3.6F/A or OLF

*Note: reduced sensitivity of the pathogen to this fungicide has occurred in the Southern U.S.*
Fontelis--12.0 to 16.0 oz 1.67SC/A
Luna Experience--10.0 to 17.0 fl oz 3.34SC/A
Pristine--12.5 to 18.5 oz 38WG/A
Switch--11.0 to 14.0 oz 62.5WG/A
Merivon--5.5 fl oz 500SC/A
Aprovia Top--10.5 to 13.5 fl oz 1.62EC/A

**Phytophthora Crown and Fruit Rot**
Multiple practices should be used 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. Preplant fumigants also will suppress disease. In addition, when the vines begin to run, subsoil between rows to allow for faster drainage following rainfall. Apply one of the following and always tank mix with fixed copper at labeled rates when conditions favor disease development (for suppression only):
Revus--8.0 fl oz 2.08 F/A
Ranman--2.75 fl oz 400SC (plus a non-ionic or organosilicon surfactant; do not apply with copper; see label for additional precautions)

Presidio--3.0 to 4.0 fl oz 4SC/A
Forum--6.0 fl oz 4.17SC/A
Gavel--1.5 to 2.0 lb 75DF/A
Zampro--14 fl oz 525SC/A
Tanos--8.0 to 10.0 oz 50DF/A *plus* mancozeb

Materials with different modes of action (FRAC codes) should always be alternated to reduce the chances for fungicide resistance development.
Presidio may also be applied through the drip irrigation (see supplemental label for details). Soil drench followed by
Drip application has given good results in some trials on crown rot caused by *Phytophthora capsici*.

**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:

**Tank mix one of the following with chlorothalonil:**

- Quintec—6.0 fl oz 2.08SC/A *plus* chlorothalonil 2.0 or 3.0 pt 6F/A
- Proline—5.7 fl oz 480 SC/A *plus* chlorothalonil 2.0 or 3.0 pt 6F/A
- Torino—3.4 fl oz 0.85SC/A *plus* chlorothalonil 2.0 or 3.0 pt 6F/A
- Vivando—15.4 fl oz 2.5SC/A *plus* chlorothalonil 2.0 or 3.0 pt 6F/A
- Luna Experience—10.0 to 17.0 fl oz 3.34SC/A *plus* chlorothalonil 2.0 or 3.0 pt 6F/A
- Luna Sensation—7.6 fl oz 4.25SC/A *and alternate with one of the following:*
  - Aprovia Top—10.5 to 13.5 fl oz 1.62EC/A
  - Procure—4.0 to 8.0 fl oz 480SC/A *plus* chlorothalonil 2.0 to 3.0 pt 6 F/A
  - Rally—5.0 oz 40WSP/A *plus* chlorothalonil 2.0 to 3.0 pt 6 F/A
  - tebufconazole—4.0 to 6.0 fl oz 3.6F/A or OLF) *plus* chlorothalonil 2.0 to 3.0 pt 6 F/A
  - or
  - Fontelis—12.0-16.0 fl oz 1.67SC /A *plus* chlorothalonil—2.0 to 3.0 pt 6F/A

**Materials with different modes of action (FRAC codes) should always be alternated.**