Flower, Vegetable & Herb Product Information Guide
### 2012 Burpee Home Gardens® Flower Listing

#### ALYSSUM
- Clear Crystal® Purple Shades (S)
- Clear Crystal White (S)

#### ANGELONIA (SUMMER SNAP)
- Archangel™ Pink (V)
- Archangel Purple (V)
- Archangel Raspberry (V)
- Archangel White (V)
- Serena® Purple (S)
- Serena White (S)
- Serena Mix (S)

#### BACOPA
- Abunda™ Giant White (V)

#### BEGONIA
- Dragon Wing™ Pink (S)
- Dragon Wing Red (S)
- Gryphon (S)
- Nightlife Red (S)
- Nightlife Rose (S)
- Nightlife White (S)

#### BIDENS
- Sun Kiss (V)

#### CALIBRACHOA
- Isabels Deep Blue (V)
- Isabels Hot Pink (V)
- Isabels Orange (V)
- Isabels Pink Vein (V)
- Isabels Red Improved (V)
- Isabels Rose Star (V)
- Isabels Terracotta (V)
- Isabels Yellow (V)

#### CAREX
- Amazon Mist (S)
- Red Rooster (S)

#### COLEUS
- Emotions Inspired (S)
- Emotions Passionate (S)
- Emotions Sophisticated (S)
- Henna (V)
- Indian Summer (V)
- Redhead (V)
- Sultana (V)
- Wasabi (V)

#### COREOPSIS
- Early Sunrise (S)

#### DIANthus
- Bouquet™ Purple (S)
- Bouquet Rose Magic (S)
- Floral Lace Cherry (S)
- Floral Lace Picotee (S)
- Floral Lace Violet (S)

#### DICHTONdRA
- Silver Falls (S)
- Breathless Blush (V)
- Breathless White (V)

#### EUphoria
- Breathless® Blush (V)
- Breathless White (V)

#### GERANIUM
- Fantasia® Cardinal Red (V)
- Fantasia Dark Red (V)
- Fantasia Purple Sizzle (V)
- Fantasia Salmon (V)
- Fantasia Strawberry Sizzle (V)
- Fantasia Violet (V)
- Fantasia White (V)

#### GERBERA
- Revolution™ Pastel Orange
  - With Dark Center (S)
  - Revolution Red With Dark Center (S)
  - Revolution Yellow With Dark Center (S)

#### IMPATIENS
- Center Stage (V)
- Enlighten Bright Red (S)
- Enlighten Cranberry Burst (S)
- Enlighten Gypsy Rose (S)

#### SALVIA
- Mystic Spires Blue (V)
- Vista Purple (S)
- Vista Red (S)

#### SNAPDRAGON
- Snapshot™ Plumblossom (S)
- Snapshot Red (S)
- Snapshot White (S)
- Snapshot Yellow (S)

#### VERBENA
- Aztec® Blue Velvet (V)
- Aztec Burgundy (V)
- Aztec Red Velvet (V)
- Aztec White (V)
  - Quartz XP Red With Eye (S)
  - Quartz XP White (S)
  - Quartz XP Merlot Mix (S)

#### VEGETABLES
- Double Impatients
- New Guinean Impatients

### TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Flowers</th>
<th>2 to 38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alyssum</td>
<td>6</td>
</tr>
<tr>
<td>Angelonia</td>
<td>7</td>
</tr>
<tr>
<td>Begonia</td>
<td>9</td>
</tr>
<tr>
<td>Bides</td>
<td>12</td>
</tr>
<tr>
<td>Bidens</td>
<td>14</td>
</tr>
<tr>
<td>Coleus</td>
<td>17</td>
</tr>
<tr>
<td>Dionthus</td>
<td>16</td>
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<tr>
<td>Doronicum</td>
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</tr>
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<td>Double Impatients</td>
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### HERBS

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<th>Herbs</th>
<th>47 to 65</th>
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<tbody>
<tr>
<td>Basil</td>
<td>47</td>
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<td>Catnip</td>
<td>48</td>
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<tr>
<td>Chives</td>
<td>49</td>
</tr>
<tr>
<td>Cilantro</td>
<td>50</td>
</tr>
<tr>
<td>Dill</td>
<td>51</td>
</tr>
<tr>
<td>Lavender</td>
<td>52</td>
</tr>
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<td>Oregano</td>
<td>53</td>
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<td>Parsley</td>
<td>54</td>
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<td>Pea</td>
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<td>Tomato</td>
<td>56</td>
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<th>39 to 56</th>
</tr>
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<tbody>
<tr>
<td>Artichoke</td>
<td>40</td>
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<tr>
<td>Arugula</td>
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<td>Bean</td>
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**“TO GO” PLANTERS**

- Garden Apricot (S)
- Garden Dark Red (S)
- Garden Pink (S)
- Garden Polka Dot (S)
- Garden White (S)
- Bridesmaid (S)
- Champagne Toast (S)
- Double Zahara® Cherry (S)
- Double Zahara Fire (S)
- UpTown Orange Blossom (S)
- UpTown Pink Champagne (S)
- UpTown Sunstreak (S)
- UpTown White Wall (S)
- White Wedding (S)
2012 Burpee Home Gardens® Vegetable & Herb Listing

ARTICHOKE
NEW Imperial Star

ARUGULA
Myway

BUSH BEAN
Blue Lake Bush
Gold 'N Green Mix

POLE BEAN
Blue Lake Pole

BROCCOLI
Flash Hybird
Packman
Raab

BRUSSELS SPROUTS
Franklin
Royal Marvel

CABBAGE
Big Flat Head
Fast Vantage

CAULIFLOWER
NEW Amazing
Cheddar

CELER
Tango

COLLARDS
Georgia

CUCUMBER
Burpee Hybrid II
Burpless No. 26
Bush Champion
NEW Homemade Pickles
Pickalot Hybrid
Sweet Burpless Hybrid

EGGPLANT
Burpee Hybrid
NEW Pot Black

OKRA
Annie Oakley

PUMPKIN
Casper
Harvest Moon
Howden
Jack-Be-Little

SPINACH
Baby's Leaf Hybrid
Bloomdale

SUMMER SQUASH
Burpee Golden (Zucchini)
Burpee Hybrid (Zucchini)
NEW Limelight (Zucchini)
NEW Lunar
Pic-N-Pic Hybrid

WINTER SQUASH
Burpee's Bush Table Queen
Burpee's Butterbush

STRAWBERRY
Black Pearl Hybrid
Napa Grape Hybrid
Red Grape
Sweet 100

TOMATO - PASTE & SALADETTE
Fresh Salsa Hybrid
Big Mama Hybrid

TOMATO - HEIRLOOM
Brandywine Red
Cherokee Purple
Pineapple
Yellow Pear

TOMATO - SMALL-FRUITED
Black Pearl Hybrid
Napa Grape Hybrid
Red Grape
Sweet 100

TOMATO - HEIRLOOM
Brandywine Red
Cherokee Purple
Pineapple
Yellow Pear

COLORFUL MIXED SALAD BOWLS
Alfresco Mix
City Garden Mix
NEW Global Gourmet Mix Improved

CREATIVE HERB COMBOS
TuScan Trio (Parsley, basil and oregano)
Good Grillin' (Parsley, rosemary and chives)

HERBS
Boxwood Basil
Cardinal Basil
Red Rubin Basil

KITCHEN FAVORITES
(Dill, parsley, oregano and basil)

NEW BOOST COLLECTION
CUCUMBER
NEW Gold Standard

PEPPER
NEW Sweet Heat

SALAD MIX
NEW Healing Hands

TOMATO
NEW Cherry Punch
NEW Power Pops
NEW Solar Power

PROGRAM DROPS FOR 2012
CAULIFLOWER
First White Hybrid

CUCUMBER
Mathilde

OKRA
Annie Oakley

PEPPER
Hottie

RED DELICIOUS HYBRID
SQUASH
Peter Pan

TOMATO
Bush Early Girl
<table>
<thead>
<tr>
<th>Crop</th>
<th>Seed Germination Media Temperature *</th>
<th>Rooting Hormone Before Sticking Cutting</th>
<th>Cover/Light Seed</th>
<th>Sow to Transplant (days)</th>
<th>Stick Cutting to Transplant (days)</th>
<th>Growing On Temperature (Night)</th>
<th>Total Crop Time for 4” (10 cm) Pots</th>
<th>306 Pack 4” (10 cm) Pot</th>
<th>6” (15 cm) Pot</th>
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<td>Juncus Blue Dart (S)</td>
<td>71-76°F (21-24°C)</td>
<td>L</td>
<td>42-49</td>
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<td>Twisted Dart (S)</td>
<td>71-76°F (21-24°C)</td>
<td>L</td>
<td>42-49</td>
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<td>Vanilla (S)</td>
<td>68-72°F (20-22°C)</td>
<td>C</td>
<td>21</td>
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<td>70-72°F (21-22°C)</td>
<td>C</td>
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<td>Ornamental Pepper Black Pearl (S)</td>
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<td>35-49</td>
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C: Cover  C. Lt.: Cover lightly  L: Light needed to germinate  Optional: Cover optional
* Root vegetative cuttings at 68-72°F (20-22°C) media temperature.
<table>
<thead>
<tr>
<th>Stick Cutting to Transplant (days)</th>
<th>Growing On Temperature (Night)</th>
<th>Total Crop Time for 4&quot; (10 cm) pots (weeks)</th>
<th>306 Pack</th>
<th>4&quot; (10 cm) Pot</th>
<th>6&quot; (15 cm) Pot</th>
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<tr>
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<td>55-60°F (13-15°C)</td>
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<td>60-70°F (15-21°C)</td>
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<td>58-62°F (14-17°C)</td>
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<tr>
<td>21</td>
<td>56-61°F (13-16°C)</td>
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</table>

Note: This chart includes general culture guidelines. Please refer to the GrowerFacts on the following pages for detailed growing information.
## Burpee Home Gardens® Flower Variety Culture Chart

<table>
<thead>
<tr>
<th>Crop</th>
<th>Seed Germination Media Temperature *</th>
<th>Rooting Hormone Before Sticking Cutting</th>
<th>Cover/ Light Seed</th>
<th>Sow to Transplant (days)</th>
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</thead>
<tbody>
<tr>
<td><strong>FLOWERS</strong></td>
<td></td>
<td></td>
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<tr>
<td>PETUNIA</td>
<td></td>
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<tr>
<td>Black Velvet  (V)</td>
<td></td>
<td></td>
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<tr>
<td>Paparazzi (S)</td>
<td>72-76°F (22-24°C)</td>
<td>L</td>
<td>28-35</td>
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<tr>
<td>Phantom (V)</td>
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<tr>
<td>Pinstripe (V)</td>
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<tr>
<td>Pop Rocks (S)</td>
<td>72-76°F (22-24°C)</td>
<td>L</td>
<td>28-35</td>
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<tr>
<td>Suncatcher (V)</td>
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<tr>
<td>RUDBECKIA</td>
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<tr>
<td>Tiger Eye (S)</td>
<td>75-78°F (24-25°C)</td>
<td>L</td>
<td>21:35</td>
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<tr>
<td>SALVIA</td>
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<tr>
<td>Mystic Spires Blue (V)</td>
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<tr>
<td>Vista (S)</td>
<td>70-75°F (21-24°C)</td>
<td>C</td>
<td>28:35</td>
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<tr>
<td>SNAPDRAGON</td>
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<tr>
<td>Snapshot (S)</td>
<td>64-68°F (18-20°C)</td>
<td>C. Lt.</td>
<td>35-42</td>
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<tr>
<td>VERBENA</td>
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<tr>
<td>Aztec (V)</td>
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</tr>
<tr>
<td>Quartz (S)</td>
<td>72-75°F (22-24°C)</td>
<td>L</td>
<td>28</td>
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<tr>
<td>VINCA</td>
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<tr>
<td>Garden (S)</td>
<td>75-78°F (24-25°C)</td>
<td>L</td>
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<tr>
<td>ZINNIA</td>
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<tr>
<td>Bridesmaid (S)</td>
<td>68-73°F (20-23°C)</td>
<td>C</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Champagne Toast (S)</td>
<td>68-73°F (20-23°C)</td>
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<td>21</td>
<td></td>
</tr>
<tr>
<td>Double Zahara (S)</td>
<td>68-73°F (20-23°C)</td>
<td>C</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Uptown (S)</td>
<td>68-73°F (20-23°C)</td>
<td>C</td>
<td>21</td>
<td></td>
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<tr>
<td>White Wedding (S)</td>
<td>68-73°F (20-23°C)</td>
<td>C</td>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>

C: Cover  C. Lt: Cover lightly  L: Light needed to germinate  Optional: Cover optional  
* Root vegetative cuttings at 68-72°F (20-22°C) media temperature.

(S) = seed  (v) = vegetative
<table>
<thead>
<tr>
<th>Stick Cutting to Transplant (days)</th>
<th>Growing On Temperature (Night)</th>
<th>Total Crop Time for 4” (10 cm) pots (weeks)</th>
<th>306 Pack</th>
<th>4” (10 cm) Pot</th>
<th>6” (15 cm) Pot</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-28</td>
<td>53-61°F (12-16°C)</td>
<td>8-11</td>
<td></td>
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<td>X</td>
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<tr>
<td></td>
<td>55-65°F (13-18°C)</td>
<td>11-13</td>
<td>X</td>
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<tr>
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<td>55-65°F (13-18°C)</td>
<td>11-13</td>
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<tr>
<td>21-28</td>
<td>53-61°F (12-16°C)</td>
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<tr>
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<td>53-61°F (12-16°C)</td>
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<td>X</td>
</tr>
<tr>
<td></td>
<td>57-65°F (14-18°C)</td>
<td>9-12</td>
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<tr>
<td></td>
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<td>X</td>
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<tr>
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<td>65-68°F (18-20°C)</td>
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<tr>
<td></td>
<td>62-67°F (17-19°C)</td>
<td>7-10</td>
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<tr>
<td></td>
<td>64-68°F (18-20°C)</td>
<td>8-10</td>
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<tr>
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<td>45-55°F (7-13°C)</td>
<td>11-12</td>
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<tr>
<td></td>
<td>62-64°F (17-18°C)</td>
<td>9-11</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>60°F (15°C)</td>
<td>10-12</td>
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<tr>
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<td>65-68°F (18-20°C)</td>
<td>9-10</td>
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</tbody>
</table>

Note: This chart includes general culture guidelines. Please refer to the Grower Facts on the following pages for detailed growing information.
NOTE: Growers should use the information presented here as a starting point. Crop times will vary depending on the climate, location, time of year, and greenhouse environmental conditions. Chemical and PGR recommendations are only guidelines. It is the responsibility of the applicator to read and follow all the current label directions for the specific chemical being used in accordance with all regulations.

**ALYSSUM (SEED)**

*Lobularia maritime*

**Clear Crystal**
Approximate seed count: 70,875 to 87,885/oz. (2,500 to 3,100/g)

**PLUG PRODUCTION**

**Media**
Use a well-drained, disease-free media with a pH range of 5.5 to 6.0, and EC less than 0.75 mmhos/cm (2:1 extraction).

**Sowing**
- Sow multi-seed pellets or multiple sow film-coated seed with 5 to 6 seeds per cell for best performance.
- The multi-seed pellet form requires a thick layer of vermiculite and sufficient water to dissolve the pellet at sowing; this is especially true in low humidity environments.

**Plug Tray Size:**
Can be best produced in 200, 288 or similar cell-size plug trays.

**Stage 1 - Germination takes approximately 3 to 4 days.**

**Germination temperature:** 70 to 72°F (21 to 22°C)

**Light:** Light is beneficial during germination.

**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge. Avoid excess humidity later in the plug production, as this will create conditions favorable for disease incidence.

**Stage 2**

**Temperature:** 65 to 75°F (18 to 24°C) days; 60 to 65°F (15 to 18°C) nights

**Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.

**Media Moisture:** Keep the media medium (level 3) to medium wet (level 4).

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorus.

**Stage 3**

**Temperature:** 65 to 75°F (18 to 24°C) days; 55 to 60°F (13 to 15°C) nights

**Media Moisture:** Keep the media medium wet (level 3) during Stages 3 and 4.

**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**

**Temperature:** 60 to 70°F (15 to 21°C) days; 55 to 60°F (13 to 15°C) nights

**Light:** Light levels can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained.

**Fertilizer:** Same as Stage 3.

**Plant Growth Regulators**
PGRs are generally not required.

---

**FLOWER GROWER FACTS**

**GROWING ON TO FINISH**

**Container Size**
Grow in 306 pack.

**Media**
Use a well-drained, disease-free media with a pH of 5.8 to 6.2 and a medium initial nutrient charge.

**Temperature**
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 75°F (15 to 24°C)

**Light**
- Keep light levels as high as possible while maintaining appropriate temperatures during production.
- Under garden/landscape conditions, Clear Crystal requires full sun; however, partial shade may be beneficial for retail shelf life.

**Fertilizer**
- Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominantly nitrate-form fertilizer with low phosphorus.
- If needed, alternate with a balanced ammonium and nitrate-form fertilizer to encourage growth and balance the media pH.
- Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.8 to 6.2.
- Excessive fertilizer levels will result in large, lush leaves and smaller flower count, whereas fertilizer stress will cause very small leaves, hard plants and yellow lower leaves.

**Irrigation**
- Maintain optimal media moisture (not too wet or too dry).
- Avoid overhead irrigation.
- Irrigation should take place during times when foliage will dry quickly, to prevent any disease incidence.

**Plant Growth Regulators**
PGRs are not required. If needed, growth can be controlled by adjusting the fertilization and day/night temperatures during the production.

**Crop Scheduling**

**Sow to transplant:** Approximately 4 weeks

**Transplant to flower:** 4 to 6 weeks seasonally

**Total crop time (sow to flower):** 8 to 10 weeks seasonally

**Common Problems**

**Diseases:** Downy mildew. Also, a preventative fungicide application for damping-off during plug production is recommended. NOTE: Avoid using copper-based fungicides on Alyssum.
**ANGELONIA** (SEED)

**Angelonia angustifolia**

**Serena™ Series**
Approximate seed count (pelleted): 28,500 S/oz. (1,000 S/g)

**PLUG PRODUCTION**

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

**Sowing**
Plug tray size from 406 to 128. Do not cover or bury the seed.

**Stage 1 – Germination takes 4 to 5 days.**

- **Soil temperature:** 71 to 76°F (22 to 24°C)
- **Light:** 10 f.c. (100 Lux) or higher
- **Moisture:** Required for germination. Seeds will not germinate in the dark.
- **Humidity:** Maintain 95% relative humidity (RH) until radicle emergence.

**Stage 2**

- **Soil temperature:** 68 to 72°F (20 to 23°C)
- **Light:** Up to 2,500 f.c. (26,900 Lux)
- **Moisture:** Start to slightly reduce soil moisture (level 4) to allow the roots to penetrate into the media.
- **Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm) from nitrate-form fertilizers with low phosphorous.

**Stage 3**

- **Soil temperature:** 65 to 70°F (18 to 21°C)
- **Light:** Up to 2,500 f.c. (26,900 Lux)
- **Moisture:** Allow the media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture level at wet-dry cycle (moisture level 4 to 2). Do not allow the seedlings to wilt as they do not recover very well.
- **Fertilizer:** Increase fertilizer to rate 2 (100 to 175 ppm).

**Growth Regulators:** Growth regulators are generally not needed in plug stage. If necessary, B-Nine (daminozide) 5,000 ppm can be used.

**Stage 4**

- **Soil temperature:** 65 to 67°F (18 to 19°C)
- **Light:** Up to 5,000 f.c. (53,800 Lux) if optimal temperature can be maintained.
- **Moisture:** Same as Stage 3.
- **Fertilizer:** Same as Stage 3.

**GROWING ON TO FINISH**

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.4 to 6.2 and a medium initial nutrient charge.

**Temperature**
- **Night:** 65 to 67°F (18 to 19°C)
- **Day:** 65 to 76°F (18 to 24°C)

**Light**
Keep light as high as possible while maintaining recommended temperatures.

**Irrigation**
Avoid both excessive watering and drought.

**Fertilizer**
- Feed plants weekly at rate 3 (175 to 225 ppm) using predominantly nitrate-form fertilizer with low phosphorus and high potassium.
- Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 5.8 to 6.2.

**Growth Regulators**
- A tank mix of B-Nine (daminozide) 2,500 ppm mixed with Cycoel (chloromequat) 750 to 1,000 ppm is the most effective growth regulator for Angelonia.
- Cycoel rates can be adjusted depending on environmental conditions.
- Use lower rates under cooler and shorter daylength conditions, and higher rates under warmer and longer daylength conditions.
- Growth regulators can be started 2 weeks after transplanting. Repeat as needed.

**For growers in warmer climates:**
A Bonzi (paclobutrazol) drench at 5-10ppm can be used 2 weeks after transplant instead of the B-Nine/Cycoel tank mix.

**Pinching**
Do not pinch the plants! Seed Angelonia has excellent natural basal-branching. Pinching will only delay flowering and make the plant habit unattractive.

**Crop Scheduling**

**Sow to transplant (406 to 128-cell plug tray):** 5 to 6 weeks

**Transplant from 406 to 288-tray to saleable finished container:**

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot</th>
<th>Weeks from Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 pack</td>
<td>1</td>
<td>8 to 9</td>
<td>13 to 15</td>
</tr>
<tr>
<td>4 to 4.5-in.</td>
<td>1</td>
<td>9 to 10</td>
<td>13 to 15</td>
</tr>
</tbody>
</table>

NOTE: When transplanted from a 128-tray, finish crop time for Serena can be reduced by 1 to 2 weeks.

**COMMON PROBLEMS**

**Insects:** No serious problems

**Diseases:** No serious problems

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**ANGELONIA** (VEGETATIVE)

**Angelonia angustifolia**

**Archangel™**

**PROPAGATION**
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- To encourage branching and reduce stem stretch, Archangel Angelonia should be propagated under as high a light as possible while avoiding unnecessary stress on the cuttings.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop. Avoid phosphorous and ammoniacal nitrogen during the rooting process to reduce stretch and unwanted vegetative growth.
- As the rooted cuttings develop, high light, appropriate water stress and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs) on Archangel Angelonia. Archangel Angelonia is responsive to a B-Nine and Cycoel tank mix, should PGRs be needed.
- Pinching is not required but to improve branching and habit, plants can be pinched 5 to 7 days before transplanting.
- Archangel Angelonia rooted cuttings should be ready for transplanting 24 to 28 days after sticking and should be transplanted as soon as possible. Rooted cuttings should not be held, as Archangel Angelonia will be actively growing and plants will begin to crowd and stretch very quickly.

**GROWING ON TO FINISH**

**Scheduling**
- Archangel Angelonia requires higher light levels.
- In areas with low light levels in early Spring, Angelonia is best planted as a mid to late-Spring and Summer crop.
- In areas with moderate to high Winter and early Spring light levels, Archangel Angelonia can be grown year-round.

**Media**
Use a light, well-drained soilless medium with a pH of 5.8 to 6.2.

**Temperature**
- **Night:** 62 to 70°F (17 to 21°C)
- **Day:** 74 to 85°F (23 to 29°C)
- Temperatures below those recommended will slow plant growth significantly and cause the lower foliage to yellow.
**ANGELONIA** continued

**Light**
- Keep light levels as high as possible while maintaining recommended temperatures.
- The ideal range is 6,000 to 10,000 f.c. (60,000 to 100,000 Lux).
- Light levels below 5,000 f.c. (50,000 Lux) will promote stem stretch and reduce branching.

**Watering**
- Allow the media to dry moderately between waterings.
- To avoid leaf tip burn, do not allow media to dry completely or the plant to wilt repeatedly.

**Fertilizer**
- Use constant feed at 175 to 225 ppm with a full complement of minor elements.
- Excessive phosphorous and ammoniacal nitrogen will promote unwanted vegetative growth.
- Both should be provided in very limited quantities.
- Controlled-release fertilizer can be used to supplement a liquid feed program.
- Leach regularly to avoid the buildup of high soluble salt levels.

**Pinching**
- A single pinch is recommended when growing Archangel Angelonia in 4.5 to 5-in. (11 to 13-cm) containers.
- The first pinch should be 5 to 7 days after transplanting.
- Stems should be pinched to 4 or 5 nodes.
- Growers may choose to pinch plants in larger, 5 to 8-in. (13 to 20-cm) containers a second time to enhance branching and the number of flower spikes.
- When growing in larger containers, the second pinch should be applied 14 to 21 days after the first.

**Controlling Growth**
- Height can be controlled, in part, by maintaining moderate fertility, allowing the media to dry slightly between waterings, providing maximum light and spacing plants in advance of crowding and stretch.
- Under conditions conducive to rapid vegetative growth, chemical plant growth regulators may be needed.
- A Cycocel (700 to 1,000 ppm) and B-Nine (1,500 to 2,000 ppm) tank mix applied 1 to 2 times is effective.
- The first application should be 7 to 10 days after the first pinch.

- Likewise, a tank mix of A-Rest (6 to 12 ppm) and B-Nine (1,000 to 1,500 ppm) applied 1 to 2 times can be used to control growth.
- Cultural practices should be emphasized to avoid use of PGRs on Archangel Angelonia compact varieties.
- In general, more frequent applications of any growth regulator at a lower concentration will produce the best results.
- Florel causes leaf tip burn when applied to Archangel Angelonia.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

**Common Problems**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant/stem collapse</td>
<td>Wet media for an extended period of time (Pythium, Rhizoctonia, Botrytis)</td>
</tr>
<tr>
<td>Excessive vegetative growth</td>
<td>Low light conditions</td>
</tr>
<tr>
<td></td>
<td>Over-fertilization under low light conditions</td>
</tr>
<tr>
<td></td>
<td>Overwatering under low light conditions</td>
</tr>
<tr>
<td>Poor branching</td>
<td>Low fertilization, especially nitrogen</td>
</tr>
<tr>
<td></td>
<td>Low light conditions</td>
</tr>
<tr>
<td>Stretched plants</td>
<td>Low light conditions</td>
</tr>
<tr>
<td></td>
<td>Crowding before spacing</td>
</tr>
<tr>
<td></td>
<td>Late transplanting</td>
</tr>
<tr>
<td></td>
<td>Excessive phosphorous</td>
</tr>
</tbody>
</table>

**Crop Schedule & Uses**
(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th>PP*</th>
<th>Unrooted Cuttings</th>
<th>Rooted Cuttings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 to 4.5-in. (10 to 11-cm) Pots 1 PP*</td>
<td>6-in. (15-cm) Pot 3 PP*</td>
</tr>
<tr>
<td>9 to 11</td>
<td>13 to 16</td>
<td>5 to 8</td>
</tr>
</tbody>
</table>

*PP: Plants per pot

**GROWING ON TO FINISH**

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.4 to 5.8.

**Temperature**
- Night: 56 to 61°F (13 to 16°C)
- Day: 65 to 76°F (18 to 24°C)
- Cool night temperatures will create maximum branching, darkest foliage color and the best possible habit.

**Light**
- Keep light intensities at 4,000 to 8,000 f.c. (40,000 to 80,000 Lux).
- Low light levels result in poor branching, stem stretch and reduced flowering.
- Abunda Bacopa is daylength neutral and will flower year-round.

**Watering**
Abunda Bacopa is susceptible to root diseases if overwatered. Allow the media to dry slightly between watering, but wilt should be avoided.

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**BACOPA** (VEGETATIVE)

**Abunda™**

**PROPAGATION**
- Bacopa should be turgid when planted. This may require rehydration of cuttings prior to sticking.
- Choose a well-drained medium with an EC of 0.75 to 0.80 mhos and a pH of 5.4 to 5.8.
- Open shipping boxes immediately. Stick cuttings within 12 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Once roots are visible, the media should be kept moderately wet and never saturated. This will prevent iron deficiency and the associated chlorotic foliage which can develop.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- As the rooted cuttings develop, high light and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- Abunda Bacopa does not require pinching during propagation. However, to improve branching and habit, plants can be pinched 7 to 10 days before transplanting.
- Bacopa rooted cuttings should be ready for transplanting 21 to 24 days after sticking.

**Sutera cordata**

**Common Problems**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil temperature</td>
<td>Maintain recommended temperatures</td>
</tr>
<tr>
<td>Open shipping boxes</td>
<td>Immediately.</td>
</tr>
<tr>
<td>Stick cuttings</td>
<td>Within 12 hours of arrival.</td>
</tr>
<tr>
<td>Unrooted cuttings</td>
<td>9 to 11</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>5 to 8</td>
</tr>
<tr>
<td>Crop Schedule &amp; Uses</td>
<td>(Crop Schedule in Weeks)</td>
</tr>
<tr>
<td>Unrooted cuttings</td>
<td>4 to 4.5-in. (10 to 11-cm) Pots 1 PP*</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>6-in. (15-cm) Pot 3 PP*</td>
</tr>
<tr>
<td><strong>Flower Grower Facts</strong></td>
<td></td>
</tr>
</tbody>
</table>

---

**FLOWER GROWER FACTS**

**BACOPA** (VEGETATIVE)

**Abunda™**

**PROPAGATION**
- Bacopa should be turgid when planted. This may require rehydration of cuttings prior to sticking.
- Choose a well-drained medium with an EC of 0.75 to 0.80 mhos and a pH of 5.4 to 5.8.
- Open shipping boxes immediately. Stick cuttings within 12 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Once roots are visible, the media should be kept moderately wet and never saturated. This will prevent iron deficiency and the associated chlorotic foliage which can develop.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- As the rooted cuttings develop, high light and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- Abunda Bacopa does not require pinching during propagation. However, to improve branching and habit, plants can be pinched 7 to 10 days before transplanting.
- Bacopa rooted cuttings should be ready for transplanting 21 to 24 days after sticking.

**GROWING ON TO FINISH**

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.4 to 5.8.

**Temperature**
- Night: 56 to 61°F (13 to 16°C)
- Day: 65 to 76°F (18 to 24°C)
- Cool night temperatures will create maximum branching, darkest foliage color and the best possible habit.

**Light**
- Keep light intensities at 4,000 to 8,000 f.c. (40,000 to 80,000 Lux).
- Low light levels result in poor branching, stem stretch and reduced flowering.
- Abunda Bacopa is daylength neutral and will flower year-round.

**Watering**
Abunda Bacopa is susceptible to root diseases if overwatered. Allow the media to dry slightly between watering, but wilt should be avoided.
**FLOWER GROWER FACTS**

**Fertilizer**
- Use constant feed of 175 to 225 ppm with a full complement of minor elements. Additional iron as needed.
- Controlled-release fertilizer can be used to supplement a liquid feed program.
- Leach regularly to avoid the buildup of high soluble salt levels.
- Test soil regularly for high pH/iron deficiency.

**Pinching**
- Pinch plants 10 to 14 days after transplanting, as needed, to improve basal branching.
- A 4-in. (10-cm) crop can be produced with no pinch, if necessary.

**Controlling Growth**
- Use high light and moderate temperatures to control growth.
- Abunda Bacopa will generally flower and be saleable well before any plant growth regulators are needed.
- Bacopa is highly responsive to Florel (300 to 500 ppm) when used to improve branching and eliminate early flowering.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

**Common Problems**
- Insects: Aphids, thrips, whitefly, fungus gnats.
- Diseases: Botrytis, Rhizoctonia, Pythium.

### BEGONIA (SEED)

**B. x hybrid**

**Dragon Wing® Series**
Approximate seed count (pelleted): 28,500 S/oz. (1,000 S/g)

**GERMINATION**
Germination takes 7 to 10 days.

**Plug Tray Size**
Dragon Wing plants are best produced in 200-cell plug trays. This permits the plant enough growth at the plug stage so that the direction of the arching stem is clear for correct orientation at planting time. This orientation can be seen in smaller plugs, but is less readily apparent.

**Media**
Use a well-drained, disease-free sowing medium with a pH of 5.8 to 6.0 and electrical conductivity (EC) of 0.5 mmhos/cm. A very light covering of vermiculite may be needed when germinating pelleted seed on the bench.

**Moisture**
Keep media saturated through germination.

**Temperature**
72 to 75°F (22 to 24°C). Keep temperature as constant as possible.

**Humidity**
Maintain relative humidity at approximately 95% or higher.

**Light**
Light is beneficial but not required for germination.

**PLUG PRODUCTION**

**Temperature**
After radicle emergence, maintain a constant 70°F (21°C) soil temperature for two weeks. In Week 3, the temperature can be decreased to 65°F (18°C).

**Moisture**
- Slightly reduce media moisture levels after radicle emergence.
- Maintain uniform media moisture until the true leaves appear; then allow media to dry out slightly between waterings.
- Do not stress plugs until Stage 4.

**Light**
- Light will help to ensure a higher-quality seedling.
- After radicle emergence, keep light levels at 400 to 2,000 ftc. (4,000 to 20,000 Lux) for two weeks.

**Fertilizer**
- Begin fertilization at 5 days out of the germination chamber, or 10 days after germination on the bench.
- Dragon Wing plugs require more feed than other fibrous begonias.
- Recommended application is 50 ppm N, 2 to 3 times per week.
- In Week 3, increase feed to 150 to 200 ppm N, 2 to 3 times per week.

**Plant Growth Regulators**
Growth regulators are not required to produce Dragon Wing begonia plugs.

**GROWING ON TO FINISH**

**Temperature**
- Night: 60 to 65°F (15 to 18°C)
- Day: 65 to 70°F (18 to 21°C)

### Container Size
Dragon Wing begonias can be transplanted into a wide range of container sizes. Follow these guidelines for the number of plants per pot or basket:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Bench Spacing</th>
<th>Plants Per Pot/Basket</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 4.5-in.</td>
<td>Pot-tight</td>
<td>1</td>
</tr>
<tr>
<td>(10 to 11-cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-in.</td>
<td>8 in.</td>
<td>2 to 3</td>
</tr>
<tr>
<td>(15-cm) pots</td>
<td>(20 cm)</td>
<td></td>
</tr>
</tbody>
</table>

**Transplanting**
Due to directional stem arching, it is very important to position Dragon Wing plugs properly when placing more than one plug into baskets and containers for finishing.

Plugs must be placed with the growing shoot facing outward, toward the outside of the container (see drawing). This is the side of the plant the flower is on. The directional growth remains consistent as the plant matures, ensuring flowers on the outside of the finish container.

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.4 to 6.0 and electrical conductivity (EC) of 1.0 mmhos/cm.
**BEGONIA** continued

**Light**
- Grow on in a high-light environment – 3,000 to 7,000 f.c. (30,000 to 70,000 Lux).
- Daylength and light quality can have a dramatic effect on plant habit; daylength can also affect flowering time.
- Dragon Wing begonias will flower under natural daylength year-round, making them a good choice for year-round production in warmer climates.
- They flower 1 to 3 weeks faster under short days.
- Short days (8 to 10 hours) cause plants to grow nearly horizontal.
- Natural or HID long days give dramatic effect on plant habit; daylength can also affect flowering time.
- Dragon Wing begonias will flower under short days (8 to 10 hours) cause plants to flower 1 to 3 weeks faster under natural daylength year-round, making them a good choice for year-round production in warmer climates.
- They flower 1 to 3 weeks faster under short days.
- Short days (8 to 10 hours) cause plants to grow nearly horizontal.
- Natural or HID long days give dramatic effect on plant habit; daylength can also affect flowering time.

**Watering**
- Produce Dragon Wing begonias on the drier side to help prevent any fungal or water mold-type diseases.
- However, allowing plants to wilt even slightly between waterings will delay flowering, reduce branch number and result in pale foliage.

**Fertilizer**
- A feed program of 200 ppm N once a week can begin as soon as the plugs have begun to root out.
- Note: Severe fertility and/or water stress will delay flowering 1 to 2 weeks.

**Crop Scheduling**
- Sow to transplant: 7 to 8 weeks
- Transplant to finish: 4-in. (10-cm) pot with 1 plant per pot: 7 to 9 weeks
- 6-in. (15-cm) pots with 2 to 3 plants per pot: 7 to 9 weeks

**Common Problems**
- Dragon Wing begonias are quite disease and pest-free. No major problems will occur if using good cultural and IPM practices. A wide range of insecticides have been tested on Dragon Wing plants with little or no phytotoxicity.

**GROWING ON TO FINISH**

**Media Use** a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.5 mmhos/cm with a 1:2 extraction). **PLUG PRODUCTION**

**Media**
- Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.5 mmhos/cm with a 1:2 extraction).

**Sowing**
- Plug Tray Size
  - Sow one pelleted seed per cell in 288 or larger plug tray.
  - Water thoroughly at sowing to completely dissolve the pellet.
  - Do not cover the pellet at sowing.

**Stage 1 - Germination takes approximately 10 to 12 days.**
- Germination temperature: 72 to 78°F (22 to 25°C). Prefers warmer temperature but can also germinate well at 72°F (22°C).

**Stage 2**
- **Temperature:** Optimum 71 to 76°F (21 to 24°C)
- **Light:** Up to 2500 f.c. (26,900 Lux)

**Stage 3**
- **Temperature:** 68 to 73°F (20 to 22°C)
- **Light:** Up to 5,000 f.c. (54,000 Lux). **Media Moisture**: Keep media medium wet to medium (level 4 to 3). Do not allow the seedlings to wilt. Maintain uniform media moisture until the true leaves appear; then allow media to dry out slightly between waterings. Do not stress plugs. **Fertilizer**: Increase the fertilizer rate to 2 (100 to 175 ppm), 2 to 3 times per week. Alternate fertilizers from ammonia-form to nitrate-form. Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**
- **Temperature:** Can be decreased to 65 to 67°F (18 to 19°C)
- **Light:** Up to 5,000 f.c. (54,000 Lux)
- **Media Moisture**: Moisture level can be reduced to medium dry (level 3). Avoid excess humidity later in the plug production, as this will create conditions favorable for disease incidence. **Fertilizer**: Same as stage 3.

**Media Use** a well-drained, disease-free, soilless medium with a pH of 5.4 to 6.0 and electrical conductivity (EC) of 1.0 mmhos/cm.

**Plants Production, as this will create conditions favorable for disease incidence.** **Fertilizer**: Same as stage 3. **GROWTH REGULATORS**
- Not needed.

**BEGONIA** (SEED)

**B. x hybrid**

**Gryphon**
- Approximate seed count (multi-pelleted): 28,500 S./oz. (1000 S./g)

**PLUG PRODUCTION**

**Media**
- Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.5 mmhos/cm with a 1:2 extraction).

**Sowing**
- **Plug Tray Size**
  - Sow one pelleted seed per cell in 288 or larger plug tray.
  - Water thoroughly at sowing to completely dissolve the pellet.
  - Do not cover the pellet at sowing.

**Stage 1 - Germination takes approximately 10 to 12 days.**
- Germination temperature: 72 to 78°F (22 to 25°C). Prefers warmer temperature but can also germinate well at 72°F (22°C).

**Stage 2**
- **Temperature:** Optimum 71 to 76°F (21 to 24°C)
- **Light:** Up to 2500 f.c. (26,900 Lux)

**Stage 3**
- **Temperature:** 68 to 73°F (20 to 22°C)
- **Light:** Up to 5,000 f.c. (54,000 Lux). **Media Moisture**: Keep media medium wet to medium (level 4 to 3). Do not allow the seedlings to wilt. Maintain uniform media moisture until the true leaves appear; then allow media to dry out slightly between waterings. Do not stress plugs. **Fertilizer**: Increase the fertilizer rate to 2 (100 to 175 ppm), 2 to 3 times per week. Alternate fertilizers from ammonia-form to nitrate-form. Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**
- **Temperature:** Can be decreased to 65 to 67°F (18 to 19°C)
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**GROWTH REGULATORS**
- Not needed.

**BEGONIA** (SEED)

**B. x hybrid**

**Gryphon**
- Approximate seed count (multi-pelleted): 28,500 S./oz. (1000 S./g)

**PLUG PRODUCTION**

**Media**
- Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.5 mmhos/cm with a 1:2 extraction).

**Sowing**
- **Plug Tray Size**
  - Sow one pelleted seed per cell in 288 or larger plug tray.
  - Water thoroughly at sowing to completely dissolve the pellet.
  - Do not cover the pellet at sowing.

**Stage 1 - Germination takes approximately 10 to 12 days.**
- Germination temperature: 72 to 78°F (22 to 25°C). Prefers warmer temperature but can also germinate well at 72°F (22°C).

**Stage 2**
- **Temperature:** Optimum 71 to 76°F (21 to 24°C)
- **Light:** Up to 2500 f.c. (26,900 Lux)

**Stage 3**
- **Temperature:** 68 to 73°F (20 to 22°C)
- **Light:** Up to 5,000 f.c. (54,000 Lux). **Media Moisture**: Keep media medium wet to medium (level 4 to 3). Do not allow the seedlings to wilt. Maintain uniform media moisture until the true leaves appear; then allow media to dry out slightly between waterings. Do not stress plugs. **Fertilizer**: Increase the fertilizer rate to 2 (100 to 175 ppm), 2 to 3 times per week. Alternate fertilizers from ammonia-form to nitrate-form. Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**
- **Temperature:** Can be decreased to 65 to 67°F (18 to 19°C)
- **Light:** Up to 5,000 f.c. (54,000 Lux)
- **Media Moisture**: Moisture level can be reduced to medium dry (level 3). Avoid excess humidity later in the plug production, as this will create conditions favorable for disease incidence. **Fertilizer**: Same as stage 3.

**GROWTH REGULATORS**
- Not needed.
FLOWER GROWER FACTS

Irrigation
Avoid both excessive watering and drought.

Fertilizer
• Apply fertilizer at rate 3 (175 to 225 ppm) once a week as soon as the plugs have begin to root out.
• A balanced ammonium and nitrate-form fertilizer may be applied as needed to encourage growth and balance the media pH.

Growth Regulators
• Generally, PGRs are not needed.
• If necessary, a tank mix of B-Nine (daminozide) 2,500 ppm nd Cycocel (chloromequat) 300 ppm or B-Nine/Alar alone (for cooler area) can be used at 2 weeks after transplanting.
• Avoid using Cycocel alone as it can cause phytotoxicity.
• Also use caution with Bonzi, Topflor, and Sumagic as they can stunt plants.

NOTE: In-house trials are recommended to determine the best rates for your location. Always follow current manufacturer label instructions.

Pinching
No pinching is required.

Crop Scheduling
Sow to transplant (288 cell plug tray): 8 to 9 weeks

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot</th>
<th>Weeks From Transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-in. (15-cm) pot</td>
<td>1 to 3</td>
<td>5 to 6</td>
</tr>
</tbody>
</table>

Common Problems
Gryphon begonias are quite disease and pest-free. No major problems will occur if using good cultural and IPM practices. A wide range of insecticides have been tested on Gryphon plants with little or no phytotoxicity.

BEGONIA (SEED)
B. x hybrid

Nightlife
Approximate seed count (pelleted): 28,550 S./oz. (1,000 S./g)

GERMINATION
Germination takes 7 to 10 days.

SOWING
Do not cover seed. Water thoroughly at sowing to completely dissolve the pellet. Recommended plug sizes are 512 to 288-cell.

Temperature
75 to 78°F (24 to 25°C). Keep temperature as constant as possible.

Humidity
Maintain relative humidity at 95%.

Sowing
Do not cover seed. Germinating in a chamber is recommended.

Light
Light is beneficial, but not required.

PLUG PRODUCTION
Media
Use a very well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 6.0 to 6.5.

Temperature
• Night: 60 to 65°F (15 to 18°C)
• Day: 65 to 70°F (18 to 21°C)

Light
Grow in a high light environment: 3,000 to 7,000 f.c. (30,000 to 70,000 Lux). High light levels will result in earlier flowering and stronger stems.

Irrigation
Allow the media to dry slightly, then water liberally. Water early in the day to avoid leaf burn when temperatures are high.

Fertilization
Fertilize every other irrigation with 15-0-15, alternating with 20-10-20 at 150 ppm N. Maintain the medium EC around 1.0 mmos/cm (1:2 extraction).

Plant Growth Regulators
Note: Nightlife is very responsive to Bonzi and Sumagic. Avoid overspray from neighboring plants.

Pinching
No pinching is required.

Crop Scheduling
Sow to transplant (512 or 288-cell plug tray): 7 to 8 weeks

Transplant to finish: 5 to 7 weeks

NOTE: Space the plants when the foliage starts touching each other.

Common Problems
Insects: Fungus gnats, shore flies
Diseases: No major problems when using good cultural and IPM practices.
**Bidens** *(Vegetative)*  
*Bidens ferulifolia*

**Sun Kiss™**

**PROPAGATION**
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Once roots are visible, the media should be kept moderately wet, but never saturated.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- As the rooted cuttings develop, high light and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- Sun Kiss Bidens should be pinched during propagation. To improve branching and habit, plants should be pinched 7 to 10 days before transplanting.
- Bidens rooted cuttings should be ready for transplanting 21 to 24 days after sticking.

**GROWING ON TO FINISH**

**Media**
Use a well-drained, disease-free, soilless medium. Maintain a media pH of 5.8 to 6.2.

**Temperature**
- **Night:** 53 to 61°F (12 to 16°C)
- **Day:** 59 to 76°F (15 to 24°C)
- Excessively warm temperatures will cause stretching.
- Recommended night temperatures will create maximum branching and the best possible habit.

**Light**
- Keep light intensities at 5,000 to 9,000 f.c. (50,000 to 90,000 Lux).
- Low light levels promote stem stretch.
- Reduce light intensity when temperatures are high to prevent flower and leaf burning.

**Watering**
- Sun Kiss Bidens is susceptible to Botrytis. Avoid high humidity and wet foliage.
- When plants are young, allow the media to dry slightly between waterings.

**Fertilizer**
- Use constant feed with a balanced fertilizer at 175 to 225 ppm N with full complement of minor elements.
- Additional iron as needed.
- Controlled-release fertilizer can be used to supplement a liquid feed program.

**Pinching**
- Pinch plants back 7 to 10 days after transplanting to improve basal branching.
- For a larger basket or container, a second pinch can be applied, but will delay flowering by approximately 2 weeks.

**Plants will generally bloom 4 to 6 weeks after a pinch.**

**Controlling Growth**
- The best way to control the growth of Bidens is to grow the crop cool, provide bright light and apply moderate, regular water stress to promote flowering and reduce unwanted vegetative growth.
- Sun Kiss Bidens is naturally more compact variety compared to other Bidens. If needed, control growth using 1 or more applications of B-Nine (1,500 to 2,000 ppm) starting 2 weeks after transplanting.
- Use of PGRs can delay flowering 1 to 2 weeks.
- Avoid spraying once flower buds appear.
- Varieties will respond differently to growth regulators.
- In general, more frequent applications of any growth regulator at a lower concentration will produce the best results.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

**Common Problems**

**Insects:** Aphids, thrips, leafminers, fungus gnats

**Diseases:** Botrytis, Rhizoctonia, Pythium

**CALIBRACHOA** *(Vegetative)*  
*Calibrachoa hybrid*

**Isabells**

**PROPAGATION**
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.4 to 5.8.
- Open boxes upon arrival. Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Avoid over-application of mist in propagation.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- Once roots are visible, the media should be kept moderately wet and never saturated. This will prevent iron deficiency and the associated chlorotic foliage which can develop.
- As the rooted cuttings develop, appropriate water stress and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- Isabells Calibrachoa can be pinched 18 to 24 days after sticking, when roots are well-developed, to promote early branching and improve habit.
- Isabells Calibrachoa rooted cuttings should be ready for transplanting 24 to 28 days after sticking.

**GROWING ON TO FINISH**

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.4 to 5.8 throughout production.
- The media should be routinely tested every 14 days or when early signs of elevated pH become visible. These early signs can be the first indicators of the need to lower the soil pH to avoid iron deficiency.

**Temperature**
- **Night:** 50 to 58°F (10 to 14°C)
- **Day:** 71 to 76°F (21 to 24°C)
- Higher than recommended temperatures will cause poor branching, unwanted stem stretch and reduced flowering.
- Suggested night temperatures will create maximum branching and the best possible habit.

**Light**
- Keep light intensities at 5,000 to 8,000 f.c. (50,000 to 80,000 Lux).
- Low light levels cause stem stretch and poor flowering.

<table>
<thead>
<tr>
<th>Crop Schedule &amp; Uses</th>
<th>4 in. (10-cm) Pots</th>
<th>Unrooted cuttings</th>
<th>Rooted cuttings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(Crop Schedule in Weeks)</strong></td>
<td>1 PP*</td>
<td>7 to 10</td>
<td>4 to 6</td>
</tr>
</tbody>
</table>

**Problems**
- Plant collapse: Wet media for an extended period (Pythium)
- Planting too deeply (Rhizoctonia)
- Delayed flowering: Late application of growth regulators
- Excessive vegetative growth: Higher than recommended air temperatures
- Over fertilization under low light conditions
- Low light levels and overwatering; wet media
- Poor branching: Low fertilization; lack of nitrogen
- Stretched plants: Low light levels
- Excess water
- Higher than recommended air temperatures
- Chlorosis: Iron deficiency
- High pH
- Nitrogen deficiency

**PP:** Plants per pot
An effective method of lowering pH is periodic application of acidic feed. Isabell’s Calibrachoa respond well to DIF. Plants must be monitored regularly for appropriate pH levels or drench applications of a chelated iron sulfate solution must be rinsed immediately after applications. Additional iron as needed.

Calibrachoa are susceptible to root diseases if over-watered. Allow the media to dry slightly between watering, but avoid any wilt.

Plants are susceptible to Botrytis - avoid watering if high soluble salt problems occur.

**Fertilizer**
- Calibrachoa require heavy fertilization.
- Use constant feed with a balanced fertilizer at 225 to 300 ppm N with a full complement of minor elements. Additional iron as needed.
- Use clear water with every third watering.
- Use high light and cool temperatures to delay flowering.

**Media pH Management**
- Plants must be monitored regularly for early visual signs of upward pH drift (interveinal yellowing on youngest leaves).
- Regular soil pH tests are an excellent way to identify movements in pH before they create visual symptoms, which can be difficult to correct.
- Periodic application of acidic feed or drench applications of a chelated iron product can be used to maintain appropriate pH levels.
- An effective method of lowering pH is a soil drench of iron sulfate. The foliage must be rinsed immediately after treatment since the iron sulfate solution can result in phytotoxicity to flowers and foliage.

**Pinching**
- Pinch plants back 7 to 14 days after transplanting to improve basal branching. Plants can be pinched as the crop matures to improve their habit, but flowering will be delayed approximately 2 to 3 weeks.
- In trials, Florel has proven effective for increasing branching when applied 1 to 3 times at 250 to 500 ppm to a stress-free, actively growing plant. Flowering will be delayed a minimum of 7 to 8 weeks, depending on the concentration used. Improved branching, darker green foliage and shorter internodes will be the benefits.

**Controlling Growth**
- Use high light and cool temperatures to control growth.
- Isabells Calibrachoa respond well to DIF in production.
- If necessary, growers can use 1 or more applications of B-Nine (1,500 to 3,000 ppm) starting 2 weeks after transplant. Calibrachoa growth can also be controlled with 1 to 2 spray applications of A-Rest (20 to 50 ppm) or drench applications of Bonzi (3 to 8 ppm). Sumagic (20 to 30 ppm) can effectively control the growth of Calibrachoa when applied 1 to 2 times as a spray.
- Growers can also use a Bonzi drench (1 to 8 ppm), applied when plants first reach saleable size, to slow growth, maintain a tight habit and allow normal flower development.
- Plant growth regulators applied late in the crop cycle can delay flowering 1 to 2 weeks. Application should be avoided once flower buds appear.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

**Common Problems**

**Insects:** Aphids, thrips, whitefly, leafminers

**Diseases:** Botrytis, Rhizoctonia, Phytophthora, Pythium, Theilaviopsis.

**Problems**

<table>
<thead>
<tr>
<th>Causes</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet media for an extended period (Phytophthora, Rhizoctonia, Theilaviopsis)</td>
<td>Plant collapse</td>
</tr>
<tr>
<td>Daylength too short</td>
<td>Delayed flowering</td>
</tr>
<tr>
<td>Late application of growth regulators</td>
<td>Excessive vegetative growth</td>
</tr>
<tr>
<td>High ammonia concentration in the soil</td>
<td>Poor branching</td>
</tr>
<tr>
<td>Over-fertilization under low light conditions</td>
<td>Chlorosis</td>
</tr>
<tr>
<td>Low light levels and over-watering; wet media</td>
<td>Stretched plants</td>
</tr>
<tr>
<td>Excessive phosphorus</td>
<td>Low light levels</td>
</tr>
<tr>
<td>Low fertilization; lack of nitrogen</td>
<td>Iron deficiency; high pH</td>
</tr>
<tr>
<td>Late/no pinch</td>
<td>Nitrogen deficiency</td>
</tr>
<tr>
<td></td>
<td>High salt levels in media</td>
</tr>
</tbody>
</table>

**Crop Schedule & Uses**

**Crop Schedule in Weeks**

<table>
<thead>
<tr>
<th>4-in. (10-cm) Pot 1 PP*</th>
<th>6-in. (15-cm) Pot 1 to 3 PP*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrooted cuttings</td>
<td>Rooted cuttings</td>
</tr>
<tr>
<td>9 to 13</td>
<td>6 to 9</td>
</tr>
<tr>
<td>10 to 15</td>
<td>7 to 11</td>
</tr>
</tbody>
</table>

*PP: Plants per pot

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**PLUG PRODUCTION**

**Plug Tray Size**
Carex plugs are best produced in 305 to 288 plug trays. The average plug production time is 6 to 8 weeks.

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC) of 0.50 to 0.75 mmhos/cm (1:2 extraction).

**Sowing**
Lightly cover the seed with a light layer of coarse grade vermiculite. This helps in keeping the seed moist during germination. Allow 7 to 10 days for germination.

**Temperature**
- Germination: 64 to 72°F (18 to 22°C)
- After Germination: Plugs can be grown in the greenhouse at 68 to 70°F (20 to 21°C) days and 64 to 67°F (18 to 19°C) nights until transplant.

**Light**
- Stage 1: Light is not required for germination
- After germination: 2,500 to 3,000 f.c. (25,000 to 30,000 Lux)
- Seeding maturity: Up to 5,000 f.c. (50,000 Lux)

**Humidity**
Maintain 95 to 100% relative humidity during germination.

**Soil Moisture**
Keep soil moisture high at radicle emergence, then reduce moisture levels after cotyledon development. Do not allow seedlings to wilt.

**Fertilizer**
When cotyledons fully expand, start fertilizing with 50 ppm N twice a week. As the true leaves develop, increase the fertilizer rate to 100 ppm N. Maintain the plug media EC at 0.75 to 1.0 mmhos/cm and pH at 6.0 to 6.2.

**Plant Growth Regulators**
Not required.
**COLEUS**  (SEED)

*Solenostemon scutellarioides*

**Emotions**
Approximate seed count: 27,500 S/oz. (970 S/g)

**PLUG PRODUCTION**

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 5.8 and a medium initial nutrient charge (EC 0.75 mS/cm).

**Sowing**
Sow seed in 288 or larger plug trays. In Europe, 264-cell trays can be used. Cover lightly with vermiculite.

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**GROWING ON TO FINISH**

**Container Size**
- 4-in. (10-cm.) pots
- 6-in. (15-cm.) pots

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and medium initial nutrient charge.

**Temperature**
- Night: 58 to 62°F (14 to 17°C)
- Day: 64 to 67°F (18 to 19°C)
  - Maintain these temperatures until bud initiation.

**Irrigation**
Maintain even moisture. Avoid excessive wetness.

**Fertilizer**
- After transplant, fertilize the crop with a balanced fertilizer supplying 150 to 200 ppm N.
  - Maintaining the media EC at 1.0 to 1.5
  - Maintain the media EC at 1.0 to 1.5
  - Maintain the media at 1.0 to 1.5
  - Maintain the media at 1.0 to 1.5

**Plant Growth Regulators**
- Not needed

**Crop Scheduling**
- Sow to transplant (288-cell plug): 5-8 weeks
- Transplant to finish:
  - 6-in. (15-cm.) pot: 7 to 9 weeks, 3 to 4 plants per pot
  - 4-in. (10-cm.) pot: 7 to 9 weeks, 1 plant per pot

---

**Stage 1**
- Germination takes 4 to 5 days
- Soil temperature: 72 to 75°F (22 to 24°C)
- Light: Light is not necessary.
- Moisture: Keep media evenly moist (level 4), but not saturated.
- Humidity: Maintain 95%+ relative humidity (RH) until radicles emerge.

**NOTE:** Coleus is very sensitive to high salts - particularly high ammonium - during germination. Keep ammonium levels less than 10 ppm.

**Stage 2**
- Soil temperature: 72 to 75°F (22 to 24°C)
- Light: Up to 2,500 f.c. (26,900 Lux)
- Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
- Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm) from nitrate-form fertilizers with low phosphorous. Alternate feed with clear water. Feed between 2 to 3 clear irrigations. Irrigate early in the day so foliage is dry by nightfall to prevent diseases. Keep soil pH at 5.5 to 6.2 and EC less than 1.0 mS/cm.

**Stage 3**
- Soil temperature: 68 to 70°F (20 to 21°C)
- Light: Up to 2,500 f.c. (26,900 Lux)
- Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering but avoid excessive wilting to promote root growth and control shoot growth. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
- Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N) to avoid stem elongation. Keep soil pH at 5.5 to 5.8 and EC less than 1.0 mS/cm (1:2 extraction).

**Growth Regulators:** Generally not needed. If necessary, A-Rest, B-Nine and Bonzi are effective on coleus. Always follow label recommendations. Use temperature differential (DIF) whenever possible, especially the first 2 hours after sunrise, to control plant height.

**Stage 4**
- Soil temperature: 60 to 62°F (16 to 17°C)
- Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
- Moisture: Same as Stage 3.
- Fertilizer: Same as Stage 3.

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**GROWING ON TO FINISH**

**Container Size**
- 306 pack: 1 plant per cell
- 4 to 5-in. (10 to 13-cm.) pots: 1 plant per pot
- 6-in. (15-cm) or gallon pots: 3 plants per pot

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mS/cm).

**Temperature**
- Night: 57 to 65°F (14 to 18°C)
- Day: 65 to 75°F (18 to 24°C)

**Light**
Provide shade if over 5,000 f.c. (53,800 Lux).

**Irrigation**
Avoid both excessive watering and drought.

**Fertilizer**
- Coleus are low to moderate feeders. Excessive feed can lead to dull coloration and decreased vigor.
- Apply fertilizer at rate 2 (100 to 175 ppm N) using predominately nitrate-form fertilizer with low phosphorus and high potassium.
- Maintain medium electrical conductivity around 1.0 mS/cm (using 1:2 extraction).

**Growth Regulators**
- Control plant growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed.
- Minimize ammonium-form nitrogen fertilizer to avoid stem elongation.
- Coleus are responsive to day/night DIF and are shorter with a negative DIF.
- B-Nine (diaminozide) 2,500 to 5,000 ppm can be applied at 2 to 3 weeks after transplanting. Repeat if necessary.

**Pinching**
Not necessary.

**Spacing**
Space plants when foliage is touching.

**Crop Scheduling**
- Sow to transplant (288 cell plug): 5 to 6 weeks
- Transplant to finish: 6 to 8 weeks

**Common Problems**
- Insects: Aphids, mealy bugs, whiteflies
- Diseases: Alternaria, Botrytis, Verticillium
- Other: Excessive internode elongation under low light
Coleus rooted cuttings should be ready once roots are visible, the media should be maintained at 68 to 73°F (20 to 23°C) until roots are visible. Avoid over-application of mist in propagation.

Once roots are visible, the media should be kept moderately wet and never saturated.

Begin fertilization with 75 to 100 ppm N when roots become visible.

Keep light intensities at 4,000 to 10,000 Light units.

Allow the media to dry slightly between waterings but any wilt should be avoided.

PROPOSITION
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Open boxes immediately upon arrival. Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Avoid over-application of mist in propagation.
- Once roots are visible, the media should be kept moderately wet and never saturated.
- Begin fertilization with 75 to 100 ppm N when roots become visible.
- As the rooted cuttings develop, appropriate moisture stress, high light and moderate air temperatures will reduce the need for chemical plant growth regulators (PGRs).
- A B-Nine application at 1,500 to 2,500 ppm applied as a spray 10 to 12 days after sticking is effective in reducing stem elongation.
- Henna, Indian Summer, Redhead, Sultana and Wasabi Coleus do not require pinching during propagation. However, to improve branching and habit for 6-in. (15-cm) plants, can be pinched 5 to 7 days before transplanting.
- Coleus rooted cuttings should be ready for transplanting 21 to 24 days after sticking.

GROWING ON TO FINISH

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2.

Temperature
- Night: 59 to 70°F (15 to 21°C)
- Day: 74 to 85°F (23 to 29°C)
- Cool night temperatures will extend crop time dramatically.

Light
- Keep light intensities at 4,000 to 10,000 f.c. (40,000 to 100,000 Lux).
- Extremely low light levels result in poor branching, stem stretch and poor foliage color.

Watering
Allow the media to dry slightly between waterings but any wilt should be avoided.

Fertilizer
- Use constant feed with a balanced fertilizer at 175 to 225 ppm.
- Leach regularly to avoid the buildup of soluble salts.

Pinching
- Pinch plants 7 to 14 days after transplanting, as needed, to improve basal branching.
- A 4-in. (10-cm) crop can be produced with no pinch.

Controlling Growth
- Use high light and recommended temperatures to control growth and produce the best possible habit.
- For large containers (1 gallon and larger), Coleus will generally not require any PGR applications during production.
- For smaller pots (4 to 6 in./10 to 15 cm), PGRs are recommended.
- A high-volume Bonzi drench at 0.5 to 2.0 ppm applied when the crop is two-thirds of finish size is effective in reducing stem elongation late in the production cycle.
- A Cycocel (1,000 to 1,500 ppm) and B-Nine (2,500 to 3,500 ppm) tank mix applied 1 to 3 times, or Sumagic (5 to 10 ppm) applied as a spray, are both effective.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

Common Problems
Insects: Aphids, whitefly.
Diseases: Rhizoctonia, Pythium.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant collapse</td>
<td>Wet media for an extended period (Pythium)</td>
</tr>
</tbody>
</table>
| Excessive vegetative growth | High ammonia concentration in the soil  
                                Over-fertilization under low light conditions  
                                Low light and overwatering  
                                Wet media |
| Poor branching         | Low fertilization  
                                Lack of nitrogen  
                                Late pinch |
| Stretched plants       | Low light  
                                Late transplanting |
| Chlorosis              | Nitrogen deficiency  
                                Low night temperatures |

Crop Schedule & Uses
(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th>Pot Size</th>
<th>Planting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-in. (10-cm)</td>
<td>Pot 1 PP*</td>
</tr>
<tr>
<td>6-in. (15-cm)</td>
<td>Pot 1 to 2 PP*</td>
</tr>
<tr>
<td>Unrooted cuttings</td>
<td>8 to 10</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>5 to 7</td>
</tr>
</tbody>
</table>

*PP: Plants per pot
**GROWING ON TO FINISH**

**Container Size**
- 4-in. (9-cm) or 6-in. (15-cm) pots

**Media**
- Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and medium initial nutrient charge.

**Temperature**
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 70°F (15 to 21°C)
- Maintain these temperatures until bud initiation.

**Light**
- Coreopsis flowers earlier under long days.
- Provide night interruption lighting (10 p.m. to 2 a.m.) when grown under short days.

**Irrigation**
- Maintain even moisture. Avoid excessive wetness.

**Fertilizer**
- After transplant, fertilize the crop with a balanced fertilizer supplying 150 to 200 ppm N.
- Maintain the media EC at 1.50 to 2.00 mmhos/cm and pH at 5.8 to 6.5.

**Crop Scheduling**
- Sow to transplant (392-cell plug): 5 weeks
- Transplant to finish in a 4-in. (10-cm) pot: 8 to 10 weeks
- Transplant to finish in a 6-in. (15-cm) pot: 9 to 10 weeks
- Total crop time from sow to finished container: 13 to 15 weeks

**Common Problems**
- Insects: Whiteflies, thrips, & aphids

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**DIANTHUS (SEED)**

*D. barbatus interspecific*

**Bouquet**
- Approximate seed count: 8,575 S/oz (300 S/g)

**PLUG PRODUCTION**

**Plug Tray Size**
- Best produced in 406-cell or larger plug trays.

**Sowing**
- Use a well-drained, disease-free medium with a pH of 5.8 to 6.2, as well as good aeration and water-holding capacity.
- Cover seed with medium layer of coarse vermiculite at sowing. Seed takes about 3 to 4 days to germinate.

**Temperature**
- Germination: 64 to 68°F (18 to 20°C)
- Cotyledon emergence: 65 to 70°F (18 to 21°C) days; 60°F (15°C) nights
- True leaf expansion: 60°F (15°C) days; 55°F (13°C) nights

**Light**
- Light is required for germination.

**Humidity**
- Maintain 95 to 97% relative humidity until cotyledons emerge.

**Fertilization**
- Beginning at Stage 3, fertilize 2 times a week with 50 ppm N.
- Increase the nitrogen concentration to 100 ppm after 1 week, and continue this program until the plugs are finished.
- Maintain the EC at 0.5 to 0.75 mmhos/cm at Stages 3 and 4.
- pH can be maintained at 5.8 to 6.2 throughout.

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**DIANTHUS (SEED)**

*D. chinensis X barbatus*

**Floral Lace**
- Approximate seed count: 34,000 to 71,000 S/oz. (1,200 to 2,500 S/g)

**GERMINATION**
- Light is required for germination. Use a well-drained, disease-free medium with a pH of 5.8 to 6.2, and EC about 0.75 mmhos/cm. Cover the seed with a medium layer of coarse grade vermiculite at sowing. It takes about 3 to 4 days to germinate.

**PLUG PRODUCTION**

**Plug Tray Size**
- Best produced in 406-cell size plug trays.

**Sowing**
- Use a well-drained, disease-free medium with a pH of 5.8 to 6.2, and EC about 0.75 mmhos/cm. Cover the seed with a medium layer of coarse grade vermiculite at sowing. It takes about 3 to 4 days to germinate.

**Temperature**
- Germination: 64 to 68°F (18 to 20°C)
- Cotyledon emergence: 65 to 70°F (18 to 21°C) days; 60°F (15°C) nights
- True leaf expansion: 60°F (15°C) days; 55°F (13°C) nights

**Light**
- Light is required for germination.
FLOWER GROWER FACTS

Humidity
Maintain 95 to 97% relative humidity during germination until the cotyledons emerge.

Fertilization
Beginning at Stage 3, fertilize 2 times per week with 50 ppm N. Increase the nitrogen concentration to 100 ppm after 1 week, and continue this program until the plugs are finished. Maintain the EC at 0.5 to 0.75 mmhos/cm and increase to 1.0 mmhos/cm at Stages 3 and 4. Maintain pH at 5.8 to 6.2 throughout.

Growth Regulators
Treat 3 week-old plugs with a foliar spray of Bonzi at 6 ppm for toning. One application in the plug stage is sufficient.

Plug Production Time
Allow 4 to 5 weeks in 406-cell plug trays.

GROWING ON TO FINISH

Container Size
306 packs

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.5.

Temperature
• Night: 50 to 60°F (10 to 15°C)
• Day: 60 to 75°F (15 to 24°C)

Fertilization
• After plants are established, apply a calcium-based fertilizer or 15-5-15 at 150 ppm, 1 to 2 times per week.
• Dianthus require adequate calcium in their fertilization program.

Growth Regulators
Foliar sprays of 20 ppm Bonzi can be applied 2 to 3 times to control height. The frequency of application is determined by the rate of plant growth, time of the year and location. First application can be done 2 weeks after transplant, followed by subsequent applications at weekly intervals.

Crop Scheduling (sow to flower)
• Late Spring/Early Summer: 9 to 10 weeks
• Late Summer/Winter: 12 to 13 weeks

DICONDRA (SEED)

D. argentea

Silver Falls
Approximate seed count: 6,070 S/oz. (214 S/g)

PLUG PRODUCTION

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.5 and a medium initial nutrient charge.

Temperature
• Night: 62 to 65°F (17° to 18°C)
• Day: 65 to 75°F (18° to 24°C)

Light
Higher light levels result in foliage that is more silver in color and shorter internodes.

Irrigation
Silver Falls Dichondra benefits from warm, dry growing conditions. Let crop dry out well in between irrigations.

Fertilizer
Feed weekly with 200 ppm N in complete fertilizer.

Growth Regulators
For pot production, a tank mix of 5,000 ppm B-Nine and 1,000 ppm Cycocel one week after transplant can be used to increase branching, control stem length and prevent plants from becoming tangled. This treatment also makes the foliage more silver.

Pinching
Pinching is not needed.

Crop Scheduling
Sow to transplant (400-cell plug tray): 5 weeks
Transplant to saleable 4-in. (10-cm) pot: 7 to 8 weeks

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot</th>
<th>Weeks From Transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 4.5-in. (10 to 11-cm) pot</td>
<td>1</td>
<td>7 to 8</td>
</tr>
</tbody>
</table>

If producing liners (72-tray), allow 7 to 8 weeks from sow to transplant, and reduce post-transplant crop time by two weeks.

Common Problems
Insects: No serious problems.
Diseases: No serious problems.
**EUPHORBIA**

*Euphorbia hypericifolia*

**Breathless™**

**PROPAGATION**
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings immediately upon arrival. Euphorbia cuttings are prone to breakdown if stored even an additional 12 hours.
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- Reduce mist as soon as possible. Once roots are visible, the media should be kept moist and never saturated. Excess water in propagation will encourage unwanted plant stretch and leaf loss.
- Appropriate water management, air and light levels should eliminate the need for chemical plant growth regulators (PGRs).
- A pinch in propagation will help to encourage early branching. Pinch 1 week before transplant.
- Breathless Euphorbia should be ready for transplant 3 to 4 weeks after sticking.

**GROWING ON TO FINISH**

**Media**
A pH of 5.8 to 6.2 is optimum. Breathless Euphorbia prefers a well-drained soil.

**Temperature**
- Night: 59 to 67°F (15 to 19°C)
- Day: 65 to 76°F (18 to 24°C)

**Light**
Breathless Euphorbia should be grown under high light levels; 6,000 to 9,000 f c (60,000 to 90,000 Lux) is the ideal range. Foliage colors will be more pronounced under high light conditions.

**Watering**
The medium should be allowed to dry between waterings. However, periods of sustained wilting should be avoided. Excess water will result in unwanted stretch and leaf loss.

**Fertilizer**
- Breathless Euphorbia has a moderate feed requirement. Use a constant liquid feed program of 175 to 225 ppm.
- Regular leaching with clear water will help to reduce buildup of excess salts in media.

**Geraniums**

*Pelargonium x hortorum*

**Fantasia®**

**PROPAGATION**
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 6.2 to 6.6.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- A rooting hormone is generally not needed, assuming the environment in propagation is optimal. If the soil temperature and/or mist coverage is not optimal, a rooting hormone may help promote early, more uniform rooting.
- A protective fungicide application should be made within 12 hrs. of sticking to reduce the risk of Botrytis.
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- As the rooted cuttings develop, high light, appropriate water stress and moderate air temperatures should reduce the need for chemical plant growth regulators (PGRs).
- Pinching should not be necessary during propagation.
- Fantasia Zonal Geranium rooted cuttings should be ready for transplanting 24 to 28 days after sticking.

**GROWING ON TO FINISH**

**Media**
Use a light, well-drained, soilless medium with a pH of 6.2 to 6.6.
- Test the medium regularly during production as Zonal Geraniums tend to acidify the soil in which they are potted, resulting in a lower-than-optimum pH. Early symptoms include cupping of the older leaves and a light brown, circular leaf spot. Symptoms typically appear 7 to 10 weeks after transplanting. Corrective actions begin with stopping the acidification of irrigation water and switching to a nitrate-based fertilizer. Flowable limestone or potassium bicarbonate can be applied for a more rapid correction.

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**Crop Schedule & Uses**

<table>
<thead>
<tr>
<th>Crop Schedule in Weeks</th>
<th>4-in. (10-cm)</th>
<th>6-in. (15-cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 PP*</td>
<td>Pot</td>
<td>Pot</td>
</tr>
<tr>
<td>Unrooted cuttings</td>
<td>8 to 11</td>
<td>9 to 13</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>6 to 7</td>
<td>6 to 9</td>
</tr>
</tbody>
</table>

*PP: Plants per pot

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Transplanting
- Plant geranium rooted cuttings so the soil slightly covers the propagation media. This will prevent the rooted cuttings from drying out unexpectedly in the early stages of the crop. If this type of drying does occur, damage to the roots of the young plant can be tremendous.
- Fantasia geraniums are produced in high-light areas and initiate flowers quickly. For the best vegetative growth, remove any flower buds when potting rooted cuttings.
- Water-in plants thoroughly with clear water immediately after transplanting to ensure good contact between the soil and roots. The same day or next apply liquid feed.

Temperature
- Day and night temperatures of 71 to 76°F (21 to 24°C) are ideal for the earliest stages of plant development. As the crop matures, night temperatures should be maintained at 62 to 67°F (17 to 19°C) with day temperatures of 65 to 76°F (18 to 24°C).
- Significantly lower night temperatures increase crop time. Higher night temperatures result in excessive stretch, softness of the crop and chlorotic foliage.
- A negative DIF of 3 to 5°F (2 to 3°C) can be used to control growth without significantly slowing the crop or reducing quality.

Light
- Zonal geraniums require moderate light levels and grow best at 3,500 to 6,000 f.c. (35,000 to 60,000 Lux).
- Lower light intensities can cause stretch.
- Do not put hanging baskets over Zonal Geraniums, as this will reduce light levels and increase the likelihood of a Botrytis infection.

Watering
- Keep the soil evenly moist during production.
- Water thoroughly, leaching regularly to prevent salt buildup.
- On cloudy, dark days, reduce watering to help control Botrytis and stretch.

Fertilizer
- Follow initial clear water application with 225 ppm N of a balanced liquid feed later that day or the next morning.
- Use a balanced liquid feed at a rate of 225 to 300 ppm N on a constant feed basis.
- Maintain a pH range of 6.0 to 6.5.
- Check the soluble salts regularly to maintain an EC reading between 1.5 and 2.0 mmhos (SME).
- Be sure to monitor soil salts and flush pots with clear water periodically to prevent the build-up of excessive salt levels.

Pinching & Disbudding
- Pinching is not required for Fantasia geraniums.
- For specimen plants in larger pots, a soft pinch will encourage branching and more flowers, but will delay finish at least 4 weeks.
- Florel can be used on zonal geraniums to increase branching and remove flower buds. Rates will vary with individual growing conditions, but a range of 200 to 350 ppm can be used as a guideline. Florel should be applied as soon as new growth is seen after transplanting, but not within the final 8 weeks of shipping. Florel can be applied 1 to 3 times, depending on local conditions and container size, at 7 to 10-day intervals.

Controlling Growth
- Under most conditions, plant growth regulators will not be needed for Fantasia varieties.
- Fantasia varieties have medium vigor, requiring some growth regulators when growing in smaller containers. Fantasia will fill out a 6-in. (15-cm) pot with 1 cutting per pot and minimal PGR applications.
- If needed, Fantasia varieties can be treated with Cycoce (750 to 1,500 ppm) applied 1 to 2 times at 7 to 14-day intervals. A tank mix of B-Nine (2,000 to 2,500 ppm) and Cycoce (750 to 1,000 ppm) can also be used.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

Disease Control
- Geranium production areas should always be thoroughly sanitized prior to beginning your growing season and between crops.
- Keep benches and floors free of plant debris, and avoid any unnecessary handling of plants.
- Fantasia geraniums should be grown drier in the first few weeks to encourage root growth and prevent Pythium problems. After transplanting, a preventative fungicide drench for Pythium and Rhizoctonia is recommended. If you mix your own growing media, pasteurization is required to eliminate potential soil-borne disease and pest problems.
- Control Botrytis with good air movement, adequate spacing and late afternoon venting of the greenhouse to reduce humidity. Regular applications of a labeled fungicide are highly recommended. Under very humid/wet conditions, no fungicide alone can prevent the spread of Botrytis. Air movement and venting of excess moisture, combined with chemical controls, provide the best prevention.
- Avoid geranium rust problems with preventative applications of labeled fungicides.
- Avoid any applications of Medallion to prevent toxicity.

Common Problems
Insects: Aphids, thrips, whitefly, leafminers, fungus gnats, mites.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant collapse</td>
<td>Botrytis, Pythium, Rhizoctonia</td>
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<td>Saturated soil for extended periods of time (Pythium)</td>
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<td>Excess vegetative growth, few flowers</td>
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<td>Cupped foliage</td>
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<td>Low light levels</td>
<td></td>
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Crop Schedule & Uses
(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th>Pot Size</th>
<th>4-in. (10-cm)</th>
<th>6-in. (15-cm)</th>
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<tbody>
<tr>
<td>PP*</td>
<td>1</td>
<td>1 to 2 PP*</td>
</tr>
<tr>
<td>Unrooted cuttings</td>
<td>12 to 13</td>
<td>13 to 14</td>
</tr>
<tr>
<td>Callus cuttings for direct sticking</td>
<td>10 to 11</td>
<td>11 to 12</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>8 to 9</td>
<td>9 to 10</td>
</tr>
</tbody>
</table>

*PP: Plants per pot
**GERBERA (SEED)**

Gerbera jamesonii

**Revolution**

Approximate seed count (film coated): 8,550 to 11,400 S. oz. (300 to 400 S. g)

**PLUG PRODUCTION**

**Media**

Use a well-drained, disease-free, soilless medium with a pH of 5.0 to 5.5 and a medium initial nutrient charge (EC 0.4 to 0.8 mmhos/cm with a 1:2 extraction).

**Sowing**

- Sow 1 seed per plug in a dibble.
- Plug tray size from 144 to 128.
- Make sure seed is lying on its side in a dibble at sowing so radicle isn't upside down at emergence.
- Cover the seeds lightly with vermiculite (course to extra course) to prevent drying out.
- Cover is important at sowing but too much isn't good either. Some of the top of the plug tray should be visible after covering but the seed should be covered completely.
- Use a preventive treatment against damping-off diseases after sowing.

**Stage 1 - Germination takes 4 to 7 days.**

- **Soil temperature:** 64 to 68°F (18 to 20°C)
- **Light:** Light is optional.
- **Moisture:** Keep soil saturated (level 5) during Stage 1 for optimal germination.
- **Humidity:** Maintain 95% relative humidity until radicle emergence.

**Stage 2**

- **Soil temperature:** 68 to 70°F (20 to 21°C)
- **Light:** Up to 2,500 f.c. (26,900 Lux)
- **Moisture:** Start to slightly reduce soil moisture (level 4) to allow the roots to penetrate into the media.
- **Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm) from nitrate-form fertilizers (17-5-17, 14-0-14, 15-5-15).

**Stage 3**

- **Soil temperature:** 68 to 70°F (20 to 21°C)
- **Light:** Up to 2,500 f.c. (26,900 Lux)
- **Moisture:** It is critical to allow the media to dry until the surface become light brown (level 2) before watering. Keep the moisture level at wet dry cycle (moisture level 4 to 2).
- **Fertilizer:** Increase fertilizer to rate 2 (100 to 175 ppm) from nitrate-form fertilizers (17-5-17, 14-0-14, 15-5-15).
- **Growth Regulators:** None

**Stage 4**

- **Soil temperature:** 68 to 70°F (21 to 21°C)
- **Light:** Up to 5,000 f.c. (53,800 Lux) to keep optimal temperature can be maintained.
- **Moisture:** Same as Stage 3.
- **Fertilizer:** Same as Stage 3.

**NOTE:** During plug production, fine drip or mist is best, using a water temperature similar to or around air temperature. Irrigation with too cold water will cause foliage to cup up hard and brittle. Once this happens, keep media dry for a few days and water later with warmer water.

**GROWING ON TO FINISH**

**Media**

Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.0 and a medium initial nutrient charge.

**Container size**

- 4-6 in. (10-15 cm)

**Potting**

- Uniformity at all levels in production will greatly increase uniformity of overall crop.
- Uniform soil level in pots; fill pots 100%
- Dibble in center of pot and set plant in hole.
- Soil depth of transplanted plug in comparison to the soil level in the pot should be slightly above level. Plug will pull itself down to level but not bring itself back up. Do not pot too deeply as this may result in crown rot.

**Temperature**

- **Night:** 62 to 66°F (17 to 19°C)
- **Day:** 66 to 68°F (19 to 20°C)
- In darker periods, day and night temperatures can be reversed (negative DIF) to keep stem length somewhat shorter.

**Light**

Gerbera likes to be grown under high light conditions. During the darker periods of the year, HID lighting can be applied.

**Irrigation**

- Generally Gerbera likes a moderate to drier soil condition. Avoid extreme moisture swings in crop culture. Overwatering is a common practice that can decrease end yield.
- Overhead watering is possible until the flower buds appear, but watering directly into pot or growing with ebb/flow floors is preferred. Drip tube culture works well, too.

**Fertilizer**

- Gerbera requires relatively high fertilization frequencies dependent on light and temperature; less feed for lower light/shorter days, more feed for higher light/longer days. Constant feed with 17-5-17 150-200 ppm is a satisfactory general feed. In high light conditions 20-10-20 at 150 200 ppm also provides adequate fertility.
- Maintain a 5.5-5.8 pH and an adequate iron.
- Use clear water 1 time each week or when necessary to maintain EC below 1.5 mmhos/cm.
- Avoid excessive ammonia nitrogen levels. This will cause excessive leaf growth, lower bud counts, and increase losses.

**Growth Regulators**

Generally, growth regulators are not needed. To reduce stretching when growing pot tight, B-Nine (daminozide) can be applied at 1000 to 1500ppm 2 to 3 times with an interval of 5 to 7 days. Do not apply when flower buds are the size of a pea or bigger to prevent decrease of flower size.

**Pinching**

None.

**Spacing**

Space plants when the leaves of the plants are touching each other, generally 5 to 6 weeks after transplanting.

**Crop Scheduling**

- **Sow to transplant (144 to 128-cell plug tray):** 6 to 7 weeks
- **Finishing the crop:** 8 to 12 weeks

**NOTE:** Crop schedule is dependent on the sowing date, the available light and the required pot/plant ratio. Total crop time is approx. 14 to 15 weeks from sowing to 50% flowering. 100% color will appear 10-14 days later.

**Common Problems**

**Insect:** White flies, thrips
**Disease:** Downy mildew, Crown rot, Botrytis, Fusarium
**IMPATIENS** (VEGETATIVE)

*Impatiens walleriana*

**Center Stage**

**Patchwork**

**Fiesta (Double Impatiens)**

**PROPAGATION**

- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- As soon as is practical, mist should be reduced. This will help decrease stretch of the rooted cutting.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 ppm N as roots develop.
- Center Stage, Patchwork and Fiesta Impatiens will not require pinching during propagation.
- As the rooted cuttings develop, high light, appropriate water stress and moderate air temperatures should reduce the need for chemical plant growth regulators (PGRs).
- Under low light and warm environmental conditions, cuttings will stretch while in propagation. Growers may need to apply PGRs during propagation to control growth. An application of Bonzi (2 to 5 ppm spray) applied at Day 4 to 6 in propagation will decrease stem stretch.
- Rooted cuttings should be ready for transplanting 21 to 28 days after sticking.

**GROWING ON TO FINISH**

**Media**

- Use a porous, well-drained, soilless medium.
- A pH of 5.8 to 6.2 is optimum.

**Temperature – Patchwork, Fiesta**

- Night: 56 to 61°F (13 to 16°C)
- Day: 68 to 76°F (20 to 24°C)

**Temperature – Center Stage**

- Night: 66 to 71°F (19 to 22°C)
- Day: 71 to 76°F (22 to 24°C)

**Light**

- Impatiens are daylength-neutral and will flower year-round.
- Plants grow best under moderate light intensity; 4,000 to 6,000 f.c. (40,000 to 60,000 Lux) is optimum.
- Plants will stretch at light intensities below 3,000 f.c. (30,000 Lux).
- Reduce light intensity when temperatures are high to prevent flower and leaf burning as well as bud drop.

**Watering**

- Keep growing media moderately moist. If the media stays too wet, plants will stretch and flowering will be reduced.
- As plants reach the desired size, mild water stress will promote flowering and reduce stretch.

**Fertilizer**

- Maintain constant fertilization at 175 to 225 ppm N.
- Excessive phosphorous and ammoniacal nitrogen will promote unwanted vegetative growth. Both should be provided in very limited quantities.
- Leach pots periodically with clear water to avoid build-up of salts.
- Controlled-release fertilizer can be used to supplement a liquid feed program.

**Pinching**

Do not require pinching because they are naturally branching.

**Controlling Growth**

- Grow plants with adequate light and space.
- Avoid high ammonium and phosphorus fertilizers and do not overwater.
- Plant growth regulators should not be needed due to Center Stage Impatiens’ naturally compact habit. Patchwork and Fiesta may require PGR’s.
- If necessary, a Bonzi (3 to 10 ppm) spray or a 1 ppm drench is effective for controlling growth of Center Stage Impatiens.
- Bonzi (3 to 15 ppm) applied as a spray 1 to 2 times can be used to control growth of Patchwork and Fiesta Impatiens. Mature plants which are approaching saleable size can be drenched with Bonzi (0.25 to 3 ppm) to significantly slow vegetative growth while allowing flowering to continue.
- A Florel (100 to 300) spray can be used to improve branching but is typically not needed. Do not use within 8 weeks of sale since Florel stops flowering.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

**Common Problems**

**Insects:** Thrips, aphids, fungus gnats.

**Diseases:** Botrytis (gray mold), Pythium, Rhizoctonia.

The most important disease and insect problem associated with Impatiens is Impatiens Necrotic Spot Virus (INSV), which is transmitted by thrips. Control of thrips is necessary to avoid INSV.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant collapse</td>
<td>Stem canker (Botrytis) Plants grown in saturated soil for extended period of time (Pythium)</td>
</tr>
<tr>
<td>Excessive vegetative growth, lack of flowers</td>
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<td>Poor branching, thin plants</td>
<td>Low fertilization in early stages of crop</td>
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</tbody>
</table>

**Center Stage Impatiens Crop Schedule & Uses**

(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th>4-in. (10-cm) Pots</th>
<th>PP*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrooted cuttings</td>
<td>9 to 12</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>7 to 9</td>
</tr>
</tbody>
</table>

*PP: Plants per pot

**Patchwork and Fiesta Impatiens Crop Schedule & Uses**

(Crop Schedule in Weeks)

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</thead>
<tbody>
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</tr>
<tr>
<td>Rooted cuttings</td>
<td>6 to 9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6-in. (15-cm) Pot</th>
<th>PP*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrooted cuttings</td>
<td>10 to 12</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>7 to 9</td>
</tr>
</tbody>
</table>

*PP: Plants per pot
**IMPATIENS (SEED)**

*Impatiens walleriana*

**Enlighten**

**GERMINATION**
- Time of radicle emergence (3 to 5 days)
- Keep media very moist and near saturation.
- Do not cover or bury the seed.
- Germination temperature: 72 to 76°F (22 to 24°C).
- Light levels at 100 to 400 f.c. (1,000 to 4,000 Lux) will enhance germination.
- Keep soil pH at 6.0 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction). Keep ammonium levels less than 10 ppm.
- Impatiens are sensitive to high salts during germination.

**PLUG PRODUCTION**

**Stage 1 – Time of radicle emergence (3 to 5 days)**
- Keep media very moist and near saturation.
- Do not cover or bury the seed.
- Germination temperature: 72 to 76°F (22 to 24°C).
- Light levels at 100 to 400 f.c. (1,000 to 4,000 Lux) will enhance germination.
- Keep soil pH at 6.0 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction). Keep ammonium levels less than 10 ppm.
- Impatiens are sensitive to high salts during germination.

**Stage 2 – Stem and cotyledon emergence (10 days)**
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Soil temperature should be 72 to 75°F (22 to 24°C).
- Light at 450 to 700 f.c. (4,500 to 7,000 Lux) using supplemental HID lights for two weeks after cotyledons have expanded (12 to 18 hours/day) decreases plug crop time.
- Maintain ammonium levels at less than 10 ppm and soil pH at 6.0 to 6.2 with an EC of less than 1.0 mmhos/cm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with 2 to 3 clear water irrigation.

**Stage 3 – Growth and development of true leaves (14 to 21 days)**
- Allow the soil to dry out thoroughly between irrigations, but avoid severe wilting to promote root growth and control shoot growth.
- Soil temperature should be between 68 to 72°F (20 to 22°C).
- Maintain soil pH 6.0 to 6.2 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14 or other calcium/potassium nitrate fertilizer.

**Stage 4 – Plants ready for transplanting or shipping (7 days)**
- Soil should still be allowed to dry thoroughly.
- Temperature should be maintained at 62 to 65°F (17 to 18°C).
- Keep soil pH at 6.0 to 6.2 and an EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
- Note: Impatiens require low to moderate feed levels. Excessive amounts will result in lush, vegetative stretched plugs.

**GROWING ON TO FINISH**

**Temperature**
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 75°F (18 to 24°C)

**Light**
- Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
- Use a well-drained, disease-free soil less medium with a medium initial nutrient charge and a pH of 6.2 to 6.8.

**Fertilization**
- Fertilize every other irrigation with 15-0-15, alternating with 20-10-20 at 150 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control. Height can also be controlled by withholding fertilizer, especially phosphorus and ammonium-form nitrogen.
- Impatiens are responsive to day/night DIF and shorter with a negative DIF.
- B-Nine, Bonzi and Sumagic are effective for height control. Always follow label instructions. B-Nine and Bonzi can delay flowering.

**Light**
- Impatiens are shade plants and should not be exposed to excessive amounts of sun. If properly hardened, impatiens can handle up to 4 hours of morning sun.

**Common Problems**

**Insects:** Aphids, thrips

**Diseases:** Pythium, Rhizoctonia, Botrytis

**TSWV/INSV (Impatiens Necrotic Spot Virus)**

**Other:** Boron deficiency, high media pH

The most important disease and insect problem associated with impatiens is Impatiens Necrotic Spot Virus (INSV), which is transmitted by thrips. Control of thrips is necessary to avoid INSV.

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**SPREADING IMPATIENS (VEGETATIVE)**

*Impatiens hybrida*

**Fanfare®**

**PROPAGATION**
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos/cm and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- As soon as practical, mist should be reduced and then removed from Fanfare Spreading Impatiens. This will help decrease stretch of the rooted cutting.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 ppm N as roots develop.
- Fanfare Spreading Impatiens will not require pinching during propagation.
- As the rooted cuttings develop, high light, appropriate water stress and moderate air temperatures should reduce the need for chemical plant growth regulators (PGRs).
- Under low light and warm temperature conditions, cuttings of Fanfare Spreading Impatiens will stretch while in propagation. Growers may need to apply PGs during propagation to further control growth. Bonzi applied as a 2 to 5 ppm heavy spray 4 to 6 days after sticking will decrease stem stretch.
- Fanfare Spreading Impatiens rooted cuttings should be ready for transplanting 21 to 24 days after sticking.

**GROWING ON TO FINISH**

**Media**
- Use a soilless medium with good aeration, drainage and water-holding capacity, and a pH of 5.8 to 6.2.

**Temperature**
- Night: 59 to 64°F (15 to 18°C)
- Day: 68 to 79°F (20 to 26°C)
- Night temperatures above 70°F (21°C) will delay flowering dramatically and reduce plant quality.
**Light**
- Fanfare Spreading Impatiens are daylength-neutral and will flower year-round.
- Plants grow best under moderate light intensity. The ideal range would be 4,000 to 9,000 f.c. (40,000 to 90,000 Lux).
- Plants will stretch at light intensities below 3,000 f.c. (30,000 Lux).
- Reduce light intensity when temperatures are high to prevent flower and leaf burning.
- HID lighting can be used to reduce crop time in areas with naturally low light levels.

**Watering**
- Allow plants to dry slightly between waterings in the first half of the crop cycle. Do not allow the plants to wilt during this period, as finished quality will be reduced.
- As the crop matures and begins to bud up and flower, avoid water stress entirely and remember that the crop will need more frequent irrigation.
- Excessive water stress will cause leaf edge damage as well as bud and flower drop.

**Fertilizer**
- Maintain constant fertilization between 175 to 225 ppm N.
- Excessive phosphorous and ammoniacal nitrogen will promote unwanted vegetative growth. Both should be provided in very limited quantities.
- Leach pots periodically with clear water to avoid build-up of salts.
- Controlled-release fertilizer can be used to supplement a liquid feed program.

**Pinching**
- Fanfare Spreading Impatiens are naturally self-branching and do not require pinching.
- Pinching will delay flowering approximately 10 to 14 days.

**Controlling Growth**
- Grow plants with adequate light and space.
- Avoid high ammonium and phosphorus fertilizers, and do not overwater.
- Fanfare Spreading Impatiens will generally flower and be saleable well before any plant growth regulators are needed.

- Bonzi (5 to 15 ppm) applied as a spray 1 to 2 times can be used to control growth of Fanfare Spreading Impatiens.
- Mature plants which are approaching shipping can be drenched with Bonzi (0.25 to 0.50 ppm) to significantly slow vegetative growth while allowing flowering to continue.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

**Common Problems**

**Insects:** Thrips, spider mites, aphids.

**Diseases:** Impatiens Necrotic Spot Virus (INSV), Botrytis (gray mold).

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*PP: Plants per pot

**NEW GUINEA IMPATIENS (VEGETATIVE)**

**Celebrette**

**PROPAGATION**
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmmhos and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- As soon as is practical, mist should be reduced and then removed from Celebrette New Guinea Impatiens.
- As rooted cuttings are removed from mist, a broad spectrum, foliar fungicide spray should be applied.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 ppm N as roots develop.
- Celebrette New Guinea Impatiens will not require pinching during propagation.
- As the rooted cuttings develop, high light, appropriate water stress and moderate air temperatures should reduce the need for chemical plant growth regulators (PGRs).
- Celebrette New Guinea Impatiens rooted cuttings should be ready for transplanting 21 to 24 days after sticking.

**GROWING ON TO FINISH**

**Media**
- Use media with good aeration and drainage, balanced against sufficient water-holding capacity.
- Maintain pH of 5.8 to 6.2.

**Temperature**
- Night: 59 to 64°F (15 to 18°C)
- Day: 68 to 76°F (20 to 24°C)
- Higher average daily temperatures will result in shorter flowering time.
- An average daily temperature of 68°F (20°C) has demonstrated optimal bloom time and bloom size for New Guinea Impatiens. Lower temperatures will increase crop time.

**Light**
- Plants should be grown with the highest light levels possible, while still maintaining temperatures within the acceptable ranges. Light levels of 4,000 to 7,000 f.c. (40,000 to 70,000 Lux) are appropriate.
- Flowering in New Guinea impatiens is daylength neutral.
NEW GUINEA IMPATIENS continued

Watering
• Maintain alkalinity below 140 ppm and EC between 1.0 to 1.2 mmmhos.
• Allow the media to dry moderately between watering in the first half of the crop cycle, but do not allow the plants to wilt during this period as the quality of the final crop will be reduced.
• As the crop matures and begins to bud and flower, irrigate more frequently and avoid water stress entirely.
• Excessive water stress at any stage will cause leaf edge damage, as well as bud and flower drop.

Humidity
Maintain 40 to 60% relative humidity with good air movement.

Pinching
Celebrette New Guinea Impatiens are naturally well-branched and do not require pinching.

Fertilizer
• Celebrette New Guinea Impatiens have a moderate fertilizer requirement. Feeding with 175 to 225 ppm N at every watering, starting 7 to 10 days after transplanting, is ideal. Use a balanced fertilizer with no additional micronutrients.
• To encourage early flowering, fertilization should be stopped during the final one-third of the crop. Using fresh water only will promote early flowering.
• New Guinea Impatiens are very sensitive to high salts. Leach with clear water every third watering.
• Excessive ammonia application will cause large leaves and poor flowering.

Controlling Growth
• Celebrette New Guinea impatiens will generally flower and be saleable well before any plant growth regulators are needed.
• If a plant growth regulator is needed, apply Bonzi (2 to 10 ppm) as a foliar spray after the plants have rooted to the side of the pot. Generally, 1 to 3 applications will be sufficient.
• Mature plants which are approaching shipping size can be drenched with Bonzi (0.25 to 1.0 ppm) to significantly slow vegetative growth while allowing flowering to continue.
• Late sprays of Bonzi may delay flowering.
• These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

Common Problems
Insects: Thrips, spider mites, aphids, fungus gnats.
Diseases: Impatiens Necrotic Spot Virus (INSV), Botrytis (gray mold), stem canker, Pythium, Rhizoctonia.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant collapse</td>
<td>Stem canker (Botrytis) Plants grown in saturated soil for extended period of time (Pythium)</td>
</tr>
<tr>
<td>Excessive vegetative growth, lack of flowers</td>
<td>Excessive nitrogen Over-fertilization under low light conditions Excess or late Florel application Low light levels and over-watering; wet media</td>
</tr>
<tr>
<td>Foliage necrosis</td>
<td>Drying out between waterings Excess minor nutrient levels in media Botrytis</td>
</tr>
<tr>
<td>Poor branching, thin plants</td>
<td>Low fertilization in early stages of crop</td>
</tr>
</tbody>
</table>

Crop Schedule & Uses
(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th>Plant Type</th>
<th>4-in. (10-cm) Pot</th>
<th>6-in. (15-cm) Pot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrooted cuttings</td>
<td>9 to 11</td>
<td>10 to 12</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>6 to 8</td>
<td>7 to 9</td>
</tr>
</tbody>
</table>

IPOMOEA (VEGETATIVE)
Ipomoea batatas

Blackie
Marguerite

PROPAGATION
• Choose a well-drained medium with an EC of 0.75 to 0.80 mmmhos and a pH of 5.8 to 6.2.
• Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
• Soil temperature should be maintained at 68 to 72°F (20 to 22°C) until roots are visible.
• Should be propagated under moderately high light as possible while avoiding unnecessary stress on the cuttings.
• Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop. Avoid phosphorous and ammoniacal nitrogen during the rooting process to reduce stretch and unwanted vegetative growth.
• As the rooted cuttings develop, high light, appropriate water stress and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs) If necessary use B-9 at 2500 ppm.

GROWING ON TO FINISH

Temperature
• Night: 65 to 68°F (18 to 20°C)
• Day: 68 to 75°F (20 to 24°C)
• Temperatures above 68°F (20°C) promote the most rapid growth.
• Avoid temperatures below 50°F (10°C) as plants may show signs of chilling.

Light
• Keep light intensities above 3000-5000 f.c. while maintaining moderate temperatures.
• Ipomoea are grown for their foliage, and the flowers are small and inconspicuous. Therefore photoperiod is irrelevant, but flowering occurs earlier under short day conditions.
• Low light levels promote stem stretch at intensities below 1500 f.c.
• Foliage color is reduced as intensity decreases.

Media
• Use a well-drained, disease-free soil-less medium with a high initial nutrient charge and a pH 5.8-6.4

Water
• Keep soil moist, but avoid wet foliage to prevent Botrytis problems.
• High relative humidity will promote leaf expansion.
Common Problems

Diseases: Botrytis, Rhizoctonia, Pythium
Insects: Aphids, Mealy bugs, Whitefly

Fertilization
- Ipomoea has a moderate fertilizer requirement.
- Apply 15-0-15 alternating with 20-10-20 2X/week.
- As the plants mature the rate can be increased to 200-300 ppm.
- Excessive application of ammonia will promote large leaves.
- Water with clear water every third watering if high soluble salts problems occur.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
- Height can be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Ipomoea also responds well to the use of B-Nine (2500 ppm).
- Pinch plants above the 5th-6th leaves

Common Problems

Problems Causes

Plant collapse
Stem canker (Botrytis)
Plants grown in saturated soil for extended period of time (Pythium)

Excessive vegetative growth, lack of flowers
Excessive nitrogen
Over-fertilization under low light conditions
Excess or late Florel application
Low light levels and over-watering; wet media

Foliation necrosis
Drying out between waterings
Excess minor nutrient levels in media
Botrytis

Poor branching, thin plants
Low fertilization in early stages of crop

Crop Schedule & Uses
(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th>Container Size</th>
<th>4-in. (10-cm) pot</th>
<th>6-in. (15-cm) pot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 PP*</td>
<td>1 to 2 PP*</td>
</tr>
<tr>
<td>Unrooted cuttings</td>
<td>10 to 12</td>
<td>11 to 13</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>7 to 9</td>
<td>8 to 10</td>
</tr>
</tbody>
</table>

*PP: Plants per pot

JUNCUS (SEED)

Juncus tenuis

Blue Dart
Approximate seed count (multi-seed pellet): 19,901 S./oz. (702 S./g)

Juncus tenuis - Juncus effusus spiralis

Twisted Dart
Approximate seed count (multi-pelleted): 11,300 to 14,000 S./oz. (400 to 500 S./g)

PLUG PRODUCTION

Media
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

Sowing
Plugs Tray Size:
Can be produced in a 288, 128, 72 liner or a similar size plug tray. Do not cover pellets.

Stage 1 - Germination takes approximately 7-8 days
Germination temperature: 71 to 76°F (21 to 24°C)
Light: Light is optional.
Media Moisture: Keep the media medium wet (level 4) during germination.
Relative Humidity: Maintain 95 to 97% relative humidity until cotyledons emerge.

Stage 2
Temperature: 68 to 70°F (20 to 21°C).
Light: Can be up to 2,500 f.c. (26,900 Lux) during Stages.
Media Moisture: Reduce soil moisture slightly (level 3) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1.2 extraction).

Stage 3
Temperature: 68 to 70°F (20 to 21°C).
Light: Can be up to 2,500 f.c. (26,900 Lux)
Media Moisture: Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1.2 extraction).

Stage 4
Temperature: 65 to 67°F (18 to 19°C).
Light: Can be up to 5,000 f.c. (54,000 Lux)
Media Moisture: Maintain wet/dry cycle. Do not allow the seedlings to wilt.
Fertilizer: Keep the fertilizer rate to 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1.2 extraction).

GROWING ON TO FINISH

Media
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm

Temperature
- Night: 59 to 64°F (15 to 18°C).
- Day: 62 to 73°F (17 to 23°C).

Plants can be grown under temperatures as low as 50°F (10°C) but the crop time will increase significantly.

Light
As high as possible while maintaining moderate temperature.

Irrigation
Keep media moisture. Avoid growing dry as this will cause yellowing on the tip of shoot. Can be grown under saturated conditions.

Fertilizer
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorous. Avoid using excessive ammonia-nitrogen-form fertilizers and overfeeding, as these will result in les upright plants. Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.5 to 6.2.

Growth Regulators
Not needed.

Pinching
Pinching is not needed.

Container Size
4-in. (10-cm) pot: 1 plug per pot
6-in. (15-cm) pot: 1 to 3 plugs per pot

Crop Scheduling
Sow to transplant (288/264-cell plug tray):
Blue Dart: 6 to 7 weeks
Twisted Dart: 7 to 8 weeks

Add one more week when using 128 or 72-cell plug tray, but reduce post-transplant crop times by one week for Blue Dart.

GROWER FACTS

FLOWER GROWER

• Apply growth regulators once plants reach side of container.

Pinching
- Once liners are estabilished, pinch plants.
- Pinch plants above the 5th-6th leaves

Common Problems

Problems Causes

Foliage necrosis
Drying out between waterings
Excess minor nutrient levels in media
Botrytis

Poor branching, thin plants
Low fertilization in early stages of crop

Poor branching, thin plants
Low fertilization in early stages of crop

PLUG PRODUCTION

Media
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

Sowing
Plugs Tray Size:
Can be produced in a 288, 128, 72 liner or a similar size plug tray. Do not cover pellets.

Stage 1 - Germination takes approximately 7-8 days
Germination temperature: 71 to 76°F (21 to 24°C)
Light: Light is optional.
Media Moisture: Keep the media medium wet (level 4) during germination.
Relative Humidity: Maintain 95 to 97% relative humidity until cotyledons emerge.

Stage 2
Temperature: 68 to 70°F (20 to 21°C).
Light: Can be up to 2,500 f.c. (26,900 Lux) during Stages.
Media Moisture: Reduce soil moisture slightly (level 3) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1.2 extraction).

Stage 3
Temperature: 68 to 70°F (20 to 21°C).
Light: Can be up to 2,500 f.c. (26,900 Lux)
Media Moisture: Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1.2 extraction).

Stage 4
Temperature: 65 to 67°F (18 to 19°C).
Light: Can be up to 5,000 f.c. (54,000 Lux)
Media Moisture: Maintain wet/dry cycle. Do not allow the seedlings to wilt.
Fertilizer: Keep the fertilizer rate to 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1.2 extraction).

GROWING ON TO FINISH

Media
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm

Temperature
- Night: 59 to 64°F (15 to 18°C).
- Day: 62 to 73°F (17 to 23°C).

Plants can be grown under temperatures as low as 50°F (10°C) but the crop time will increase significantly.

Light
As high as possible while maintaining moderate temperature.

Irrigation
Keep media moisture. Avoid growing dry as this will cause yellowing on the tip of shoot. Can be grown under saturated conditions.

Fertilizer
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorous. Avoid using excessive ammonia-nitrogen-form fertilizers and overfeeding, as these will result in les upright plants. Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.5 to 6.2.

Growth Regulators
Not needed.

Pinching
Pinching is not needed.

Container Size
4-in. (10-cm) pot: 1 plug per pot
6-in. (15-cm) pot: 1 to 3 plugs per pot

Crop Scheduling
Sow to transplant (288/264-cell plug tray):
Blue Dart: 6 to 7 weeks
Twisted Dart: 7 to 8 weeks

Add one more week when using 128 or 72-cell plug tray, but reduce post-transplant crop times by one week for Blue Dart.
**LANTANA (VEGETATIVE)**

*Lantana camara*

**Lucky™**

**PROPAGATION**
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings immediately upon arrival. Lantana cuttings are prone to breakdown if stored even an additional 12 hours.
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- A protective fungicide application should be made immediately after sticking.
- Once roots are visible, the media should be kept moderately wet and never saturated. This will prevent iron deficiency and the associated chlorotic foliage which can develop.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- As rooted cuttings develop, high light and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- Lucky Lantana does not require pinching during propagation. However, to improve branching and habit, plants can be pinched 7 to 10 days before transplanting.
- Lucky Lantana rooted cuttings should be ready for transplanting 24 to 28 days after sticking.

**GROWING ON TO FINISH**

**Media**
Use a well-drained, disease-free, soiless medium with a pH of 5.8 to 6.2.

**Temperature**
- Night: 62 to 67°F (17 to 19°C)
- Day: 74 to 85°F (23 to 29°C)

**Light**
- Keep light intensities above 5,000 f.c. (50,000 Lux).
- Low light levels promote stem stretch and poor flowering.

**Water**
- During the first 10 to 14 days, water media sparingly and never saturate. Allow media to dry somewhat between waterings.
- Avoid extended periods where the media is saturated, as this will cause root system problems.

**Fertilizer**
- Lucky Lantana has moderate to heavy fertilizer requirements to keep the plants growing vigorously. Reducing the feed causes the plant to become woody with reduced flowering.
- Use a balanced fertilizer at 225 to 300 ppm every watering to ensure maximum growth and flowering.
- Excessive phosphorous and ammoniacal nitrogen will promote unwanted vegetative growth. Both should be provided in very limited quantities.
- Controlled-release fertilizer can be used to supplement a liquid feed program.
- Flush pots periodically with clear water to avoid build-up of salts.

**Controlling Growth**
- Lucky Lantana is generally more compact and will require less PGRs than other lantanias.
- Appropriate pinching, depending on pot size, combined with good crop culture and environment should minimize PGR applications. If needed, a tank mix of Cycocel (750 to 1,000 ppm) and B-Nine (2,000 to 3,000 ppm) applied 7 to 10 days after pinching will encourage the naturally mounded habit of Lucky Lantana.
- Lucky Lantana is also very responsive to Bonzi (10 to 40 ppm) or Sunmac (5 to 20 ppm) applied as a spray.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

**Common Problems**
- Insects: No serious problems.
- Diseases: No serious problems.

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot/ Basket</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-in. (10-cm) pot, Blue Dart</td>
<td>1</td>
<td>7 to 8</td>
<td>13 to 15</td>
</tr>
<tr>
<td>4-in. (10-cm) pot, Twisted Dart</td>
<td>1</td>
<td>7 to 8</td>
<td>14 to 16</td>
</tr>
<tr>
<td>6-in. (15-cm) pot, Blue Dart</td>
<td>3</td>
<td>7 to 8</td>
<td>13 to 15</td>
</tr>
<tr>
<td>6-in. (15-cm) pot, Twisted Dart</td>
<td>3</td>
<td>7 to 8</td>
<td>14 to 16</td>
</tr>
</tbody>
</table>

Note: Add 2 more weeks to the crop time when planting 1 plug per 6-in. (15-cm)

**Crop Schedule & Uses**
(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant collapse</td>
<td>Wet media for an extended period (Pythium, Botrytis)</td>
</tr>
<tr>
<td>Excess vegetative growth</td>
<td>High ammonia concentration in the soil, Over-fertilization under low light conditions, Low light and overwatering; wet media</td>
</tr>
<tr>
<td>Poor branching</td>
<td>Low fertilization during early stages</td>
</tr>
<tr>
<td>Foliage necrosis</td>
<td>Drying out the plant between irrigations, High soluble salts in the soil, Powdery mildew</td>
</tr>
<tr>
<td>Foliage chlorosis</td>
<td>Low temperatures</td>
</tr>
</tbody>
</table>

**FOLIAGE**: 300 to 400 ppm

<table>
<thead>
<tr>
<th>Plant Size</th>
<th>4-in. (10-cm) Pot 1 to 2 PP*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrooted cuttings</td>
<td>9 to 10</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>6 to 7</td>
</tr>
</tbody>
</table>

*PP: Plants per pot

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**FLOWER GROWER FACTS**

**Lucky Lantana**

- **containers**
  - 4-in. (10-cm) pot, Blue Dart
  - 4-in. (10-cm) pot, Twisted Dart
  - 6-in. (15-cm) pot, Blue Dart
  - 6-in. (15-cm) pot, Twisted Dart

**Transplant to saleable size (from 288 cell):**

- **Lucky Lantana** rooted cuttings should be
- **As rooted cuttings develop,** high light and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- **Begin fertilization with 75 to 100 ppm N** when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- **As rooted cuttings develop,** high light and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- **Lucky Lantana does not require pinching during propagation. However, to improve branching and habit, plants can be pinched 7 to 10 days before transplanting.**
- **Lucky Lantana rooted cuttings should be ready for transplanting 24 to 28 days after sticking.**

---

**Crop Schedule & Uses**
(Crop Schedule in Weeks)

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<tr>
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</tr>
<tr>
<td>Rooted cuttings</td>
<td>6 to 7</td>
</tr>
</tbody>
</table>

*PP: Plants per pot
AFRICAN MARIGOLD (SEED)

*Tagetes erecta*

**Taishan**

**Vanilla**

Approximate seed count: 9,200 to 10,600 S./oz. (325 to 375 S./g)

**PLUG PRODUCTION**

**Media**

Use a well-drained, disease-free soilless medium with a pH of 5.5 to 6.2, and a medium initial nutrient charge (EC less than 0.75 mmhos/cm with a 2:1 extraction).

**Plug Tray Size**

Can be produced in 200, 288 or similar cell-size plug trays.

**Sowing**

Cover the seed with a medium layer of vermiculite at sowing.

**Stage 1 – Germination takes approximately 2 to 3 days.**

**Germination temperature:** 68 to 72°F (20 to 22°C)

**Light:** Light is not required for germination.

**Moisture:** Keep soil wet (level 4) during Stage 1.

**Humidity:** Maintain 95 to 97% relative humidity (RH) until radicle emergence.

**Stage 2**

**Temperature:** 70 to 75°F (21 to 24°C) days; 60 to 65°F (15 to 18°C) nights

**Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stage 2.

**Moisture:** Keep the media medium (level 3) to medium wet (level 4).

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm) with a nitrate-form fertilizer with low phosphorus.

**Stage 3**

**Temperature:** 70 to 75°F (21 to 24°C) days; 60 to 65°F (15 to 18°C) nights

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Keep the media medium wet (level 3) during Stage 3.

**Fertilizer:** Increase the fertilizer rate to level 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**

**Temperature:** 65 to 70°F (18 to 21°C) days; 60 to 65°F (15 to 18°C) nights

**Light:** Light levels can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained.

**Moisture:** Same as Stage 3.

**Fertilizer:** Same as Stage 3.

**Growth Regulators:** Generally not required during plug production. Do not hold the plugs too long – transplant them on time.

**GROWING ON TO FINISH**

**Container Size**

306 packs: 1 plant per cell

4-in. (10-cm) pots: 1 plant per pot

**Media**

Use a well-drained, disease-free media with a pH of 5.8 to 6.5 and a medium initial nutrient charge.

**Temperature**

- **Night:** 59 to 65°F (15 to 18°C)
- **Day:** 63 to 70°F (17 to 21°C)

**Light**

Keep light levels as high as possible while maintaining appropriate temperatures.

**Irrigation**

Maintain optimal media moisture (not too wet or not too dry).

**Fertilizer**

- Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm mS/cm) using predominantly nitrate-form fertilizer with low phosphorus.
- Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 6.2 to 6.5.
- For constant fertilizer program, can apply fertilizer at rate 2 (100 to 175 ppm) while maintaining the above recommended EC and pH ranges.

**Plant Growth Regulators**

- PGRs are not required when grown under short days, since plants will finish naturally shorter. Taishan can be treated with PGRs when grown under long days.
- B-Nine (daminozide) at 5,000 ppm applied twice as a foliar spray can control the plant growth.

**Photoperiod**

African Marigolds are a facultative short-day plant and the critical daylength is about 12 hours, i.e. it will flower quicker when the daylength is 12 hours or shorter. When grown at daylength longer than 12 hours, it will take an additional 10 to 14 days to flower.

**Crop Scheduling**

- **Sow to transplant:** Approximately 3 weeks.
- **Transplant to flower:** 4 to 6 weeks in Spring, 6 to 7 weeks in Summer.
- **Total crop time (sow to flower):** 7 to 9 weeks in Spring, 9 to 10 weeks in Summer.

**Common Problems**

**Insects:** Monitor for Aphids early in production, and for Thrips and Mites during flowering.
**FRENCH MARIGOLD**

(Seed)

Tagetes patula

**Durango®**

Approximate de-tailed seed count: 9,500 to 10,500 S/oz. (335 to 370 S/g)

**PLUG PRODUCTION**

**Plug Tray Size**

Durango marigold plugs can be produced in 200 to 288-cell plug trays.

**Media**

Use a well-drained, disease-free, soilless medium with a pH of 6.2 to 6.5 and a medium initial nutrient charge (EC) of 0.75 mmhos/cm (1:2 extraction).

**Sowing**

Cover the seed with coarse vermiculite. Sow to transplant: 3 to 4 days for germination.

**Temperature**

- Germination: 70 to 72°F (21 to 22°C)
- Cotyledon stage: 65 to 72°F (18 to 22°C)
- True leaves: 65 to 70°F (18 to 21°C)
- Hold plugs: 65 to 68°F (18 to 20°C)

**Light**

- Stage 1: Light is not required for germination.
- After germination: 1,000 to 2,500 f.c. (10,000 to 25,000 Lux)
- Seedling maturity: Up to 3,000 f.c. (30,000 Lux)

**Humidity**

Maintain 95% relative humidity (RH) until cotyledons emerge.

**Soil Moisture**

Keep soil moisture high until radicle emergence, then reduce moisture levels after the radicle penetrates the medium. Do not allow seedlings to wilt.

**Fertilizer**

- Feed plants weekly with 150 to 200 ppm N in a complete fertilizer. Maintain the media EC at 1.5 to 2.0 mmhos/cm and pH at 6.2 to 6.8.

**Crop Scheduling**

- Sow to transplant: 3 weeks
- Transplant to finished 306 pack: 3 to 4 weeks
- Transplant to saleable 4-in. (10-cm) pot: 5 to 6 weeks with 3 plants per pot

**Common Problems**

- Diseases: Damping off in the seedling stage
- Insects: Aphids, mites, whitefly

**OSTEOSPERMUM**

(Vegetative)

Osteospermum hybrid

**Voltage™ Yellow**

**PRODUCTION**

- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) for up to 14 days.
- Once roots begin to form, reduce temperature to 64 to 68°F (18 to 20°C) to avoid unnecessary stretch.
- A rooting hormone can be applied to promote early, uniform rooting.

**Watering**

- The media should be allowed to dry regularly between waterings and never saturated. However, plants should not be allowed to wilt at anytime.
- Leach regularly to avoid the buildup of high soluble salt levels.

**Fertilizer**

Use a balanced fertilizer at a rate of 225 to 300 ppm N. When grown excessively hungry, plants will become woody and will not branch properly.

**Pinching**

A pinch is optional; however, disbudding may be necessary for better branching.
Controlling Growth
- High light intensity and cool temperatures are needed for optimal habit.
- Voltage Yellow Osteospermum are responsive to Cycoceol and Bonzi. Apply Cycoceol as a spray (750 to 1,000 ppm). Drench applications of Cycoceol (1,000 to 1,500 ppm) have also demonstrated control. Bonzi (15 to 30 ppm) applied as a spray is also effective in reducing elongation. Begin PGR applications as new growth develops after pinching. More frequent applications will be required for smaller container sizes or if grown under warm conditions. Voltage Yellow is also responsive to B-Nine (2,500 to 4,000 ppm) alone as a spray or tank mix with Cycoceol. Apply B-Nine early in the crop cycle before buds are visible to avoid bloom delay or a reduction in bloom size.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

Common Problems
Insects: Thrips, whitefly, aphids, fungus gnats.
Diseases: Botrytis (gray mold), Thielaviopsis, Pythium, Rhizoctonia, Powdery Mildew.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant collapse</td>
<td>Plants grown in saturated media for extended periods of time (Pythium, Thielaviopsis) Stem canker (Botrytis) Rooted cuttings transplanted too deeply</td>
</tr>
<tr>
<td>Excessive vegetative growth and lack of flowers</td>
<td>Excessive ammonium-based fertilizer Over-fertilization under low light conditions Low light and overwatering, saturated media</td>
</tr>
<tr>
<td>Yellowing of young foliage</td>
<td>Saturated media</td>
</tr>
<tr>
<td>Foliage necrosis</td>
<td>High soluble salts in media Excessive water stress</td>
</tr>
<tr>
<td>Poor branching and thin plants</td>
<td>Low fertilization during early stages of growth Low light conditions</td>
</tr>
</tbody>
</table>

Crop Schedule & Uses
(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th>Container Size</th>
<th>4-in. (10-cm) Pot</th>
<th>6-in. (15-cm) Pot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrooted cuttings</td>
<td>11 to 15</td>
<td>11 to 15</td>
</tr>
<tr>
<td>Rooted cuttings</td>
<td>8 to 11</td>
<td>8 to 11</td>
</tr>
</tbody>
</table>

*PP: Plants per pot

GROWING ON TO FINISH

Media
Use a well-drained, disease-free, soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.3.

Temperature
- Night: 65 to 70°F (18 to 21°C)
- Day: 68 to 80°F (20 to 26°C)
- Peppers will be damaged by temperatures below 45°F (7°C). Prefer temperatures as warm as possible.

Light
Provide light levels as high as possible. Peppers prefer high light with warm temperatures. Foliage colors will be more intense under higher light levels and high temperatures.

Fertilization
- Fertilize at every other irrigation with 20-10-20 at rate 3 (175 to 225 ppm).
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
- High light levels and spacing will keep plants from stretching.
- Sumagic can be used on peppers.

Container Size
4-in. (10-cm) pot: 1 plug per pot
6-in (15-cm) pot: 1 to 3 plugs per pot

Crop Schedule (Spring Production)
Plug stage: 4 to 5 weeks
Transplant to foliage only, no fruit: 9 to 10 weeks
Transplant to mature fruit: 16 to 20 weeks

NOTE: Crop time for mature fruit will be 4 to 5 weeks shorter during Summer production.

ORNAMENTAL PEPPERS (SEED)
Capsicum annuum

Black Pearl
Purple Flash
Approximate seed count: 6,850 S./oz. (240 S./g)

PLUG PRODUCTION
Plug Tray Size
Ornamental peppers are well-suited to 288-cell or larger plugs.

Stage 1 - Radicle emergence/5 to 7 days
- Maintain soil temperature at 72 to 76°F (22 to 24°C).
- Keep medium evenly moist but not saturated (level 4).
- Cover the seed lightly with coarse vermiculite.
- Light is not necessary for germination until radicle emergence.
- Maintain soil pH at 5.5 to 5.8 and soluble salts (EC) at less than 0.5 mmhos/cm (using 2:1 extraction).
- Keep ammonium levels less than 10 ppm.

Stage 2 - Stem and cotyledon emergence/7 to 10 days
- Maintain soil temperature at 70 to 75°F (21 to 24°C).
- Allow the medium to dry out slightly (level 3) before watering for best germination and rooting.
- Provide light levels of up to 2,500 f.c. (26,900 Lux) for the remainder of plug production.
- Begin fertilizing at rate 1 (less than 100 ppm) from 14-0-14 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.

Stage 3 - Growth and development of true leaves/10 to 14 days
- Maintain soil temperature at 70 to 75°F (21 to 24°C).
- Avoid wilt.
- Increase feed to rate 2 (100 to 175 ppm) from 14-0-14 or other calcium/potassium nitrate fertilizer. Fertilize every 2 to 3 irrigations.

Stage 4 - Plants ready for transplanting or shipping/7 days
- Maintain soil temperature at 68 to 70°F (20 to 21°C).
- Provide medium soil moisture and avoid wilt.
- Maintain soil pH at 5.5 to 5.8 and soluble salts (EC) at less than 0.75 mmhos/cm.
- Continue to fertilize with 100 to 175 ppm N from 14-0-14 or calcium/potassium nitrate feed as needed.

PEPPERS (SEED)
ORNAMENTAL
Capsicum annuum

Purple Flash
Black Pearl
Approximate seed count: 6,850 S./oz. (240 S./g)

PLUG PRODUCTION
Plug Tray Size
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- Maintain soil temperature at 68 to 70°F (20 to 21°C).
- Provide medium soil moisture and avoid wilt.
- Maintain soil pH at 5.5 to 5.8 and soluble salts (EC) at less than 0.75 mmhos/cm.
- Continue to fertilize with 100 to 175 ppm N from 14-0-14 or calcium/potassium nitrate feed as needed.
PETUNIA (SEED)

P. x hybrid

Paparazzi™ (grandiflora)
Paparazzi™ Flash (multiflora)
Pop Rocks (spreading)

Approximate seed count (pelleted): 33,000 S/oz.
(1,200 S/g)

PLUG PRODUCTION

Media

Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 mS/cm (1:2 extraction).

Sowing

Covering seed is not recommended. Water adequately after sowing to completely dissolve the pellet.

Stage 1 – Germination takes approximately 4 days.

Soil temperature: 72 to 76°F (22 to 24°C)

Light: Lighting is optional for all varieties

Moisture: Keep soil very wet (level 5) during Stage 1 for optimal germination

Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Stage 2

Soil temperature: 68 to 75°F (20 to 24°C)

Light: Up to 2,500 f.c. (26,900 Lux)

Moisture: Start to slightly reduce soil moisture (level 4) to allow roots to penetrate into the media.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3

Soil temperature: 65 to 70°F (18 to 21°C)

Light: Up to 2,500 f.c. (26,900 Lux)

Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).

Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization.

Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Growth Regulators:

Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.

Apply B-Nine (diaminozide) 1 to 2 applications at 5,000 ppm as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

Stage 4

Soil temperature: 60 to 65°F (16 to 18°C)

Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled

Moisture: Same as Stage 3.

Fertilizer: Same as Stage 3.

GROWING ON TO FINISH

Container Size

306 packs: 1 plant per pot Paparazzi Flash
4-in. (10-cm) pots: 1 plant per pot Paparazzi Flash, Paparazzi and Pop Rocks
6-in. (15-cm) pots: 1 to 3 plants per pot Paparazzi and Pop Rocks

Media

Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

Temperature

• Night: 57 to 65°F (14 to 18°C)
• Day: 61 to 75°F (16 to 24°C)

Petunias can tolerate temperatures as low as 35°F (2°C); however, keep in mind that crop timing (time to flower) is related to daily average temperature when grown under proper daylength. Plants will take longer to flower when grown in cooler conditions.

Light

Keep light levels as high as possible while maintaining moderate temperatures.

Fertilizer

• Apply nitrate-form with low phosphorus fertilizer at rate 3 (175 to 225 ppm) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and balance medium pH. Maintain medium pH 5.8 to 6.2.
• For a constant fertilizer program, apply fertilizer at rate 3 (175 to 225 ppm) while maintaining the above recommended EC and pH ranges.

Growth Regulators

• Use B-Nine (diaminozide) at 5,000 ppm for weekly application starting at 7 days after transplant, or just use the same PGR as that for other petunias.
• To determine the best rate for your conditions, we recommend that you run an in-house trial.

Photoperiod

Petunias can flower successfully at 10-hour daylengths. Crop time is 3 to 6 days faster under longer day conditions.

Crop Scheduling

Sow to transplant (400 to 288-cell plug): 4 to 6 weeks
Transplant to flower: 5 to 7 weeks

Total Crop Time:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Number of Plants</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 &amp; 6-in. (10 &amp; 15-cm) pot</td>
<td>1</td>
<td>7 to 8</td>
<td>13 to 15</td>
</tr>
</tbody>
</table>

Common Problems

No major problems will occur if good cultural and IPM practices are used.
**PETUNIA (VEGETATIVE)**

*Petunia x hybrida*

**Black Velvet**

**Phantom**

**Pinstripe**

**PROPAGATION**
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.4 to 5.8.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- Once roots are visible, the media should be kept moderately wet and never saturated. This is critical to prevent iron deficiency and the associated chlorotic foliage which can develop.
- Appropriate water management, air and light levels should eliminate the need for chemical plant growth regulators (PGRs).
- Avoid stretch by moving crop to cooler air temperature during the last weeks of propagation.
- A pinch in propagation is not necessary.
- Black Velvet, Phantom and Pinstripe Petunias should be ready for transplant 3 weeks after sticking.

**GROWING ON TO FINISH**

**Media**
- A pH of 5.4 to 5.8 is optimum.
- Black Velvet, Phantom and Pinstripe Petunias prefer a well-drained soil.

**Temperature**
- Night: 53 to 61°F (12 to 16°C)
- Day: 59 to 76°F (15 to 24°C)

**Light**
- Black Velvet, Phantom and Pinstripe Petunias should be grown under moderate light levels; 5,000 to 8,000 f.c. (50,000 to 80,000 Lux) is the ideal range.
- Low light levels promote stem stretch and reduced plant quality.
- For fastest flowering during short daylength, maintain night temperatures at 59 to 61°F (15 to 16°C) and use lighting to provide a daylength of 10 hrs.

**Watering**
The medium should be allowed to dry between waterings. However, periods of sustained wilting should be avoided. Petunias are susceptible to Botrytis and root diseases - avoid high humidity, constantly saturated media and wet foliage.

**Fertilizer**
- Black Velvet, Phantom and Pinstripe Petunias have a high feed requirement.
- Use constant feed with a balanced fertilizer at 225 to 300 ppm N with a full complement of minor elements. Additional iron as needed.
- Regular leaching with clear water will help to reduce buildup of excess salts in media.

**Media pH Management**
- Plants must be monitored regularly for early, visual signs of upward pH drift (intereval yellowing on youngest leaves). Regular soil pH tests are an excellent way to identify movements in pH before they create visual symptoms, which can be difficult to correct.
- Periodic application of acidic feed or drench applications of a chelated iron product can be used to maintain appropriate pH levels.
- An effective method of lowering pH is a soil drench of iron sulfate. The foliage must be rinsed immediately after treatment since the iron sulfate solution which can result in phytotoxicity to flowers and foliage.

**Pinching**
Black Velvet, Phantom and Pinstripe Petunias are free-branching and do not require pinching. Pinching will delay flowering approximately 2 weeks.

**Controlling Growth**
- Use high light levels and cool temperatures to control growth.
- To control early growth and improve flowering and habit, growers can use 1 or more applications of B-Nine (1,500 to 2,500 ppm) starting 7 to 14 days after transplant. B-Nine applications late in the crop can cause instability in flower color.
- Mature plants which are approaching shipping size can be drenched with Bonzi (0.25 to 1.0 ppm) to significantly slow vegetative growth while allowing flowering to continue.
- Use of PGRs can delay flowering 1 to 2 weeks. Avoid spraying once flower buds appear.
- In general, more frequent applications of any growth regulator at a lower concentration will produce the best results.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

**Common Problems**
Black Velvet will develop a few flowers with coloring similar to Phantom. This generally occurs in low light, low fertility situations. As growing conditions improve, this is minimized.

**Insects:** Aphids, thrips, whitefly, leafminers, fungus gnats.

**Diseases:** Botrytis, Rhizoctonia, Pythium.

Because Petunias are susceptible to several viruses, it is vital to begin with cuttings supplied from clean stock.

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**Crop Schedule & Uses**

(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant collapse</td>
<td>Wet media for an extended period (Pythium) Rhizoctonia due to planting too deep</td>
</tr>
<tr>
<td>Delayed flowering</td>
<td>Daylength too short Late application of growth regulators</td>
</tr>
<tr>
<td>Excessive vegetative growth</td>
<td>High ammonia concentration in the soil Over-fertilization under low light conditions Low light levels and over-watering; wet media</td>
</tr>
<tr>
<td>Poor branching</td>
<td>Low fertilization; lack of nitrogen</td>
</tr>
<tr>
<td>Stretched plants</td>
<td>Low light levels</td>
</tr>
<tr>
<td>Chlorosis</td>
<td>Iron deficiency High pH Nitrogen deficiency</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Crop Schedule in Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4-in. (10-cm)</strong> Pot</td>
</tr>
<tr>
<td><strong>1 PP</strong></td>
</tr>
<tr>
<td><strong>6-in. (15-cm)</strong> Pot</td>
</tr>
<tr>
<td><strong>2 to 3 PP</strong></td>
</tr>
<tr>
<td><strong>Unrooted cuttings</strong></td>
</tr>
<tr>
<td>8 to 10</td>
</tr>
<tr>
<td>9 to 11</td>
</tr>
<tr>
<td><strong>Rooted cuttings</strong></td>
</tr>
<tr>
<td>5 to 7</td>
</tr>
<tr>
<td>6 to 8</td>
</tr>
</tbody>
</table>

*PP: Plants per pot*
TRAILING PETUNIA
(VEGETATIVE)

Petunia x hybrid

Suncatcher™

PROPAGATION
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.4 to 5.8.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- Once roots are visible, the media should be kept moderately wet and never saturated. This will prevent iron deficiency and the associated chlorotic foliage which can develop.
- As the rooted cuttings develop, appropriate water stress and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- Suncatcher Trailing Petunias can be pinched 18 to 24 days after sticking, when roots are well developed, to promote early branching and improve habit.
- Suncatcher Trailing Petunia rooted cuttings should be ready for transplanting 21 to 28 days after sticking.

GROWING ON TO FINISH

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.4 to 5.8.

Temperature
- Night: 53 to 61°F (12 to 16°C)
- Day: 59 to 76°F (15 to 24°C)
- Higher than recommended temperatures will cause stretch, weak stems and reduced flower size.
- Recommended night temperatures will create maximum branching and the best possible habit.

Light
- Keep light intensities at 5,000 to 8,000 f.c. (50,000 to 80,000 Lux).
- Low light levels promote stem stretch and reduced plant quality.
- For Suncatcher Trailing Petunias, flowering is best under long days of Spring and Summer. Generally, flowering will be heaviest in April to September. Crop times will be significantly lengthened under short daylengths.
- For fastest flowering during short daylength, maintain night temperatures at 59 to 61°F (15 to 16°C) and use lighting to provide a daylength of 12 to 13 hrs.

Watering
- Plants are susceptible to Botrytis - avoid high humidity, constantly saturated media and wet foliage.
- Vegetative petunias are susceptible to root diseases if overwatered. Allow the media to dry slightly between waterings, but avoid any wilt.

Fertilizer
- Vegetative petunias require heavy, constant fertilization.
- Use constant feed with a balanced fertilizer at 225 to 300 ppm N with additional iron as needed.
- A full complement of minor elements should be provided to the plant.
- Apply clear water to prevent problems with soluble salt buildup.

Media pH Management
- Plants must be monitored regularly for early, visual signs of upward pH drift (interveinal yellowing on youngest leaves). Regular soil pH tests are an excellent way to identify movements in pH before they create visual symptoms, which can be difficult to correct.
- Periodic application of acidic feed or drench applications of a chelated iron product can be used to maintain appropriate pH levels.
- An effective method of lowering pH is a soil drench of iron sulfate. The foliage must be rinsed immediately after treatment since the iron sulfate solution is a broad spectrum preventative fungicide drench following transplant.

Pinching
- Pinch plants 10 to 14 days after transplanting to improve basal branching.
- For a larger basket or container, a second pinch can be applied, but will delay flowering approximately 2 weeks.

Controlling Growth
- Use high light levels and cool temperatures to control growth.
- To control growth and improve flowering and habit, growers can use 1 or more applications of B-nine (1,500 to 2,500 ppm) starting 7 to 14 days after transplant.
- Mature plants which are approaching shipping size can be drenched with Bonzi (0.25 to 1.0 ppm) to significantly slow vegetative growth while allowing flowering to continue.
- Use of PGRs can delay flowering 1 to 2 weeks. Avoid spraying once flower buds appear.
- In general, more frequent applications of any growth regulator at a lower concentration will produce the best results.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

Common Problems
Insects: Aphids, thrips, whitefly, leafminers, fungus gnats.
Diseases: Botrytis, Rhizoctonia, Pythium.

Because Petunias are susceptible to several viruses, it is vital to begin with cuttings supplied from clean stock. Always start with clean flats and pots and apply a broad spectrum preventative fungicide drench following transplant.

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Crop Schedule & Uses
(Crop Schedule in Weeks)

| Unrooted cuttings       | 9 to 11                           |
|                        | 10 to 12                          |
| Rooted cuttings         | 6 to 8                            |
|                        | 7 to 9                            |

*PP: Plants per pot
**FLOWER GROWER FACTS**

**RUDBECKIA (SEED)**

Runbeckia hirta

**Tiger Eye**

Approximate seed count: 63,190 S./oz. (2,229 S./g)

**PLUG PRODUCTION**

**Plug Tray Size**

Rudbeckia Tiger Eye plugs are best produced in 288 plug trays. The average plug production time is 5 – 8 weeks.

**Media**

Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC) of 0.50 to 0.75 mmhos/cm (1:2 extraction).

**Sowing**

Lightly cover the seed with a light layer of coarse grade vermiculite. This helps in keeping the seed moist during germination. Light is required for germination. Allow 10 to 14 days for germination.

**Temperature**

**Germination:** 75 to 78°F (24 to 25°C)

**After germination:** Plugs can be grown in the greenhouse at 70 to 75°F (21 to 24°C) days and 64 to 67°F (18 to 19°C) nights until transplant.

**Light**

**Stage 1:** Light is required for germination

**After germination:** 2,500 to 3,000 f.c. (25,000 to 30,000 Lux)

**Seeding maturity:** Up to 5,000 f.c. (50,000 Lux)

**Humidity**

Maintain 95 to 100% relative humidity during germination.

**Soil Moisture**

Keep soil moisture high at radicle emergence, then reduce moisture levels after cotyledon development. Do not allow seedlings to wilt.

**Fertilizer**

When cotyledons fully expand, start fertilizing with 50 ppm N twice a week. As the true leaves develop, increase the fertilizer rate to 100 ppm N. Maintain the plug media EC at 1.0 to 1.5 mmhos/cm and pH at 6.0 to 6.2.

**Plant Growth Regulators**

Not required.

**GROWING ON TO FINISH**

**Container Size**

6-in. (15-cm.) pots

**Media**

Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and medium initial nutrient charge.

**Temperature**

• **Night:** 55 to 60°F (13 to 15°C)
• **Day:** 64 to 67°F (18 to 19°C)

**Irrigation**

Maintain even moisture. Avoid excessive wetness.

**Fertilizer**

• After transplant, fertilize the crop with a balanced fertilizer supplying 150 to 200 ppm N.
• Maintain the media EC at 1.50 to 2.00 mmhos/cm and pH at 5.8 to 6.5.

**Crop Scheduling**

**Sow to transplant** (288-cell plug): 5 to 8 weeks

**Transplant to finish in a 6-in. (15-cm.) pot:** 7 to 9 weeks, 1 to 3 plants per pot

**Common Problems**

Insects: Whiteflies, thrips, & aphids

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**SALVIA (VEGETATIVE)**

**Mystic Spires Blue**

**PROPAGATION**

• Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.

• Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).

• Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.

• Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.

• Once roots are visible, the media should be kept moderately wet and never saturated. This will prevent iron deficiency and the associated chlorotic foliage which can develop.

• As the rooted cuttings develop, appropriate water stress and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).

• A B-Nine spray (2,500 to 3,000 ppm) once roots have developed is effective in controlling stretch and encouraging good branching.

• A Bonzi drench (0.5 to 3 ppm) 10 to 12 days after sticking is also effective in controlling stretch.

• Mystic Spires Blue Salvia should be pinched 18 to 24 days after sticking, when roots are well developed, to promote early branching and improve habit.

• Mystic Spires Blue Salvia rooted cuttings should be ready for transplanting 21 to 24 days after sticking.

**GROWING ON TO FINISH**

**Media**

• A pH of 5.8 to 6.2 is optimum.

• Mystic Spires Blue Salvia prefers a well-drained soil.

**Temperature**

• **Night:** 62 to 67°F (17 to 19°C)
• **Day:** 71 to 79°F (21 to 26°C)

**Light**

• Mystic Spires Blue Salvia should be grown in high light; 6,000 to 10,000 f.c. (60,000 to 100,000 Lux) is the ideal range.

• Plants will stretch badly at light intensities below 4,000 f.c. (40,000 Lux); branching will be reduced, as will flowering, and the overall quality of Mystic Spires Blue Salvia will be reduced significantly.

• Mystic Spires Blue Salvia will bloom quicker under short days.

**Watering**

The medium must be allowed to dry between waterings. However, periods of sustained wilting should be avoided.
**SALVIA continued**

**Fertilizer**
- Mystic Spires Blue Salvia has a moderate fertilizer requirement.
- Maintain constant fertilization at 150 to 225 ppm N.
- Excessive phosphorous and ammoniacal nitrogen will promote unwanted vegetative growth. Both should be provided in very limited quantities.
- If new growth is chlorotic, add chelated iron to the feed.
- Slow-release fertilizer can be incorporated at a moderate rate to supplement a liquid program.

**Pinching**
- Mystic Spires Blue Salvia should be pinched 7 to 10 days after transplanting.
- Depending on the pot size, light levels and other cultural factors, 1 to 2 additional pinches will be required. Each pinch should be performed when 4 mature leaves can be left on the stem after the terminal is removed to ensure adequate breaks after the pinch. Plants should bloom 4 to 6 weeks after a pinch.

**Controlling Growth**
- Maintain recommended temperatures and light levels to avoid stretch.
- Wet media will cause stretching and produce weak growth.
- Do not allow the plants to become crowded on the bench.
- Mystic Spires Blue Salvia is responsive to Bonzi (0.5 to 1.5 ppm drench), B-Nine (2,500 to 3,000 ppm) and Cycocel (1,000 to 1,500 ppm) tank mix (spray) applied 1 to 3 times and is effective for toning. Applications should be made 10 to 14 days apart as needed.
- When producing under long days (greater than 14 hr. days) B-Nine at 2,500 to 5,000 ppm is useful for controlling height. Flowering time is increased under long days.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

**Common Problems**

<table>
<thead>
<tr>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant collapse</td>
<td>Stem canker (Botrytis) Plants grown in saturated media for extended periods of time (Pythium)</td>
</tr>
<tr>
<td>Excessive vegetative growth and lack of flowers</td>
<td>Excessive ammonia nitrogen in fertilizer Low light and over-watering; saturated media</td>
</tr>
<tr>
<td>Poor branching and thin plants</td>
<td>Low fertilization during early stages of growth; low light</td>
</tr>
</tbody>
</table>

**Crop Schedule & Uses**

<table>
<thead>
<tr>
<th>6-in. (15-cm) Pots</th>
<th>Unrooted cuttings</th>
<th>Rooted cuttings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 2 PP*</td>
<td>10 to 14</td>
<td>6 to 10</td>
</tr>
</tbody>
</table>

*PP: Plants per pot

**SALVIA (SEED)**
Salvia splendens

**Vista Purple**
Vista Red

Approximate seed count: 7,500 S/.oz. (256 S/.g)

**PLUG PRODUCTION**

**Media**
Use a well-drained, disease-free seedling medium with a pH of 5.8 to 6.2 and EC about 0.5 mS/cm (1:2 extraction).

**Sowing**
Covering seed with a thin layer of vermiculite is recommended.

**Stage 1 - Germination takes approximately 4-5 days.**

**Soil temperature:** 75 to 78°F (24 to 25°C)
**Light:** Lighting is not necessary
**Moisture:** Keep soil moist (level 4) during Stage 1 for optimal germination.
**Humidity:** Maintain 100% relative humidity (RH) until radicles emerge.

**Stage 2**

**Soil temperature:** 72 to 75°F (24 to 25°C)
**Light:** Up to 2,500 f.c. (26,900 Lux)
**Moisture:** Start to slightly reduce soil moisture (level 3) to allow roots to penetrate into the media
**Fertilizer:** Apply fertilizer at rate 1 (less than 50-75 ppm) from nitrate-form fertilizers with low phosphorous.

**Stage 3**

**Soil temperature:** 65 to 70°F (18 to 21°C)
**Light:** Up to 2,500 f.c. (26,900 Lux)
**Moisture:** Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
**Fertilizer:** Increase fertilizer to rate 2 (100 to 175 ppm). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 0.75-1.0 and 1.5 mS/cm (1:2 extraction).
**Growth Regulators:** Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. B-Nine at 2500-5000 to tone plugs. Test all chemical plant regulators first.

**Stage 4**

**Soil temperature:** 60 to 65°F (15 to 18°C)
**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
**Moisture:** Same as Stage 3.
**Fertilizer:** Same as Stage 3.
**SNAPDRAGON (SEED)\(^*\)**

*Antirrhinum majus*

**Snapshot™ Series**
Approximate seed count: 180,000 S./oz. (6,350 S./g)

### GROWTH ON TO FINISH

**Container Size**
306 tray: 1 plant per cell

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.8-6.2 and a medium initial nutrient charge.

**Temperature**
- **Night:** 55 to 60°F (13 to 15°C)
- **Day:** 70 to 75°F (21 to 24°C)

**Light**
Keep light levels as high as possible while maintaining moderate temperatures.

**Fertilizer**
- **For a constant fertilizer program**, apply fertilizer at rate 2 (100 to 175 ppm) while maintaining the above recommended EC and pH ranges.
- **Growth Regulators**
  - Use B-Nine (daminozide) at 2,500-5,000 ppm every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and balance medium pH. Maintain medium pH 5.8 to 6.2.
  - For a constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm) while maintaining the above recommended EC and pH ranges.
- **Soil EC:**
  - **Stage 1:** Initial charge and a pH of 5.5 to 6.2
  - **Stage 2:** 5.5 to 5.8
  - **Stage 3:** 5.5 to 5.8
  - **Stage 4:** <0.75 mmhos/cm

**Stage 1 - Time of radical emergence.**
Use a well-distributed, disease-free seedling medium with a pH of 5.5 to 5.8 and EC less than 0.75 mmhos/cm (2:1 extraction).

**Germination and Plug Production**

**Stage 1 - Time of radical emergence.**
Use a well-distributed, disease-free seedling medium with a pH of 5.5 to 5.8 and EC less than 0.75 mmhos/cm (2:1 extraction).

**Germination:**
- **Stage 4:** 50 to 75 ppm N from 14-0-14 or calcium/potassium nitrate feed once per week when cotyledons are fully expanded. Alternate feed with clear water. Maintain water alkalinity at 60-100 ppm and ammonium levels at less than 10 ppm.

**Soil pH:**
- 5.5 to 5.8

**Soil EC:**
- <0.75 mmhos/cm

**Stage 2 - Stem and cotyledons emerge.**
Timing: 7 to 14 days

**Soil temperature:**
- 65 to 70°F (18 to 21°C)

**Moisture:**
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering. Irrigate early in the day so that foliage is dry by nightfall.

**Light:**
- 450 to 1,500 fc. (5,000 to 16,000 Lux)

**Fertilizer:**
- 50 to 75 ppm N from 14-0-14 or calcium/potassium nitrate feed once per week when cotyledons are fully expanded.

**Stage 3 - Growth and development of true leaves.**
Timing: 14 days

**Soil temperature:**
- 62 to 65°F (17 to 18°C)

**Moisture:**
- To promote root growth and control shoot growth, allow the soil to dry between irrigations, but avoid wilting.

**Light:**
- 1,000 to 2,500 fc. (11,000 to 27,000 Lux)

**Fertilizer:**
- 100 to 150 ppm of 20-10-20 alternating with 15-5-15 or other cal-mag formulations, every 2 or 3 irrigations.

**Soil pH:**
- 5.5 to 5.8

**Soil EC:**
- <1.0 mmhos/cm

**Stage 4 - Plants are ready for transplant or shipping.**
Timing: 7 days

**Soil temperature:**
- 60 to 62°F (16 to 19°C)

**Moisture:**
- Allow soil to dry thoroughly between irrigations, but avoid wilting.

**Light:**
- 1,000 to 2,500 fc. (11,000 to 27,000 Lux)

**Fertilizer:**
- 100 to 150 ppm N from 15-5-15 or other cal-mag formulation as needed. Avoid ammonium fertilizers in Stage 4.

**Soil pH:**
- 5.5 to 5.8

**Soil EC:**
- <0.75 mmhos/cm

**Common Problems**

**Insects:** Thrip, Aphids, Whitefly

**Diseases:** Alternaria Leaf Spot, Powdery Mildew, Rust

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**Snapshot™ Series**
Approximate seed count: 180,000 S./oz. (6,350 S./g)

**GERMINATION AND PLUG PRODUCTION**

**Stage 1 - Time of radical emergence.**
Use a well-distributed, disease-free seedling medium with a pH of 5.5 to 5.8 and EC less than 0.75 mmhos/cm (2:1 extraction).

**Germination:**
- 64 to 68°F (18 to 20°C)

**Timing:**
- 4 to 8 days

**Soil temperature:**
- 64 to 68°F (18 to 20°C)

**Moisture:**
- Medium

**Light:**
- Not required

**Cover:**
- Lightly with vermiculite

**Stage 2 - Stem and cotyledons emerge.**
Timing: 7 to 14 days

**Soil temperature:**
- 65 to 70°F (18 to 21°C)

**Moisture:**
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering. Irrigate early in the day so that foliage is dry by nightfall.

**Light:**
- 450 to 1,500 fc. (5,000 to 16,000 Lux)

**Fertilizer:**
- 50 to 75 ppm N from 14-0-14 or calcium/potassium nitrate feed once per week when cotyledons are fully expanded.

**Stage 3 - Growth and development of true leaves.**
Timing: 14 days

**Soil temperature:**
- 62 to 65°F (17 to 18°C)

**Moisture:**
- To promote root growth and control shoot growth, allow the soil to dry between irrigations, but avoid wilting.

**Light:**
- 1,000 to 2,500 fc. (11,000 to 27,000 Lux)

**Fertilizer:**
- 100 to 150 ppm of 20-10-20 alternating with 15-5-15 or other cal-mag formulations, every 2 or 3 irrigations.

**Soil pH:**
- 5.5 to 5.8

**Soil EC:**
- <1.0 mmhos/cm

**Stage 4 - Plants are ready for transplant or shipping.**
Timing: 7 days

**Soil temperature:**
- 60 to 62°F (16 to 19°C)

**Moisture:**
- Allow soil to dry thoroughly between irrigations, but avoid wilting.

**Light:**
- 1,000 to 2,500 fc. (11,000 to 27,000 Lux)

**Fertilizer:**
- 100 to 150 ppm N from 15-5-15 or other cal-mag formulation as needed. Avoid ammonium fertilizers in Stage 4.

**Soil pH:**
- 5.5 to 5.8

**Soil EC:**
- <0.75 mmhos/cm
VERBENA (VEGETATIVE)

Verbena x hybrid

Aztec®

PROPAGATION
- Choose a well-drained medium with an EC of 0.75 to 0.80 mho and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Once roots are visible, the media should be kept moderately wet and never saturated. This will prevent iron deficiency and the associated chlorotic foliage which can develop.
- As rooted cuttings are removed from mist, apply a broad spectrum foliar fungicide.
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- As the rooted cuttings develop, high light and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- To improve branching and habit, plants can be pinched 7 to 10 days before transplanting.
- Aztec Verbena rooted cuttings should be ready for transplanting 24 to 28 days after sticking.

GROWING ON TO FINISH

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2.

Temperature
- Night: 62 to 64°F (17 to 18°C)
- Day: 71 to 79°F (21 to 26°C)

Light
- Keep light intensities above 5,000 f.c. (50,000 Lux) while maintaining moderate temperatures.
- Low light levels promote stem stretch and poor flowering.
- Aztec Verbena flower year-round, although shortest crop times will occur under Spring and Summer conditions.

Water
- During the first 10 to 14 days, water sparingly and never saturate the media. Allow the media to dry somewhat between waterings.
- Avoid extended periods where the media is saturated, as this will cause root system problems.
- Avoid wet foliage in areas where powdery mildew can be a problem.

Fertilizer
- Aztec Verbena have moderate to heavy fertilizer requirements to keep the plants growing vigorously. Reducing the feed causes the plant to become woody and foliage quality to decline.
- Use a balanced fertilizer at 225 to 300 ppm every watering to ensure maximum growth and flowering.
- Excessive phosphorous and ammoniacal nitrogen will promote unwanted vegetative growth. Both should be provided in very limited quantities.
- Controlled-release fertilizer can be used to supplement a liquid feed program.
- Leach pots periodically with clear water to avoid build-up of salts.

Pinching
- Aztec Verbena should be pinched 7 to 14 days after transplanting. When pinched, plants should be actively growing with roots at or near the edge of the pot.
- Plants can be sheared 1 to 2 times as needed if the crop must be held.
- Florel promotes branching and improves the habit of Verbena. Any application of Florel should be avoided within 8 weeks of sale. A range of 300 to 400 ppm, applied 1 to 2 times should be used as a guideline.

Controlling Growth
- A tank mix of Cycocel (750 to 1,500 ppm) and B-Nine (2,500 to 3,500 ppm) applied 7 to 10 days after pinching will encourage the naturally mounded habit of Aztec Verbena.
- Similar results occur with a B-Nine spray (3,000 to 4,000 ppm). Multiple applications can be made as needed.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

Common Problems
Insects: Aphids, thrips, whitefly, spider mites, leafminer.
Diseases: Botrytis, Rhizoctonia, Pythium, powdery mildew.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant collapse</td>
<td>Wet media for an extended period (Pythium, Botrytis)</td>
</tr>
<tr>
<td>Excess vegetative growth</td>
<td>High ammonia concentration in the soil Over-fertilization under low light conditions Low light and over-watering; wet media</td>
</tr>
<tr>
<td>Poor branching</td>
<td>Low fertilization during early stages</td>
</tr>
<tr>
<td>Foliage necrosis</td>
<td>Drying out the plant between irrigations High soluble salts in the soil Powdery mildew</td>
</tr>
<tr>
<td>Foliage chlorosis</td>
<td>Low temperatures Powdery mildew</td>
</tr>
</tbody>
</table>

Crop Schedule & Uses
(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th></th>
<th>4-in. (10-cm)</th>
<th>6-in. (15-cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PP</strong></td>
<td>Pot</td>
<td>Pot</td>
</tr>
<tr>
<td>1 PP*</td>
<td>Rooted cuttings</td>
<td>10 to 11</td>
</tr>
<tr>
<td>5 to 7</td>
<td>Unrooted cuttings</td>
<td>7 to 8</td>
</tr>
</tbody>
</table>

*PP: Plants per pot
**VERBENA (SEED)**

*Verbena x hybrid*

**Quartz XP**

Approximate seed count: 11,900 S/oz (420 S/g)

**PLUG PRODUCTION**

*Plug Tray Size*

392-cell or similar size.

**Sowing**

- Cover with a medium covering of coarse-grade vermiculite.
- Moisture management is the key to successful verbena germination.
- Verbena germinates best under medium-dry (level 2) to medium (level 3) plug media moisture levels; medium-wet (level 4), and wet (level 5) conditions will tend to decrease germination performance.
- Moisture levels in the plug media at sowing can be controlled by adjusting the water pressure, number of misting nozzles and the speed of the misting tunnel in the sowing line.

**Stage 1 - Sow to radicle emergence; 4 to 6 days**

*Germination temperature:* 72 to 75°F (22 to 24°C)

*Light:* Not required for germination.

*Relative humidity:* 95 to 97%.

**Stage 2 - Radicle emergence to cotyledon expansion; 10 to 14 days**

*Temperature:* The day air temperatures can be set at 70 to 72°F (21 to 22°C) and the night temperature at approximately 60°F (15°C).

*Light:* Up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.

*Moisture:* Once the plug trays come out of the germination chamber, grow them under medium-wet (level 4) moisture conditions. Avoid wet (level 5) moisture conditions until the seedlings establish.

*Fertilizer:* Apply fertilizer at rate 1 (less than 100 ppm) with a nitrate-form fertilizer with low phosphorus. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

**Stage 3 - Cotyledon expansion to growth of all set of true leaves; 10 to 14 days**

*Temperature:* The day air temperatures can be set at 68 to 70°F (20 to 21°C) and the night temperature at approximately 60°F (15°C).

*Fertilizer:* Increase the fertilizer rate to 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4 - Development of all true leaves to shipping/transplant; 7 days**

Maintain the recommended growing temperatures and fertilizer regime as in Stage 3. Light levels can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained. Check for powdery mildew from this stage onwards.

**Growth Regulators**

If plant growth regulator treatments are necessary for holding/toning the plugs, apply A-Rest (ancymidol) at 10 ppm as a foliar spray.

**GROWING ON TO FINISH**

**Container Size**

306-cell packs.

**Media**

Use a well-drained, disease-free soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

**Temperature**

Maintain day temperatures at 65 to 70°F (18 to 21°C) and night temperatures at about 60°F (15°C) until finish. Verbena can be grown as low as 55°F (13°C), but the crop time will be longer.

**Light**

Keep light levels as high as possible while maintaining appropriate temperatures.

**Humidity**

Avoid high humidity in the growing environment as this can induce powdery mildew.

**Fertilizer**

Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm) using predominantly nitrate-form fertilizer with low phosphorus. If needed, a balanced ammonium and nitrate-form fertilizer may be used as needed to encourage growth and balance the media pH.

**Growth Regulators**

Use 2 applications of A-Rest (ancymidol) at 20 ppm as a foliar spray. One application can be done 1 week after transplant, and the second application can be done 10 to 14 days later.

**B-Nine (daminozide) at 3,500 ppm applied as a foliar spray also works well. Use the same spray schedule as recommended for A-Rest.**

**Crop Scheduling**

Sow to transplant (392-cell plug): Approximately 4 weeks

Transplant to flower in 306-cell packs: 6 to 8 weeks

**Total Crop Time:**

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Number of Plants</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 pack</td>
<td>1 per cell</td>
<td>10 to 12 weeks</td>
</tr>
</tbody>
</table>

**Common Problems**

Insects: Mites, thrips

Diseases: Powdery mildew

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**VINCA (SEED)**

*Catharanthus roseus*

**Garden**

Approximate seed count: 14,875 S/oz (525 S/g)

**PLUG PRODUCTION**

*Media*

Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.0 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

**Sowing**

Can be produced in 392, 288, or similar cell size plug trays. Cover the seed with vermiculite. Allow 3 to 5 days for germination.

**Stage 1 - Germination takes 3 to 5 days.**

*Soil Temperature:* 75 to 78°F (24 to 25°C)

*Light:* Not required

*Moisture:* Keep soil wet (level 4) during Stage 1.

*Humidity:* Maintain 95% relative humidity (RH) until the cotyledons emerge.

**Stage 2**

*Soil temperature:* 70 to 72°F (21 to 22°C)

*Light:* Up to 2,500 f.c. (26,900 Lux)

*Moisture:* Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.

*Fertilizer:* Apply fertilizer at rate 1 (less than 100 ppm) from nitrate-form fertilizers with low phosphorous.

**Stage 3**

*Soil temperature:* 70 to 72°F (21 to 22°C)

*Light:* Up to 2,500 f.c. (26,900 Lux)

*Moisture:* Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).

*Fertilizer:* Increase fertilizer to rate 2 (100 to 175 ppm). Maintain medium pH of 5.8 to 6.0 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).
**ZINNIA** (SEED)

*Zinia spp.*

**Bridesmaid**
Champagne Toast
White Wedding
UpTown
Double Zahara
Approximate seed count: 10,000 to 17,000 S./oz. (350 to 600 S./g)

**PLUG PRODUCTION**

**Media**
Use a well-drained, disease-free, soilless media with a pH range of 5.8 to 6.2 and EC less than 0.75mmhos/cm (2:1 extraction).

**Stage 1 – Germination takes approximately 2 to 3 days**
Germination temperature: 68 to 73°F (20 to 22°C)

**Light:** Light is not required for germination.

**Moisture:** Keep the soil wet (level 4) during Stage 1
Relative humidity: Maintain 95 to 97% relative humidity (RH) until cotyledons emerge.

**Stage 2**
Temperature: 68 to 76°F (20 to 24°C) days; 59 to 64°F (15 to 18°C) nights

**Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.

**Media Moisture:** Keep the media medium (level 3) to medium wet (level 4).

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm) with a nitrate-form fertilizer with low phosphorus.

**Stage 3**
Temperature: 68 to 76°F (20 to 24°C) days; 59 to 64°F (15 to 18°C) nights

**Media Moisture:** Keep the media medium wet (level 3) to medium wet (level 4) during Stages 3 and 4.

**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm) and pH at 5.8 to 6.2, and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**
Temperature: 65 to 70°F (18 to 21°C) days; 59 to 64°F (15 to 18°C) nights

**Light:** Light levels can be up to 5,000 f.c. (53,800 Lux) if optimal temperatures can be maintained.

**Fertilizer:** Same as Stage 3.

**Crop Scheduling**
**Sow to transplant:** (392, 288, or similar cell plug size): 5 weeks
**Transplant to finish in 306-packs:** 3 to 5 weeks
4-in. (10-cm) pot: 3 to 5 weeks. 1 plant per pot
6-in (15-cm) pot: 3 to 5 weeks. 1-3 plants per pot
**Total crop time from sow to finish:** 8 to 10 weeks. The timing is dependent on temperature and light levels.

**Common Problems**
**Diseases:** Incorporate a preventative fungicide program for *Rhizoctonia*, *Botrytis* and *Phytophthora*.

---

**FLOWER GROWER FACTS**

**GROWING ON TO FINISH**

**Container Size**
Double Zahara can be produced in 306 pack or 4-in. (10-cm) pots.
The other varieties can be produced in 4-in. (10-cm) or 6-in. (15-cm) pots.

**Media**
Use a well-drained, disease-free media with a pH of 5.8 to 6.2 and a medium initial nutrient charge.

**Temperature**
- **Night:** 59 to 64°F (15 to 18°C)
- **Day:** 65 to 70°F (18 to 21°C)

**Light**
Keep light levels as high as possible while maintaining appropriate temperatures. Flowers will be more double with intense color under high light levels.

**Fertilizer**
- **Starting 1 week after transplant,** apply fertilizer at rate 3 (175 to 225 ppm) using predominantly nitrate-form fertilizer with low phosphorus.
- **If needed,** alternate with a balanced ammonium and nitrate-form fertilizer to encourage growth and balance the media pH.
- Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.8 to 6.2.
- Avoid fertilizer/nutritional stress during production as this can cause the flowers to be less double.

**Irrigation**
Maintain optimal media moisture (not too wet or too dry). Avoid overhead irrigation. Irrigation should take place during times when foliage will dry quickly, to prevent any disease incidence.

**Plant Growth Regulators**
*Botrytis* (daminozide) at 3,500 to 5,000 ppm applied twice as a foliar spray will help in controlling the plant growth. First application can be done one week after transplant, followed by a second application 7 to 10 days later.

**Crop Scheduling**
**Sow to transplant:** Approximately 3 weeks
**Transplant to flower:** 8 to 9 weeks in Spring, 5 to 6 weeks in Summer
**Total crop time (sow to flower):** 11 to 12 weeks in Spring, 8 to 9 weeks in Summer.

**Common Problems**
**Insects:** Monitor for Aphids early in production, and Thrips during flowering.
**Disease:** Avoid high humidity and condensation in the greenhouse, as these conditions are favorable for *Botrytis* and Powdery Mildew incidence.
## Burpee Home Gardens® Vegetable Variety Culture Chart

Note: This chart includes general culture guidelines. Please refer to the GrowerFacts on the following pages for detailed growing information. See the inside back cover for Burpee Home Gardens "To Go" Culture Charts.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Germination Temperature</th>
<th>Cover/Light</th>
<th>Sow to Transplant (days)</th>
<th>Growing On Temperature</th>
<th>Total Crop Time for 4-in. (10-cm) pots (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VEGETABLES</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Artichoke</td>
<td>70-75°F (21-24°C)</td>
<td>C. Lt.</td>
<td>35-45</td>
<td>55-58°F (13-14°C)</td>
<td>10-12</td>
</tr>
<tr>
<td>Arugula</td>
<td>65-70°F (18-21°C)</td>
<td>C</td>
<td>10-15</td>
<td>50-60°F (15-15°C)</td>
<td>7-8</td>
</tr>
<tr>
<td>Bean (Pole/Bush)</td>
<td>72-75°F (22-24°C)</td>
<td>C</td>
<td>Direct sow into container²</td>
<td>60-65°F (15-18°C)</td>
<td>3-5</td>
</tr>
<tr>
<td>Broccoli</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>10-21</td>
<td>50-60°F (10-15°C)</td>
<td>8-9</td>
</tr>
<tr>
<td>Brussels Sprouts</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>10-14</td>
<td>50-60°F (10-15°C)</td>
<td>8-9</td>
</tr>
<tr>
<td>Cabbage</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>10-15</td>
<td>50-60°F (10-15°C)</td>
<td>8-9</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>10-16</td>
<td>50-60°F (10-15°C)</td>
<td>8-9</td>
</tr>
<tr>
<td>Celery</td>
<td>70-72°F (21-22°C)</td>
<td>C</td>
<td>30-35</td>
<td>58-60°F (14-15°C)</td>
<td>8-10</td>
</tr>
<tr>
<td>Collards</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>10-14</td>
<td>50-60°F (10-15°C)</td>
<td>8-9</td>
</tr>
<tr>
<td>Cucumber</td>
<td>72°F (22°C)</td>
<td>C</td>
<td>Direct sow into container²</td>
<td>60-65°F (15-18°C)</td>
<td>3-5</td>
</tr>
<tr>
<td>Eggplant</td>
<td>70-75°F (21-24°C)</td>
<td>C</td>
<td>12-18</td>
<td>60-65°F (15-18°C)</td>
<td>8-9</td>
</tr>
<tr>
<td>Fennel</td>
<td>70-72°F (21-22°C)</td>
<td>C</td>
<td>30-35</td>
<td>55-60°F (13-15°C)</td>
<td>9-11</td>
</tr>
<tr>
<td>Kohrabi</td>
<td>65-70°F (18-21°C)</td>
<td>C</td>
<td>28-30</td>
<td>50-60°F (10-15°C)</td>
<td>8-9</td>
</tr>
<tr>
<td>Lettuce &amp; Greens</td>
<td>65-70°F (18-21°C)</td>
<td>C/L</td>
<td>Direct sow into container²</td>
<td>55-60°F (13-15°C)</td>
<td>6-9</td>
</tr>
<tr>
<td>Melon</td>
<td>75-78°F (24-25°C)</td>
<td>C</td>
<td>Direct sow into container²</td>
<td>65-70°F (18-21°C)</td>
<td>4-5</td>
</tr>
<tr>
<td>Mustard</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>10-14</td>
<td>50-60°F (10-15°C)</td>
<td>8-9</td>
</tr>
<tr>
<td>Okra</td>
<td>70°F (21°C)</td>
<td>C. Lt.</td>
<td>14-18</td>
<td>60-65°F (15-18°C)</td>
<td>9-11</td>
</tr>
<tr>
<td>Onion</td>
<td>70°F (21°C)</td>
<td>C. Lt.</td>
<td>Direct sow into container²</td>
<td>55-60°F (13-15°C)</td>
<td>12-15</td>
</tr>
<tr>
<td>Pak Choi</td>
<td>65-70°F (18-21°C)</td>
<td>C</td>
<td>28-32</td>
<td>50-60°F (10-15°C)</td>
<td>7-8</td>
</tr>
<tr>
<td>Pea</td>
<td>50-60°F (10-15°C)</td>
<td>C</td>
<td>Direct sow into container²</td>
<td>45-55°F (7-13°C)</td>
<td>4-5</td>
</tr>
<tr>
<td>Pepper</td>
<td>75-78°F (24-25°C)</td>
<td>C/L</td>
<td>21-26</td>
<td>62-65°F (17-18°C)</td>
<td>9-11</td>
</tr>
<tr>
<td>Pumpkin</td>
<td>72°F (22°C)</td>
<td>C</td>
<td>Direct sow into container²</td>
<td>62-65°F (17-18°C)</td>
<td>4-6</td>
</tr>
<tr>
<td>Spinach</td>
<td>65-70°F (18-21°C)</td>
<td>C/L</td>
<td>Direct sow into container²</td>
<td>55-60°F (13-15°C)</td>
<td>6-9</td>
</tr>
<tr>
<td>Squash (Summer &amp; Winter)</td>
<td>72°F (22°C)</td>
<td>C</td>
<td>Direct sow into container²</td>
<td>60-65°F (15-18°C)</td>
<td>4-6</td>
</tr>
<tr>
<td>Strawberry</td>
<td>65-70°F (18-21°C)</td>
<td>C. Lt.</td>
<td>28-38</td>
<td>60-62°F (15-17°C)</td>
<td>9-10</td>
</tr>
<tr>
<td>Swiss Chard</td>
<td>68-72°F (20-22°C)</td>
<td>C</td>
<td>30-35</td>
<td>55-58°F (13-14°C)</td>
<td>10-12</td>
</tr>
<tr>
<td>Tomato</td>
<td>70-75°F (21-24°C)</td>
<td>C</td>
<td>12-18</td>
<td>62-65°F (17-18°C)</td>
<td>8-10</td>
</tr>
<tr>
<td>Watermelon</td>
<td>75-80°F (24-26°C)</td>
<td>C</td>
<td>Direct sow into container²</td>
<td>65-70°F (18-21°C)</td>
<td>6-7</td>
</tr>
<tr>
<td><strong>HERBS</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Basil</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>15-18⁴</td>
<td>60-65°F (15-18°C)</td>
<td>8-10</td>
</tr>
<tr>
<td>Borage</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>14-20</td>
<td>55-60°F (13-15°C)</td>
<td>10-12</td>
</tr>
<tr>
<td>Catnip</td>
<td>70-75°F (21-24°C)</td>
<td>C. Lt.</td>
<td>25-29</td>
<td>55-60°F (13-15°C)</td>
<td>12-13</td>
</tr>
<tr>
<td>Chives</td>
<td>70°F (21°C)</td>
<td>C. Lt.</td>
<td>Direct sow into container³</td>
<td>55-60°F (13-15°C)</td>
<td>15-17</td>
</tr>
<tr>
<td>Cilantro</td>
<td>68-70°F (20-21°C)</td>
<td>C/L</td>
<td>14-18⁴</td>
<td>55-60°F (13-15°C)</td>
<td>10-11</td>
</tr>
<tr>
<td>Dill</td>
<td>65-70°F (18-21°C)</td>
<td>L</td>
<td>10-15⁴</td>
<td>55-60°F (13-15°C)</td>
<td>9-11</td>
</tr>
<tr>
<td>Lavender</td>
<td>65-75°F (18-24°C)</td>
<td>L</td>
<td>20-32</td>
<td>60-65°F (15-18°C)</td>
<td>18-20</td>
</tr>
<tr>
<td>Oregano</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>21-28</td>
<td>50-55°F (10-13°C)</td>
<td>12-13</td>
</tr>
<tr>
<td>Parsley</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>21-28⁴</td>
<td>60-65°F (15-18°C)</td>
<td>10-11</td>
</tr>
<tr>
<td>Peppermint &amp; Spearmint</td>
<td>70-75°F (21-24°C)</td>
<td>C. Lt.</td>
<td>25-29</td>
<td>55-60°F (13-15°C)</td>
<td>12-13</td>
</tr>
<tr>
<td>Rosemary</td>
<td>70°F (21°C)</td>
<td>L</td>
<td>21-28</td>
<td>55-60°F (13-15°C)</td>
<td>16-18</td>
</tr>
<tr>
<td>Sage</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>20-27</td>
<td>55-60°F (13-15°C)</td>
<td>12-14</td>
</tr>
<tr>
<td>Stevia</td>
<td>70°F (21°C)</td>
<td>C. Lt.</td>
<td>10-14</td>
<td>60-65°F (15-18°C)</td>
<td>7-10</td>
</tr>
<tr>
<td>Summer Savory</td>
<td>70-72°F (21-22°C)</td>
<td>L</td>
<td>28-30</td>
<td>60-62°F (16-17°C)</td>
<td>7-8</td>
</tr>
<tr>
<td>Summer Thyme</td>
<td>70°F (21°C)</td>
<td>C</td>
<td>12-18</td>
<td>55-60°F (13-15°C)</td>
<td>13-15</td>
</tr>
<tr>
<td>Sweet Marjoram</td>
<td>70°F (21°C)</td>
<td>C. Lt.</td>
<td>10-14</td>
<td>55-60°F (13-15°C)</td>
<td>11-12</td>
</tr>
</tbody>
</table>

C: Cover  C. Lt.: Cover lightly  L: Light needed to germinate  C/L: Cover optional

1 Based on 512-plug (except when direct sown)  2 2-3 seeds per container

3 Broadcast seed  4 Can broadcast seed into final container to cut cost and growing time

5 Weeks from sow to saleable size: For packs, reduce the crop time 1-2 weeks. For containers larger than 4-in. size, increase the crop time 1-2 weeks.
NOTE: Growers should use the information presented here as a starting point. Crop times will vary depending on the climate, location, time of year and greenhouse environmental conditions. Chemical and PGR recommendations are only guidelines. It is the responsibility of the applicator to read and follow all the current label directions for the specific chemical being used in accordance with all regulations.

### ARTICHOKE
*Cynara scolymus*

#### Imperial Star

#### PLUG PRODUCTION

**Stage 1 - Time of radicle emergence (4 to 8 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Artichoke is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed lightly with coarse vermiculite.

**Stage 2 - Stem and cotyledon emergence (7 to 10 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 - Growth and development of true leaves (14 to 18 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.

**Stage 4 - Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 55 to 60°F (13 to 15°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

#### GROWING ON TO FINISH

**Temperature**
- Night: 55 to 58°F (13 to 14°C)
- Day: 55 to 62°F (13 to 17°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Artichoke is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

#### POST-PRODUCTION CARE

**Optimum Temperature**
- Night: 55 to 65°F (13 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Artichoke prefers cool temperatures; below 70°F (21°C) is recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Artichoke grows best in full sun; however partial shading may be beneficial during retail display.

**Common Problems**
*Insects:* Aphids, Whitefly, Fungus gnats
*Diseases:* Pythium, Rhizoctonia, Powdery Mildew

### ARUGULA
*Eruca sativa*

#### Myway

#### PLUG PRODUCTION

**Stage 1 - Time of radicle emergence (3 to 5 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Arugula is very sensitive to high salts, particularly high ammonium, during germination.
**Stage 2 – Stem and cotyledon emergence (4 to 7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (10 to 14 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 – Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 60 to 62°F (15 to 17°C).
- Allow the soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

**Temperature**
- Night: 50 to 60°F (10 to 15°C)
- Day: 55 to 60°F (13 to 15°C)

**Light**
- Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
- Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Day: 65 to 70°F (18 to 21°C)
- Arugula prefers cool temperatures; however partial shading may be beneficial during retail display.

**Common Problems**
- Insects: Aphids, Arugula looper, Whitefly, Stem borer, Fungus gnats
- Diseases: Pythium, Rhizoctonia

**BEAN**

**Phaseolus vulgaris**

**Blue Lake Bush**
**Blue Lake Pole**
**Green ‘N Gold Mix**

**DIREC SOW**
Sow seed directly into finish container.

**Time of radicle emergence (2 to 4 days)**
- Soil temperature 72 to 75°F (22 to 24°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) to less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels less than 10 ppm.

**After stem and cotyledon emergence (7 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.
- Keep soil pH to 5.8 to 6.2 and EC to less than 0.75 mmhos/cm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**GROWING ON TO FINISH**
Grow and development after the development of true leaves (3 to 5 weeks)

**Temperature**
- Night: 60 to 65°F (15 to 18°C)
- Day: 65 to 70°F (18 to 21°C)

**Light**
- Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
- Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.2.
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

**Fertilization**
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations. If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz /100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Maintain soil pH at 5.8 to 6.2.

**Controlling Height**
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs can not be used on most vegetables and herbs.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Day: 65 to 70°F (18 to 21°C)
- Arugula prefers cool temperatures; however partial shading may be beneficial during retail display.

**Common Problems**
- Insects: Whitefly, Spider mites
- Diseases: Fungal diseases
**BROCCOLI**

Brassica oleracea Botrytis group

Flash Hybrid
A Burpee Home Gardens® Exclusive variety.

Packman
Raab

**PLUG PRODUCTION**

**Stage 1 – Time of radicle emergence (3 to 5 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Broccoli is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

**Stage 2 – Stem and cotyledon emergence (4 to 7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (10 to 14 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 – Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 60 to 62°F (16 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

**Temperature**
- Night: 50 to 60°F (10 to 15°C)
- Day: 55 to 60°F (13 to 15°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 2 – Stem and cotyledon emergence (4 to 7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (10 to 14 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC to less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 – Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 60 to 62°F (16 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

**Temperature**
- Night: 50 to 60°F (10 to 15°C)
- Day: 55 to 60°F (13 to 15°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 2 – Stem and cotyledon emergence (4 to 7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (10 to 14 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC to less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 – Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 60 to 62°F (16 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
VEGETABLE GROWER FACTS

CABBAGE
Brassica oleracea Capitata group

Big Flat Head

Fast Vantage

Pacifica

PLUG PRODUCTION
Stage 1 – Time of radicle emergence (3 to 5 days)
• Soil temperature 65 to 70°F (18 to 21°C).
• Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
• Cabbage is very sensitive to high salts, particularly high ammonium, during germination.
• Keep ammonium levels to less than 10 ppm.
• Cover the seed with coarse vermiculite.

Stage 2 – Stem and cotyledon emergence (4 to 7 days)
• Soil temperature 62 to 65°F (17 to 18°C).
• Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
• Keep soil pH to 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
• Keep ammonium levels to less than 10 ppm.

POST-PRODUCTION CARE
Optimum Temperature
• Night: 62 to 65°F (17 to 18°C).
• Day: 65 to 70°F (18 to 21°C).

Chemical PGRs can not be used on most vegetables and herbs.

Cauliflower
Brassica oleracea Botrytis group

Amazing Cheddar
Romanesco Veronica
Snow Crown

PLUG PRODUCTION
Stage 1 – Time of radicle emergence (3 to 5 days)
• Soil temperature 65 to 70°F (18 to 21°C).
• Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
• Cauliflower is very sensitive to high salts, particularly high ammonium, during germination.
• Keep ammonium levels to less than 10 ppm.
• Cover the seed with coarse vermiculite.

Stage 2 – Stem and cotyledon emergence (4 to 7 days)
• Soil temperature 62 to 65°F (17 to 18°C).
• Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
• Keep soil pH at 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
• Keep ammonium levels to less than 10 ppm.

POST-PRODUCTION CARE
Optimum Temperature
• Night: 62 to 65°F (17 to 18°C).
• Day: 65 to 70°F (18 to 21°C).

Chemical PGRs can not be used on most vegetables and herbs.

ITALIAN CABBAGE
Brassica oleracea Acephala group

Sweetheart

PLUG PRODUCTION
Stage 1 – Time of radicle emergence (3 to 5 days)
• Soil temperature 65 to 70°F (18 to 21°C).
• Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
• Cabbage is very sensitive to high salts, particularly high ammonium, during germination.
• Keep ammonium levels to less than 10 ppm.
• Cover the seed with coarse vermiculite.

Stage 2 – Stem and cotyledon emergence (4 to 7 days)
• Soil temperature 62 to 65°F (17 to 18°C).
• Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
• Keep soil pH to 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
• Keep ammonium levels to less than 10 ppm.
CAULIFLOWER continued

- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

Stage 4 – Plugs ready for transplanting or shipping (7 days)

- Soil temperature 60 to 62°F (16 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

Temperature
- Night: 50 to 60°F (10 to 15°C)
- Day: 55 to 60°F (13 to 15°C)

Light
- Maintain light levels as high as possible while maintaining moderate temperatures.

Media
- Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

Fertilization
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Cauliflower is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)

Light
- Cauliflower grows best in full sun; however partial shading may be beneficial during retail display.

Common Problems
- Insects: Aphids, Cauliflower looper, Whitefly, Stem borer, Fungus gnats
- Diseases: Pythium, Rhizoctonia

CELERY

Apium graveolens var. dulce

Tango

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (8 to 10 days)

- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

Stage 2 – Stem and cotyledon emergence (7 to 10 days)

- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (10 to 14 days)

- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20 10-20 alternating with 14 0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.

Stage 4 – Plugs ready for transplanting or shipping (7 days)

- Soil temperature 60 to 62°F (16 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

Temperature
- Night: 58 to 60°F (14 to 15°C)
- Day: 60 to 65°F (15 to 18°C)

Light
- Maintain light levels as high as possible while maintaining moderate temperatures.

Media
- Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

Fertilization
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Celery prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
- Celery grows best in full sun; however partial shading may be beneficial during retail display.

Common Problems
- Insects: Aphids, Whitefly, Fungus gnats
- Diseases: Pythium, Rhizoctonia

COLLARDS

Brassica oleracea Acephala group

Georgia

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (3 to 5 days)

- Soil temperature 65 to 70°F (18 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Collards are very sensitive to high salts, particularly high ammonium, during germination.
VEGETABLE GROWER FACTS

Stage 2 – Stem and cotyledon emergence (4 to 7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14 or 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (10 to 14 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20:10:20 alternating with 14:0:14, 15:5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

Stage 4 – Plugs ready for transplanting or shipping (7 days)
- Soil temperature 60 to 62°F (16 to 17°C).
- Allow the soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14:0:14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

Temperature
- Night: 50 to 60°F (10 to 15°C)
- Day: 55 to 60°F (13 to 15°C)

Light
Maintain light levels as high as possible while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

Fertilization
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20:10:20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)

Light
Collards grow best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids, Cabbage looper, Whitefly, Stem borer, Fungus gnats
Diseases: Pythium, Rhizoctonia

CUCUMBER
Cucumis sativus

BOOST Gold Standard
Burpee Hybrid II
Burpless No. 26
Bush Champion
A Burpee Home Gardens® Exclusive variety.

Homemade Pickles
Pickalot Hybrid
A Burpee Home Gardens® Exclusive variety.

Sweet Burpless Hybrid
A Burpee Home Gardens® Exclusive variety.

DIRECT SOW
Sow seed directly into finish container.

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Collards are responsive to day/night temperature differential (DIF), and are shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)

Light
Maintain light levels as high as possible while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.2.

Fertilization
- Increase feed to 100 to 150 ppm N from 20:10:20 alternating with 14:0-14 or 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Maintain soil pH at 5.8 to 6.2.

Controlling Height
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)

Light
Cucumbers grow best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Whitefly, Spider mites
Diseases: Fungal diseases
**EGGPLANT**

*Solanum melongena*

**Burpee Hybrid**
A Burpee Home Gardens® Exclusive variety.

**Pot Black**

**Purple Blaze**
A Burpee Home Gardens® Exclusive variety.

**White Star Hybrid**
A Burpee Home Gardens® Exclusive variety.

**PLUG PRODUCTION**

**Stage 1 - Time of radicle emergence (3 to 6 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.5 mmhos/cm (2:1 extraction).
- Eggplant is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 - Stem and cotyledon emergence (7 to 10 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC to less than 0.5 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14 or 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 - Growth and development of true leaves (10 to 14 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 - Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 60 to 62°F (16 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

**Temperature**
- Night: 55 to 65°F (13 to 18°C)
- Day: 60 to 70°F (15 to 21°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).**

**Alternate feed with clear water.**

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 55 to 65°F (13 to 18°C)
- Day: 60 to 70°F (15 to 21°C)

**Optimum conditions may be difficult to maintain, especially if plants are displayed outside.**

**Light**
Eggplant prefers full sun; however partial shading may be beneficial during retail display.

**Common Problems**
**Insects:** Aphids, Thrips, Whitefly
**Diseases:** Botrytis, Pythium

**FENNEL**

*Foeniculum vulgare*

**Orion**

**PLUG PRODUCTION**

**Stage 1 - Time of radicle emergence (5 to 7 days)**
- Soil temperature 70 to 72°F (21 to 22°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Fennel is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

**Stage 2 - Stem and cotyledon emergence (7 to 10 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 - Growth and development of true leaves (10 to 14 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil at pH 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.

**Stage 4 - Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 55 to 60°F (13 to 15°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 55 to 65°F (13 to 18°C)

Light
Maintain light levels as high as possible while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

Fertilization
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Fennel is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)

Light
- Fennel prefers cool temperatures; Day: 65 to 70°F (18 to 21°C) Night: 62 to 65°F (17 to 18°C).
- Kohlrabi prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Common Problems
- Insects: Aphids, Cabbage looper, Whitefly, Stem borers, Fungus gnats
- Diseases: Pythium, Rhizoctonia, Fusarium

LETTUCE & GREENS

Lactuca sativa

Burpee Bibb
- A Burpee Home Gardens® Exclusive variety.

Buttercrunch
- A Burpee Home Gardens® Exclusive variety.

Little Caesar
- A Burpee Home Gardens® Exclusive variety.

LETTUCE BLENDS

Gourmet Blend
- A Burpee Home Gardens® Exclusive variety.

Heatwave Blend
- A Burpee Home Gardens® Exclusive variety.

MULTI-SPECIES, MULTI-PELLET MIXES

Alfresco Mix

City Garden Mix

Global Gourmet Mix

SALAD MIX

BOOST Healing Hands

PLUG PRODUCTION

Stage 1 - Time of radicle emergence (3 to 5 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm.
- Kohlrabi is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

Stage 2 - Stem and cotyledon emergence (4 to 7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 - Growth and development of true leaves (10 to 14 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations, Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.

Stage 4 - Plugs ready for transplanting or shipping (7 days)
- Soil temperature 60 to 62°F (15 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

Temperature
- Night: 50 to 60°F (10 to 15°C)
- Day: 55 to 60°F (13 to 15°C)

Light
Maintain light levels as high as possible while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

Fertilization
- Fertilize every other irrigation with 15:0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Kohlrabi is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

PLUG PRODUCTION

Note: Direct sowing seed into the finish container is an alternative.

Stage 1 - Time of radicle emergence (3 to 5 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Keep media very moist, near saturation.
- Cover the seed very lightly with vermiculite or no covering.
- Light at 100 to 400 foot-candles may be beneficial for germination.
**LETTUCE & GREENS continued**

- Soils pH 5.5 to 5.8 and soluble salts (EC) less than 0.50 mmhos/cm (2:1 extraction).
- Lettuce is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 - Stem and cotyledon emergence (5 to 7 days)**
- Soil temperature 65°F to 70°F (18 to 21°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.50 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14 or 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 - Growth and development of true leaves (7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14 or 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Use DIF whenever possible, especially for the first 2 hours after sunrise, to control plant height.
- Growth regulators cannot be used on lettuce.

**Stage 4 - Plugs ready for transplanting or shipping (5 to 7 days)**
- Soil temperature 60 to 62°F (15 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

**Temperature**
- Night: 55 to 60°F (13 to 15°C)
- Day: 55 to 65°F (13 to 18°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Melon**

*Cucumis melo*

**Ambrosia**

**Doral**

Twice As Nice
A Burpee Home Gardens® Exclusive variety.

**DIRECT SOW**
Sow seed directly into finish container.

**Time of radicle emergence (2 to 4 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

**After stem and cotyledon emergence (7 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Fertilizer**
- Fertilize every 2 to 3 irrigations.
- Use DIF whenever possible, especially for the first 2 hours after sunrise, to control plant height.

**Common Problems**
- Diseases: Botrytis, Pythium, Rhizoctonia
- Insects: Aphids

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Controlling Height**
- Once plants are rooted to the sides of the container, they can be allowed to root up to maintain, especially if plants are displayed outside.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Lettuce prefers full sun; however partial shade may be beneficial during retail display.

**Common Problems**
- Insects: Whitefly, Spider mites
- Diseases: Fungal diseases

**VEGETABLE GROWER FACTS**

**Soil**
- Soil temperature 65°F to 70°F (18 to 21°C).
- Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm.

**Controlling Height**
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Lettuce is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 65 to 70°F (18 to 21°C)
- Day: 68 to 75°F (20 to 24°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.2.

**Fertilization**
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14 or 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Use DIF whenever possible, especially for the first 2 hours after sunrise, to control plant height.

**Common Problems**
- Insects: Whitefly, Spider mites
- Diseases: Fungal diseases

**Melon**

*Cucumis melo*

**Ambrosia**

**Doral**

Twice As Nice
A Burpee Home Gardens® Exclusive variety.

**DIRECT SOW**
Sow seed directly into finish container.

**Time of radicle emergence (2 to 4 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

**After stem and cotyledon emergence (7 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm.

**Controlling Height**
- Once plants are rooted to the sides of the container, they can be allowed to root up to maintain, especially if plants are displayed outside.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Lettuce prefers full sun; however partial shade may be beneficial during retail display.

**Common Problems**
- Insects: Whitefly, Spider mites
- Diseases: Fungal diseases

**Melon**

*Cucumis melo*

**Ambrosia**

**Doral**

Twice As Nice
A Burpee Home Gardens® Exclusive variety.

**DIRECT SOW**
Sow seed directly into finish container.

**Time of radicle emergence (2 to 4 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

**After stem and cotyledon emergence (7 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm.

**Controlling Height**
- Once plants are rooted to the sides of the container, they can be allowed to root up to maintain, especially if plants are displayed outside.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 65 to 70°F (18 to 21°C)
- Day: 68 to 75°F (20 to 24°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.2.

**Fertilization**
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14 or 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Use DIF whenever possible, especially for the first 2 hours after sunrise, to control plant height.

**Common Problems**
- Insects: Whitefly, Spider mites
- Diseases: Fungal diseases
**VEGETABLE GROWER FACTS**

**MUSTARD**
*Brassica juncea*

**Florida Broadleaf**

**PLUG PRODUCTION**

**Stage 1 – Time of radicle emergence** (3 to 5 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Mustard is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

**Stage 2 – Stem and cotyledon emergence (4 to 7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (10 to 14 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every other irrigation with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunset, to control plant height.

**Stage 4 – Plugs ready for transplanting or shipping** (7 days)
- Soil temperature 60 to 62°F (15 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

**Temperature**
- Night: 50 to 60°F (10 to 15°C)
- Day: 55 to 60°F (13 to 15°C)

**OKRA**
*Abelmoschus esculentus*

**Clemson Spineless**

**PLUG PRODUCTION**

**Stage 1 – Time of radicle emergence** (5 to 7 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Okra is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed lightly with coarse vermiculite.

**Stage 2 – Stem and cotyledon emergence** (7 to 14 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 0:1 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorus and ammonium-form nitrogen.
- Mustard is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Mustard prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Maximum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
- Mustard grows best in full sun; however partial shading may be beneficial during retail display.

**Common Problems**
- Insects: Aphids, Cabbage looper, Whitefly, Stem borer, Fungus gnats
- Diseases: *Pythium, Rhizoctonia*

**GROWING ON TO FINISH**

**Temperature**
- Night: 60 to 65°F (15 to 18°C)
- Day: 65 to 75°F (18 to 24°C)

**Light**
- Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
- Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 0:1 extraction).
OKRA continued

Controlling Height
• Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
• Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
• Okra is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
• Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE
Optimum Temperature
• Okra prefers temperatures of 68°F (20°C) during retail display.
• Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Okra grows best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids, Whitefly
Diseases: Pythium, Rhizoctonia

ONION

Allium cepa

Parade Bunching
Red Zeppelin
White Sweet Spanish
Yellow Sweet Spanish

DIRECT SOW
Sow seed directly into finish container.

Time of radicle emergence (2 to 4 days)
• Soil temperature 70 to 75°F (21 to 24°C).
• Keep media very moist, near saturation.
• Seed are to be covered.
• Soil ph 5.8 to 6.2 and soluble salts (EC) to less than 0.75 mmhos/cm (2:1 extraction).
• Avoid high salts and particularly high ammonium during germination.
• Keep ammonium levels to less than 10 ppm.

After stem and cotyledon emergence (7 days)
• Soil temperature 65 to 70°F (18 to 21°C).
• Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.
• Keep soil ph to 5.8 to 6.2 and EC to less than 0.75 mmhos/cm.
• Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate fertilizer once cotyledons are fully expanded.
• Alternate fertilize with clear water.
• Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

GROWING ON TO FINISH
Growth and development after the development of true leaves (12 to 15 weeks)

Temperature
• Night: 55 to 60°F (13 to 15°C)
• Day: 65 to 70°F (18 to 21°C)
• Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

Light
Maintain light levels as high as possible while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.2.

Fertilization
• Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.

Controlling Height
• Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.
• Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
• Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE
Optimum Temperature
• Night: 62 to 65°F (17 to 18°C)
• Day: 65 to 70°F (18 to 21°C)
• Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Onions grow best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Diseases: Fungal diseases

PAK CHOI

Brassica rapa Chinensis group

Toy Choy

PLUG PRODUCTION

Stage 1 - Time of radicle emergence (3 to 5 days)
• Soil temperature 65 to 70°F (18 to 21°C).
• Soil ph 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
• Pak Choi is very sensitive to high salts, particularly high ammonium, during germination.
• Keep ammonium levels to less than 10 ppm.
• Cover the seed with coarse vermiculite.

Stage 2 - Stem and cotyledon emergence (4 to 7 days)
• Soil temperature 62 to 65°F (17 to 18°C).
• Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
• Keep soil pH at 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
• Keep ammonium levels to less than 10 ppm.
• Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
• Alternate fertilize with clear water.
• Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 - Growth and development of true leaves (4 to 7 days)
• Soil temperature 62 to 65°F (17 to 18°C).
• Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
• Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
• Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
• Fertilize every 2 to 3 irrigations.

Stage 4 - Plugs ready for transplanting or shipping (7 days)
• Soil temperature 55 to 60°F (13 to 15°C).
• Allow soil to dry thoroughly between irrigations.
• Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
• Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH
Temperature
• Night: 50 to 60°F (10 to 15°C)
• Day: 55 to 60°F (18 to 15°C)

Light
Maintain light levels as high as possible while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

Fertilization
• Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
• Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).
Controlling Height
- Once plants are rooted to the sides of the container, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorus and ammonium-form nitrogen.
- Pak Choi is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE
Optimum Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)
- Pak Choi prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- flavor is expected to be produced early in the season.
- Light
  Pak Choi grows best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids, Cabbage looper, Whitefly, Stem borer, Fungus gnats
Diseases: Pythium, Rhizoctonia, Fusarium

GROWING ON TO FINISH
Growth and development after the development of true leaves (2 to 3 weeks)
Temperature
- Night: 45 to 55°F (7 to 13°C)
- Day: 55 to 60°F (13 to 15°C)
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

Light
Maintain light levels as high as possible while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.2.

Fertilization
- Increase feed to 100 ppm N from 20-10-20 alternating with 14-0-14 or 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Maintain soil at pH 5.8 to 6.2.

Controlling Height
- Height can also be controlled by withholding fertilizer, especially phosphorus and ammonium-form nitrogen.
- Chemical PGRs can not be used on most vegetables and herbs.

PEA
Pisum sativum
RSVPea
A Burpee Home Gardens® Exclusive variety.

DIRECT SOW
- Sow seed directly into finish container.
- Peas are a cool season crop and should be produced early in the season.

Time of radicle emergence (4 to 6 days)
- Soil temperature 50 to 60°F (10 to 15°C).
- Keep media very moist, near saturation.
- Cover seed.
- Soil pH 5.8 to 6.2 and soluble salts (EC) to less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

After stem and cotyledon emergence (7 to 10 days)
- Soil temperature 50 to 60°F (10 to 15°C).
- Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.
- Keep soil pH to 5.8 to 6.2 and EC to less than 0.75 mmhos/cm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14 or 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.

Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

PEPPER
Capsicum annuum

Bananarama
Baron
Better Belle
Big Bertha
Big Daddy Hybrid
A Burpee Home Gardens® Exclusive variety.
Big Early
BOOST Sweet Heat
Burning Bush
Cajun Belle
Costa Rican Sweet Hybrid
A Burpee Home Gardens® Exclusive variety.
Flavorburst Hybrid
A Burpee Home Gardens® Exclusive variety.
Great Stuff Hybrid
A Burpee Home Gardens® Exclusive variety.
Hot Lemon
A Burpee Home Gardens® Exclusive variety.
Hungarian Yellow Wax
Jalapeño Gigante
Pinot Noir
Ristra Cayenne Hybrid
A Burpee Home Gardens® Exclusive variety.
Sweet Spot Hybrid X3R
Tabasco
Zavory
A Burpee Home Gardens® Exclusive variety.

PLUG PRODUCTION
Stage 1 – Time of radicle emergence (5 to 7 days)
- Soil temperature 75 to 78°F (24 to 26°C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Light is not necessary for germination until radicle emergence.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.5 mmhos/cm (2:1 extraction).
- Peppers are very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (7 to 10 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Increase light levels to 1,000 to 2,500 foot-candles.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.5 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
PEPPER continued

• Alternate feed with clear water.
• Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (10 to 14 days)
• Soil temperature 65 to 70°F (18 to 21°C).
• Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
• Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
• Increase feed to 100 to 150 ppm N with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
• Fertilize every 2 to 3 irrigations.
• If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
• Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

Stage 4 – Plugs ready for transplanting or shipping (7 days)
• Soil temperature 60 to 62°F (15 to 17°C).
• Allow soil to dry thoroughly between irrigations.
• Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
• Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

Temperature
• Night: 62 to 65°F (17 to 18°C)
• Day: 65 to 70°F (18 to 21°C)
• Peppers will be damaged by temperatures below 45°F (7°C).

Light
Maintain high light levels while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.3.

Fertilization
• Fertilize every third irrigation with 15-0-15.
• Fertilize every 2 to 3 irrigations.
• If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
• Use DIF whenever possible, especially if plants are displayed outside.

CONTROLLING HEIGHT
• Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
• Chemical PGRs can not be used on most vegetables and herbs.

PUMPKIN
Cucurbita maxima

Casper
A Burpee Home Gardens® Exclusive variety.

Harvest Moon

Howden
Jack-Be-Little

DIRECT SOW
Sow seed directly into finish container.

Time of radicle emergence (2 to 4 days)
• Soil temperature 70 to 75°F (21 to 24°C).
• Keep media very moist, near saturation.
• Seed are to be covered.
• Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
• Avoid high salts and particularly high ammonium during germination.
• Keep ammonium levels to less than 10 ppm.

After stem and cotyledon emergence (7 days)
• Soil temperature 65 to 70°F (18 to 21°C).
• Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.
• Keep soil pH to 5.8 to 6.2 and EC to less than 0.75 mmhos/cm.
• Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feeds once cotyledons are fully expanded.
• Alternate feed with clear water.
• Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

GROWING ON TO FINISH
Growth and development after the development of true leaves (4 to 6 weeks)

Temperature
• Night: 62 to 65°F (17 to 18°C)
• Day: 66 to 70°F (19 to 21°C)

• Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

Light
Maintain light levels as high as possible while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.2.

Fertilization
• Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
• Fertilize every 2 to 3 irrigations.
• If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
• Maintain soil pH at 5.8 to 6.2.

Controlling Height
• Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.
• Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
• Chemical PGRs can not be used on most vegetables and herbs.

SPINACH
Spinacia oleracea

Baby’s Leaf Hybrid
A Burpee Home Gardens® Exclusive variety.

Bloomsdale

PLUG PRODUCTION
Note: Direct sowing seed into the finish container is an alternative.

Stage 1 – Time of radicle emergence (3 to 5 days)
• Soil temperature 65 to 70°F (18 to 21°C).
• Keep media very moist, near saturation.
• Cover the seed.
• Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.50 mmhos/cm (2:1 extraction).
VEGETABLE GROWER FACTS

- Spinach is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 – Stem and cotyledon emergence (7 to 14 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.50 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (7 to 14 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.
- Chemical PGRs can not be used on vegetables and herbs.

**Stage 4 – Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 60 to 62°F (15 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

**Temperature**
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 memos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Spinach is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 55 to 58°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Spinach should be placed in partial shade during retail display.

**Common Problems**
**Insects:** Aphids
**Diseases:** Botrytis, Pythium, Rhizoctonia

**SQUASH**
- *Cucurbita pepo* (Summer squash)
- *Cucurbita maxima* (Winter squash)
- **Burpee Golden (Zucchini)**
  A Burpee Home Gardens® Exclusive variety.
- **Burpee Hybrid (Zucchini)**
  A Burpee Home Gardens® Exclusive variety.
- **Burpee’s Bush Table Queen**
  A Burpee Home Gardens® Exclusive variety.
- **Burpee’s Butterbush**
  A Burpee Home Gardens® Exclusive variety.
- **Limelight (Zucchini)**
- **Lunar**
- **Pic-N-Pic Hybrid**
  A Burpee Home Gardens® Exclusive variety.

**DIRECT SOW**
Sow seed directly into finish container.

**Time of radicle emergence (2 to 4 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

**After stem and cotyledon emergence (7 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.
- Keep soil pH to 5.8 to 6.2 and EC to less than 0.75 mmhos/cm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**GROWING ON TO FINISH**

**Temperature**
- Night: 60 to 65°F (15 to 18°C)
- Day: 68 to 75°F (20 to 24°C)
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.2.

**Fertilization**
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-0-15, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Maintain soil pH at 5.8 to 6.2.

**Controlling Height**
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs can not be used on most vegetables and herbs.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Squash prefers full sun, although partial shade may be beneficial in retail areas.

**Common Problems**
**Insects:** Whitefly, Spider mites
**Diseases:** Fungal diseases


### STRAWBERRY

**Fragaria x ananassa**

**Berri Basket® White**

**Berries Galore® Pink, Rose & White**

#### PLUG PRODUCTION

**Stage 1 – Time of radicle emergence (5 to 7 days)**
- Soil temperature 70°F (21°C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Light at 100 to 400 foot-candles may be beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Gradually increase the light intensity to 500 to 1,500 foot-candles.
- Keep soil pH to 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 – Stem and cotyledon emergence (16 to 21 days)**
- Soil temperature 70°F (21°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Gradually increase the light intensity to 500 to 1,500 foot-candles.
- Keep soil pH to 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (7 to 14 days)**
- Soil temperature 65° to 68°F (18 to 20°C).
- Allow the soil to dry slightly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Gradually increase the light intensity to 1,500 to 2,500 foot-candles.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 – Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 60 to 62°F (15 to 17°C).
- Allow soil to dry slightly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

### GROWING ON TO FINISH

**Temperature**
- Night: 60 to 62°F (15 to 17°C)
- Day: 60 to 65°F (15 to 18°C)

**Light**
- Maintain high light levels while maintaining moderate temperatures.

**Media**
- Use a well-drained, disease-free soilless medium with a medium internal nutrient charge and a pH of 6.5 to 7.5.

**Watering**
- Keep the media moist but not soggy.
- Do not allow the media to dry out.

**Fertilization**
- Fertilize every other irrigation with 10 ppm.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorus and ammonium-form nitrogen.
- Strawberries are responsive to day/night temperature differential (DIF), and are shorter with a negative DIF.
- Chemical PGRs can not be used on most fruit, vegetables and herbs.

### POST-PRODUCTION CARE

**Optimum Temperature**
- Night: 60 to 62°F (15 to 17°C)
- Day: 60 to 65°F (15 to 18°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
- Strawberries perform best in full sun; however partial shading may be beneficial during retail display.

**Crop Timing**
- Baskets with 3 to 4 plugs per baskets: 11 to 13 weeks

**Common Problems**
- Insects: Spider mites
- Diseases: Leaf spots, Mildew

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### SWISS CHARD

**Beta vulgaris ssp. Cicla**

#### Bright Lights

#### PLUG PRODUCTION

**Stage 1 – Time of radicle emergence (4 to 8 days)**
- Soil temperature 68 to 72°F (20 to 22°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Swiss Chard is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

**Stage 2 – Stem and cotyledon emergence (4 to 7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (10 to 14 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.

**Stage 4 – Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 60 to 62°F (15 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
GROWING ON TO FINISH

Temperature
- Night: 55 to 58°F (13 to 14°C)
- Day: 60 to 62°F (15 to 17°C)

Light
Maintain light levels as high as possible while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH 5.5 to 6.2.

Fertilization
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20:10:20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Growth can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 55 to 65°F (13 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Swiss Chard prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Swiss Chard grows best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids, Whitefly, Fungus gnats
Diseases: Pythium, Rhizoctonia

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (2 to 3 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media evenly moist but not saturated.
- Cover the seed with coarse vermiculite.
- Light is not needed for germination until radicle emergence.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.50 mmhos/cm (2:1 extraction).
- Tomatoes are very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (7 days)
- Soil temperature 68 to 72°F (20 to 22°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Light levels can be increased to 1,000 to 1,500 foot-candles.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.50 mmhos/cm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Keep ammonium levels to less than 10 ppm.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (7 days)
- Soil temperature 60 to 65°F (15 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Increase light intensity to 1,000 to 2,500 foot-candles.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 50 to 75 ppm N with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Do not mix magnesium sulfate with potassium nitrate fertilizer.
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.

Stage 4 – Plugs ready for transplanting or shipping (7 days)
- Soil temperature 60 to 62°F (15 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
**WATERMELON**

*Citrullus lanatus*

**Crimson Sweet**

**Sugar Baby**

**DIRECT SOW**

Sow seed directly into finish container.

**Time of radicle emergence (2 to 4 days)**

- Soil temperature 75 to 80°F (24 to 27°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

**After stem and cotyledon emergence (7 days)**

- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.
- Keep soil pH to 5.8 to 6.2 and EC to less than 0.75 mmhos/cm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer. Feed once cotyledons are fully expanded.
- Alternate feed with clear water. Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**GROWING ON TO FINISH**

Growth and development after the development of true leaves (4 to 5 weeks)

**Temperature**

- Night: 65 to 70°F (18 to 21°C).
- Day: 68 to 75°F (20 to 24°C).
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Fertilization**

- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Maintain soil pH at 5.8 to 6.2.

**Controlling Height**

- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs can not be used on most fruits, vegetables and herbs.

**Light**

Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**

Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.8 to 6.2.

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**POST-PRODUCTION CARE**

**Optimum Temperature**

- Night: 65 to 70°F (18 to 21°C).
- Day: 70 to 75°F (18 to 24°C).
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**

Watermelon prefers full sun although partial shade may be beneficial in retail areas.

**Common Problems**

- Insects: Whitefly, Spider mites
- Diseases: Fungal diseases
**BASIL**

*Ocimum basilicum*

**Boxwood**

**Cardinal**

**Nufar**

**Red Rubin**

**Siam Queen**

**Sweet Dani Lemon**

**Sweet Italian Large Leaf**

**Sweet Mammoth**

**PLUG PRODUCTION**

*Note: Direct sowing into the finish container is an alternative.*

**Stage 1 - Time of radicle emergence (5 to 8 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Keep media very moist, near saturation.
- Seed should be covered.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Basil is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 - Stem and cotyledon emergence (7 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Radicum nitrogen levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 - Growth and development of true leaves (7 to 10 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with nitrogen as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 - plugs ready for transplanting or shipping (7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

- **Temperature**
  - Night: 60 to 65°F (15 to 18°C)
  - Day: 65 to 70°F (18 to 21°C)

- **Light**
  - Maintain light levels as high as possible while maintaining moderate temperatures.

- **Media**
  Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

- **Fertilization**
  - Fertilize every 2 to 3 irrigations.
  - Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed at 100 to 150 ppm nitrogen.
  - Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

- **Controlling Height**
  - Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
  - Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
  - Basil is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
  - Chemical PGRs can not be used on most vegetables and herbs.

**POST-PRODUCTION CARE**

- **Optimum Temperature**
  - Night: 62 to 65°F (17 to 18°C)
  - Day: 65 to 70°F (18 to 21°C)
- **Optimum conditions may be difficult to maintain, especially if plants are displayed outside.**

- **Light**
  - Basil grows best in full sun; however partial shading may be beneficial during retail display.

**Common Problems**

- **Insects:** White fly, Aphids
- **Diseases:** Fungal diseases

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**CATNIP**

*Nepeta cataria*

**Hardy zones 3-9**

**PLUG PRODUCTION**

**Stage 1 - Time of radicle emergence (2 to 3 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Light is not needed for germination until radicle emergence.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Mint is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 - Stem and cotyledon emergence (3 to 5 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 - Growth and development of true leaves (5 to 7 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 - plugs ready for transplanting or shipping (7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
CATNIP continued

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 62°F (15 to 17°C)
- Cooler temperatures will produce more compact growth.
- Warm temperatures promote weak growth and stretching.

Light
Maintain high light levels while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

Fertilization
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Catnip is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 60°F (13 to 15°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Catnip grows best in full sun; however partial shading may be beneficial during retail display.

Common Problems
- Insects: Aphids, Whitefly
- Diseases: Botrytis

CHIVES

Garlic Allium tuberosum
Onion Allium schoenoprasum
Hardy zones 3-9

DIRECT SOW
Sow seed directly into finish container.

Time of radicle emergence (2 to 5 days)
- Soil temperature 70 to 75°F (21 to 24°C)
- Keep media very moist, near saturation.
- Seed should be covered.

• Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
• Avoid high salts and particularly high ammonium during germination.
• Keep ammonium levels to less than 10 ppm.

After stem and cotyledon emergence (7 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.
- Keep soil pH at 5.8 to 6.2 and EC less than 0.75 mmhos/cm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

GROWING ON TO FINISH

Optimum Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Fertilization
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations. If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Maintain soil pH at 5.8 to 6.2.

Controlling Height
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs can not be used on most vegetables and herbs.

CILANTRO

Coriandrum sativum (Coriander)

Santo

PLUG PRODUCTION
NOTE: Direct sowing into the finish container is an alternative.

Stage 1 - Time of radicle emergence (3 to 5 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Keep media very moist, near saturation.
- Cover the seed very lightly with vermiculite or no covering.
- Light at 100 to 400 foot-candles may be beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.50 mmhos/cm (2:1 extraction).

Cilantro is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 - Stem and cotyledon emergence (7 to 10 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.50 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 - Growth and development of true leaves (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.
**HERB GROWERFACTS**

**Stage 4 - Plugs ready for transplanting or shipping (5 to 7 days)**
- Soil temperature 60 to 62°F (16 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**Growing on to Finish**

**Temperature**
- Night: 55 to 60°F (13 to 15°C)
- Day: 55 to 65°F (13 to 18°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 memos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Cilantro is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

**Post-production Care**

**Optimum Temperature**
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Cilantro grows best in full sun; however partial shading may be beneficial during retail display.

**Common Problems**

**Insects:** Aphids

**Diseases:** Botrytis, Pythium, Rhizoctonia

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**DILL**

*Anethum graveolens*

**Dill**

**Fernleaf**

**Plugging Production**

Note: Direct sowing into the finish container is recommended.

**Stage 1 - Time of radicle emergence (4 to 7 days)**
- Soil temperature 68 to 72°F (20 to 22°C).
- Keep media evenly moist but not saturated.
- Do not cover or bury the seed.
- Light at 100 to 400 foot-candles may be beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Dill is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 - Stem and cotyledon emergence (5 to 8 days)**
- Soil temperature 68 to 72°F (20 to 22°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Gradually increase light levels to 500 to 1,000 foot-candles.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 - Growth and development of true leaves (14 to 21 days)**
- Soil temperature 65 to 68°F (18 to 20°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14 or other calcium/potassium nitrate fertilizer.
- Gradually increase light intensity to 1,000 to 1,500 foot-candles.
- Fertilize every 2 to 3 irrigations.
- If 15-0-15 is used, supplement with magnesium sulfate to limit calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.
- Chemical PGRs can not be used on vegetables and herbs.

**Stage 4 - Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Gradually increase light intensity to 1,500 to 2,500 foot-candles.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
- If not potted up once established in the cell pack, dill will flower within 10 weeks.

**Growing on to Finish**

**Temperature**
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)

**Light**
Maintain high light levels while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Dill is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

**Post-production Care**

**Temperature**
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.
- Using a negative DIF will help keep the plants short and of high quality.

**Light**
Dill prefers full sun. Partial shading may be beneficial during retail display.

**Common Problems**

**Insects:** Aphids

**Diseases:** Fungal diseases
**LAVENDER**

*Lavandula angustifolia*

Hardy zones 5–8

Potpourri Dark Purple, Sky Blue & White

**PLUG PRODUCTION**

**Stage 1 - Time of radicle emergence (7 to 10 days)**
- Soil temperature 68 to 72°F (20 to 22°C).
- Keep media evenly moist but not saturated.
- Do not cover or bury the seed.
- Light at 100 to 400 foot-candles is beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Lavender is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 - Stem and cotyledon emergence (7 to 14 days)**
- Soil temperature 68 to 72°F (20 to 22°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Gradually increase light levels to 50 to 1,000 foot-candles.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 - Growth and development of true leaves (14 to 21 days)**
- Soil temperature 65 to 68°F (18 to 20°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14 or other calcium/potassium nitrate fertilizer.
- Gradually increase light intensity to 1,000 to 1,500 foot-candles.
- Fertilize every 2 to 3 irrigations.
- If 15-0-15 is used, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.
- Chemical PGRs can not be used on vegetables and herbs.

**Stage 4 - Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Gradually increase light intensity to full intensity.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**Growing on to Finish**

**Temperature**
- Night: 60 to 65°F (15 to 18°C)
- Day: 65 to 70°F (18 to 21°C)

**Light**
- Maintain high light levels while maintaining moderate temperatures.

**Media**
- Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Lavender is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

**Post-Production Care**

**Optimum Temperature**
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)

**Optimum conditions may be difficult to maintain, especially if plants are displayed outside.**

**Light**
- Lavender prefers full sun. Partial shading may be beneficial during retail display.

**Common Problems**

**Insects:** Aphids

**Diseases:** Fungal diseases

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**OREGANO**

*Origanum vulgare* (Common Oregano)  
*Origanum herculeoticum* (Greek Oregano)  
Hardy zones 5–9

**PLUG PRODUCTION**

**Stage 1 - Time of radicle emergence (5 to 7 days)**
- Soil temperature 68 to 70°F (20 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (21 extraction).
- Oregano is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed lightly with coarse vermiculite.

**Stage 2 - Stem and cotyledon emergence (7 to 14 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day as foliage is dry by nightfall to prevent diseases.

**Stage 3 - Growth and development of true leaves (10 to 14 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 - Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 60 to 62°F (16 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
**HERB GROWER FACTS**

**GROWING ON TO FINISH**

**Temperature**
- Night: 50 to 55°F (10 to 13°C)
- Day: 60 to 65°F (15 to 18°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20:10:20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Oregano is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs cannot be used on most vegetables and herbs.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 50 to 55°F (10 to 13°C)
- Day: 60 to 65°F (15 to 18°C)
- Oregano prefers cool temperatures. Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Oregano grows best in full sun; however, partial shading may be beneficial during retail display.

**Common Problems**
- Insects: Aphids, Whitefly
- Diseases: Pythium, Rhizoctonia

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**PARSLEY**

*Petroselinum crispum*

**Italian Dark Single**

**Triple Curled**

**PLUG PRODUCTION**

**Note:** Direct sowing into the finish container is an alternative.

**Stage 1 – Time of radicle emergence (3 to 5 days)**
- Soil temperature 68 to 70°F (20 to 21°C).
- Keep media very moist, near saturation.
- Cover the seed lightly with vermiculite or do not cover.
- Light at 100 to 400 foot-candles may be beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.50 mmhos/cm (2:1 extraction).
- Parsley is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 – Stem and cotyledon emergence (7 to 10 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.50 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20:10:20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.
- Chemical PGRs cannot be used on vegetables and herbs.

**Stage 4 – Plugs ready for transplanting or shipping (5 to 7 days)**
- Soil temperature 60 to 62°F (16 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

**Temperature**
- Night: 60 to 65°F (15 to 18°C)
- Day: 65 to 70°F (18 to 21°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 alternating with 20:10:20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs cannot be used on most vegetables and herbs.

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**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Parsley grows best in full sun; however, partial shading may be beneficial during retail display.

**Common Problems**
- Insects: Aphids
- Diseases: Botrytis, Pythium, Rhizoctonia

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800 879-BALL  ballseed.com 61
PEPPERMINT & SPEARMINT

*Mentha piperita* (Peppermint)
*Mentha spicata* (Spearmint)
Hardy zones 5-9

**PLUG PRODUCTION**

**Stage 1 – Time of radicle emergence (2 to 3 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Light is not needed for germination until radicle emergence.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Mints are very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 – Stem and cotyledon emergence (3 to 5 days)**
- Soil temperature 70 to 75°F (21 to 24°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (5 to 7 days)**
- Soil temperature 65 to 70°F (18 to 21°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 – Plugs ready for transplanting or shipping (7 days)**
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

**Temperature**
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 62°F (15 to 17°C)
- Cooler temperatures will produce more compact growth.
- Warm temperatures promote weak growth and stretching.

**Light**
- Maintain high light levels while maintaining moderate temperatures.

**Media**
- Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Mints are responsive to day/night temperature differential (DIF), and are shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
- Mints grow best in full sun; however partial shading may be beneficial during retail display.

**Common Problems**
- Insects: Aphids, Whitefly
- Diseases: Botrytis

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**ROSEMARY**

*Rosmarinus officinalis*
Hardy zones 7-10

**PLUG PRODUCTION**

**Stage 1 – Time of radicle emergence (4 to 7 days)**
- Soil temperature 68 to 72°F (20 to 22°C).
- Keep media evenly moist but not saturated.
- Do not cover or bury the seed.
- Light at 100 to 400 foot-candles may be beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Rosemary is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

**Stage 2 – Stem and cotyledon emergence (5 to 8 days)**
- Soil temperature 68 to 72°F (20 to 22°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Gradually increase light levels to 500 to 1,000 foot-candles.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves (14 to 21 days)**
- Soil temperature 65 to 68°F (18 to 20°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Gradually increase light intensity to 1,000 to 1,500 foot-candles.
- Fertilize every 2 to 3 irrigations.
- If 15-0-15 is used, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.
- Chemical PGRs can not be used on vegetables and herbs.
**Optimum conditions may be difficult to maintain, especially if plants are displayed outside.**

### Light
Rosemary prefers full sun. Partial shading may be beneficial during retail display.

### Common Problems
- **Insects:** Aphids
- **Diseases:** Pythium

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## SAGE

**Salvia officinalis**

**Hardy zones 5-8**

### PLUG PRODUCTION

#### Stage 1 - Time of radicle emergence (5 to 7 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm.

#### Stage 2 - Stem and cotyledon emergence (7 to 14 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Maintain medium pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed lightly with coarse vermiculite.

#### Stage 3 - Growth and development of true leaves (10 to 14 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz /100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

#### Stage 4 - Plugs ready for transplanting or shipping (7 days)
- Soil temperature 60 to 62°F (15 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or 30-20-10, alternating with 14-0-14 or other calcium/potassium nitrate fertilizer.

### GROWING ON TO FINISH

#### Temperature
- **Night:** 55 to 60°F (13 to 15°C)
- **Day:** 60 to 65°F (15 to 18°C)

#### Light
Maintain light levels as high as possible while maintaining moderate temperatures.

#### Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

#### Fertilization
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

#### Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Sage is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs cannot be used on most vegetables and herbs.

### POST-PRODUCTION CARE

#### Optimum Temperature
- **Night:** 55 to 60°F (13 to 15°C)
- **Day:** 60 to 65°F (15 to 18°C)
- Optimum conditions may vary in different climates.

#### Light
Sage grows best in full sun; however partial shading may be beneficial during retail display.

#### Common Problems
- **Insects:** Aphids, Whitefly
- **Diseases:** Pythium, Rhizoctonia

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## STEVIA

**Stevia rebaudiana**

**Sweet Leaf**

### PLUG PRODUCTION

#### Stage 1 - Time of radicle emergence (5 to 7 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.
- Maintain high light levels while maintaining moderate temperatures.
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Sage is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs cannot be used on most vegetables and herbs.

### POST-PRODUCTION CARE

#### Optimum Temperature
- Sage prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may vary in different climates.

#### Light
Sage grows best in full sun; however partial shading may be beneficial during retail display.

#### Common Problems
- **Insects:** Aphids
- **Diseases:** Pythium, Rhizoctonia
**STEVIA** continued

- Stevia is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed lightly with coarse vermiculite.

**Stage 2 - Stem and cotyledon emergence (7 to 10 days)**

- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Cover the seed lightly with coarse vermiculite.

**Stage 3 - Growth and development of true leaves (7 to 10 days)**

- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feeding to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**Stage 4 - Plugs ready for transplanting or shipping (7 days)**

- Soil temperature 60 to 62°F (15 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or other calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

**GROWING ON TO FINISH**

**Temperature**

- Night: 60 to 62°F (15 to 17°C)
- Day: 65 to 75°F (18 to 24°C)

**Light**

Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**

Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**

- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**

- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Stevia is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

**POST-PRODUCTION CARE**

**Optimum Temperature**

- 68°F (20°C) is recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**

- Stevia grows best in full sun; however partial shading may be beneficial during retail display.

**Common Problems**

**Insects:** Aphids, Whitefly

**Diseases:** Pythium, Rhizoctonia

**SUMMER SAVORY**

*Satureja hortensis*

**PLUG PRODUCTION**

**Stage 1 - Time of radicle emergence (10 to 12 days)**

- Soil temperature 70 to 72°F (21 to 22°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Summer Savory is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Do not cover the seed.

**Stage 2 - Stem and cotyledon emergence (4 to 7 days)**

- Soil temperature 62 to 65°F (17 to 18°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 - Growth and development of true leaves (7 to 10 days)**

- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.

**Stage 4 - Plugs ready for transplanting or shipping (7 days)**

- Soil temperature 60 to 62°F (15 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**GROWING ON TO FINISH**

**Temperature**

- Night: 60 to 62°F (15 to 17°C)
- Day: 62 to 65°F (17 to 18°C)

**Light**

Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**

Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**

- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**

- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Summer Savory is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Plants can stretch quickly.
- Chemical PGRs can not be used on most vegetables and herbs.
**SUMMER THYME**

*Thymus vulgaris*

Hardy zones 4-8

### PLUG PRODUCTION

#### Stage 1 - Time of radicle emergence (4 to 8 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Keep media very moist, near saturation.
- Seed may be covered.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Thyme is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

#### Stage 2 - Stem and cotyledon emergence (7 days)
- Soil temperature 65 to 70°F (18 to 21°C). Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

#### Stage 3 - Growth and development of true leaves (14 to 20 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

### POST-PRODUCTION CARE

#### Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

#### Light
Thyme prefers full sun. Partial shading may be beneficial during retail display.

**COMMON PROBLEMS**

**Insects:** Aphids, Whitefly, Fungus gnats

**Diseases:** Pythium, Rhizoctonia
**SWEET MARJORAM continued**

**GROWING ON TO FINISH**

**Temperature**
- Night: 55 to 60°F (13 to 15°C)
- Day: 65 to 70°F (18 to 21°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.2.

**Fertilization**
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Sweet Marjoram is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Chemical PGRs can not be used on most vegetables and herbs.

**POST-PRODUCTION CARE**

**Optimum Temperature**
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

**Light**
Sweet Marjoram prefers full sun.
Partial shading may be beneficial during retail display.

**Common Problems**
- Insects: Spider mites, Aphids
- Diseases: Fungal diseases
Burpee Home Gardens® “To Go” Culture Charts

Note: This chart includes general culture guidelines. Please refer to the GrowerFacts on pages 39 to 66 for detailed growing information.

### Cucumber, Eggplant, Pepper & Tomato Planters

**Cucumber:** BOOST Gold Standard, Bush Champion  
**Eggplant:** Burpee Hybrid  
**Pepper:** Better Belle, BOOST Sweet Heat, Flavorburst Hybrid, Jalapeño Gigante  
**Tomato:** BOOST Cherry Punch, BOOST Power Pops, BOOST Solar Power, Bush Champion II, Bush Early Girl II, Celebrity, Fourth of July, Fresh Salsa Hybrid, Phoenix, Tumbler

Recommended for 12-in. (30-cm) or larger patio pots.

**NOTE:** Tomatoes and cucumbers will benefit from some type of “cage” to contain the plants. Fourth of July tomato is indeterminate and will also benefit from a “stake” to support its vertical growth.

<table>
<thead>
<tr>
<th></th>
<th>Sow to transplant (weeks)</th>
<th>Seeds per 200-plug tray</th>
<th>Number of plugs to transplant into a 4-4.5-in. (10-11 cm) pot</th>
<th>Growing on in 4-4.5-in. (10-11 cm) pots (weeks)</th>
<th>Number of 4-4.5-in. (10-11 cm) pots to plant in a 12-in. (30-cm) or larger container</th>
<th>Transplant to sale in a 12-in. (30-cm) or larger container (weeks)</th>
<th>Total crop time sow to sell (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cucumber</strong></td>
<td>Direct sow to 4-4.5-in. (10-11 cm) pots</td>
<td>—</td>
<td>—</td>
<td>3-5</td>
<td>3</td>
<td>1-3</td>
<td>4-8</td>
</tr>
<tr>
<td><strong>Eggplant</strong></td>
<td>2-3</td>
<td>1</td>
<td>1</td>
<td>7-9</td>
<td>3</td>
<td>2-3</td>
<td>11-15</td>
</tr>
<tr>
<td><strong>Pepper</strong></td>
<td>3-4</td>
<td>1-2</td>
<td>1</td>
<td>6-7</td>
<td>3-5</td>
<td>3-4</td>
<td>12-15</td>
</tr>
<tr>
<td><strong>Tomato</strong></td>
<td>2-3</td>
<td>1</td>
<td>1</td>
<td>6-8</td>
<td>3</td>
<td>2-3</td>
<td>10-14</td>
</tr>
</tbody>
</table>

1 A 200-plug tray is recommended to grow eggplant, peppers, and tomatoes for the “To Go” program

### Mixed Salad Bowls

**Multi-Species, Multi-Pellet Mixes:** Alfresco Mix, City Garden Mix, Global Gourmet Mix  
**Lettuce Blends:** Gourmet Blend, Heatwave Blend  
**Salad Mix:** BOOST Healing Hands

Recommended for 10 to 12-in. (25 to 30 cm) color bowls.

<table>
<thead>
<tr>
<th></th>
<th>Sow to transplant (weeks)</th>
<th>Seeds or pellets per 105/128-plug tray</th>
<th>Number of plugs to transplant into a 10-12-in. (25-30 cm) container</th>
<th>Growing on in 4-4.5-in. (10-11 cm) pots (weeks)</th>
<th>Number of 4-4.5-in. (10-11 cm) pots to plant in a 12-in. (30 cm) or larger container</th>
<th>Transplant to sale in a 10-12-in. (25-30 cm) or larger container</th>
<th>Total crop time sow to sell (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multi-Species, Multi-Pellet Mixes</strong></td>
<td>2-3</td>
<td>1-2 pellets 2</td>
<td>4-7</td>
<td>4-7</td>
<td>4-7</td>
<td>6-9</td>
<td>6-9</td>
</tr>
<tr>
<td><strong>Lettuce Blends</strong></td>
<td>2-3</td>
<td>3-4 seeds 3</td>
<td>4-7</td>
<td>4-7</td>
<td>4-7</td>
<td>6-9</td>
<td>6-9</td>
</tr>
</tbody>
</table>

2 These mixes are offered as a pellet containing several varieties of greens. Only 1 to 2 pellets need to be sown per cell.

3 These blends should be sown using 3 to 4 seeds per cell to produce a representative assortment of varieties.

Since 4 to 7 plugs are used in each color bowl, an excellent mix is produced.

4 For best results, plant the plugs directly in the finish container to minimize checking the growth.

### Herb Combos

**Good Grillin’:** Chives, parsley, and rosemary  
**Kitchen Favorites:** Basil, dill, oregano, and parsley  
**Tuscan Trio:** Basil, oregano, and parsley

Recommended for color bowls or 10-in. (25 cm) or larger patio pots.

<table>
<thead>
<tr>
<th></th>
<th>Sow to transplant (weeks)</th>
<th>Seeds per 200-plug tray 5</th>
<th>Number of plugs to transplant into a 4-4.5-in. (10-11 cm) pot</th>
<th>Growing on in 4-4.5-in. (10-11 cm) pots (weeks)</th>
<th>Number of 4-4.5-in. (10-11 cm) pots to plant in a 12-in. (30 cm) or larger container</th>
<th>Transplant to sale in a 10-12-in. (25-30 cm) or larger container (weeks)</th>
<th>Total crop time sow to sell (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basil</strong></td>
<td>5-6</td>
<td>1-2</td>
<td>Standard: 1 Boxwood: 3</td>
<td>3-4</td>
<td>Depending on the size of the container, 4 to 7 4-5-in. (10-11 cm) pots make a saleable container.</td>
<td>1-3</td>
<td>9-13</td>
</tr>
<tr>
<td><strong>Chives</strong></td>
<td>5-6</td>
<td>7-8</td>
<td>6-7</td>
<td>3-4</td>
<td>1-3</td>
<td>9-13</td>
<td></td>
</tr>
<tr>
<td><strong>Dill</strong></td>
<td>3-4</td>
<td>2-3</td>
<td>5-6</td>
<td>3-4</td>
<td>1-3</td>
<td>7-11</td>
<td></td>
</tr>
<tr>
<td><strong>Oregano</strong></td>
<td>5-6</td>
<td>1-2</td>
<td>3-4</td>
<td>4-6</td>
<td>1-3</td>
<td>9-13</td>
<td></td>
</tr>
<tr>
<td><strong>Parsley</strong></td>
<td>5-6</td>
<td>2-3</td>
<td>3-4</td>
<td>3-4</td>
<td>1-3</td>
<td>9-13</td>
<td></td>
</tr>
<tr>
<td><strong>Rosemary</strong></td>
<td>9-10</td>
<td>1-2</td>
<td>1-2</td>
<td>4-6</td>
<td>1-3</td>
<td>14-19</td>
<td></td>
</tr>
</tbody>
</table>

5 A 200-plug tray is recommended to grow these herb varieties for the “To Go” program