



# Technical 2010 Guide

**Goldsmith**  
SEEDS

*syngenta* flowers

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## Fields™, Tycoon™

### AGERATUM HOUSTONIANUM

**Minimum Germination Rate:** Fields 90%, Tycoon 85%

**Seed Product Form:** Pelleted, raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 10 – 14; 2 – 4 leaves present.

**Flowering Type:** Facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** Ageratum is an irradiance indifferent plant. Maturity and daylength have the biggest influence on flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion.

Expect radicle emergence in 2 – 5 days.

**Cover:** No covering over the seed is required.

**Media:** • pH: 5.5 – 5.8

• EC: <0.75

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Moisture:** Saturated (5) from day 1 – 5 or until radicle emergence. On days 6 – 15, lower moisture level to moist (3).

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Temperature:** 72° – 75°F (22° – 23°C) until radicle emergence, then reduce temperatures to 65° – 70°F (18° – 21°C) until cotyledons appear.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8

• EC: <1

**Light:** Ageratum is a day-neutral crop. Provide 2,500 – 3,500 foot candles (25,000 lux – 30,000 lux).

**Temperature:** 62° – 68°F (17° – 20°C) beginning day 16.

**Average Daily Temperature (ADT):** 67°F (19°C).

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Brown leaf edges may indicate excessive drying.

**Humidity:** 40%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Initially feed at 50 – 75 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14). Under high light conditions, an ammonium-based feed (17-5-17) can be used. Increase feed to 100 ppm nitrogen as seedlings mature.

**Growth Regulators:** If needed, apply B-Nine (daminozide) at 2,500 ppm. It can be applied after the first true leaves have developed. A second application can be made at 5,000 ppm once a full stand is established to hold the plugs until transplant.

### GROWING ON

**Transplant Ready:** 5 – 6 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.8 – 6.2

• EC: 1 – 1.2 Leaf necrosis may indicate sodium toxicity.

**Light:** Provide 2,500 – 3,500 foot candles (12 – 15 total mols or 25,000 – 35,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth. Light levels <2,500 foot candles (25,000 lux) will delay flowering. Rinse nutrients off leaves if light intensity exceeds 3,000 foot candles (30,000 lux).

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

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Brown leaf edges indicate excessive drying.

**Humidity:** 40 – 70%

**Fertilizers:** Feed weekly at 150 – 200 ppm nitrogen using a calcium-based fertilizer.

**Growth Regulators:** If needed, 1 – 2 applications of B-Nine (daminozide) at 2,500 – 5,000 ppm will control growth. Also responds to A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniconazol) or a B-Nine/Cycoceel (chlormequat chloride) tank mix.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine at 2,500 – 3,000 ppm.

**Fertilizer:** Potassium nitrate at 150 ppm nitrogen

**Common Diseases:** Botrytis Blight, Rhizoctonia, Fusarium, Pythium

**Common Pests:** Thrips, Aphids, Whitefly

PRODUCT USE	GARDEN SPECIFICATIONS
<b>Tycoon:</b> Packs, pots, containers, border edgings <b>Fields:</b> Packs, pots, containers, mass plantings, add height for interest.	<b>Light:</b> Partial sun to full sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Fields</b>	14 – 16" (35 – 40 cm)	12 – 14" (30 – 35 cm)
<b>Tycoon</b>	6 – 8" (15 – 20 cm)	6 – 8" (15 – 20 cm)

### AGERATUM SCHEDULING IN WEEKS

	Fields	Tycoon
<b>Total crop time</b>	12 – 14	10 – 12
<b>'288' plug crop time</b>	5 – 6, 1 week earlier in late spring.	5 – 6, 1 week earlier in late spring.
<b>Transplant to finish crop time</b>		
<b>Packs</b>	6 – 7	5 – 6
<b>4" crop</b>	7 – 8	6 – 7
<b>6" crop</b>	8 – 9	N/A

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Origami™

### AQUILEGIA CAERULEA

**Minimum Germination Rate:** 85%

**Seed Product Form:** Raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** 4 – 6 leaves present.

**Flowering Type:** Facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** A vernalization treatment is needed to initiate flowering. Origami can be vernalized once the plugs have established root systems and are at least 6 – 8 weeks old. Light intensity enhances flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 6 – 8 days.

**Seed Handling:** No special treatments are needed prior to sowing. Chilling the seed prior to sowing is not advisable. It may be desirable to double sow larger plug trays.

**Cover:** No cover is necessary. However, seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Temperature:** 70° – 72°F (21° – 22°C)

**Moisture:** Wet (4) until radicle emergence. Then reduce moisture level to medium (2).

**Humidity:** 100% until radicle emergence then reduce to 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 0.75

**Temperature:** 65° – 68°F (18° – 20°C)

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 65 – 70%. Provide horizontal airflow to aid in drying down the media through evapotranspiration under cool, low light conditions.

**Fertilizers:** 50 – 100 ppm nitrogen weekly or as needed with a calcium-based fertilizer (13-2-13 or 14-4-14).

**Plug Flower Initiation:** Optimum conditions to make plant receptive to flower initiation.

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** Maintain night temperatures within 40° – 50°F (5° – 10°C) for 14 – 21 days. Bred in Gilroy, CA, Origami is more tolerant of higher vernalization temperatures than other Aquilegia. This is an advantage for Southern growers.

**Average Daily Temperature (ADT):** After vernalization ADT is 65° – 67°F (18° – 19°C).

**Fertilizers:** 100 ppm nitrogen as needed of a calcium-based fertilizer 13-2-13 or 14-4-14).

**Growth Regulators:** If necessary, Origami will respond to B-Nine (daminozide) at 2,500 ppm. PGRs are more effective in the early stages of production.

**Fungicides:** Apply preventative fungicides for Botrytis prior to vernalization.

### GROWING ON

Origami's unique habit easily adapts to a variety of container sizes. Suitable for packs and larger containers, Origami naturally adjusts to finish habit to fit proportionally into whatever container you choose – without the use of growth regulators.

**Transplant Ready:** 9 – 10 weeks from sow in a '288' tray.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

**Finish Bulking:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container.

**Media:** • pH: 5.5 – 5.8

• EC: 1 – 1.2

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** After crop has been vernalized, night temperatures may be increased to 60° – 65°F (16° – 18°C). Cooler temperatures are tolerated but will increase the final crop time. Keep day temperatures cool. High night temperatures will negate the vernalizing process and reduce uniformity to flower.

**Average Daily Temperature (ADT):** After vernalization ADT is 65° – 67°F (18° – 19°C).

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Aquilegia is a moderate feeder. Alternate between potassium and calcium-based fertilizers at 150 – 200 ppm nitrogen as needed. Under cool weather conditions, avoid ammonium-based fertilizers that may encourage root rot problems and excessive vegetative growth or stretching. Excessive phosphorus will promote stretching.

**Growth Regulators:** If necessary, Origami will respond to B-Nine (daminozide) at 2,500 ppm. PGRs are more effective in the early stages of production.

**Finish Flower Initiation:** Optimum conditions to make plant receptive to flower initiation.

**Temperature:** Locate plants in a cool area where they will not freeze for 14 – 21 days. The upper temperature threshold for proper vernalization is 40° – 50°F (5° – 10°C). Plants will grow slower at lower temperatures. If plants turn purple, temperatures are too low.

**Average Daily Temperature (ADT):** After vernalization ADT is 65° – 67°F (18° – 19°C).

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Fertilizer:** Calcium nitrate at 150 ppm nitrogen. A calcium chloride spray at 150 ppm nitrogen applied one week prior to shipping may discourage flower drop in shipment.

**Common Diseases:** Powdery Mildew

**Common Pests:** Spider Mites, Aphids

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings. Traditionally a spring blooming perennial, Origami has been bred for an extended bloom window that will increase its value in the landscape.	<b>Light:</b> Filtered shade to full sun <b>USDA Hardiness Zone:</b> 4 <b>AHS Heat Zone:</b> 8 – 1

	Garden Height	Garden Width
<b>Origami</b>	14 – 16" (35 – 40 cm)	10 – 14" (25 – 35 cm)

### AQUILEGIA SCHEDULING IN WEEKS

	Origami
<b>Total crop time</b>	20 – 24
<b>'288' plug crop time</b>	9 – 10
<b>Transplant to finish crop time</b>	
<b>Vernalization in finish container</b>	2 – 3. A well established root system is required before plants are vernalized.
<b>4" crop</b>	9 – 11



## Bada<sup>®</sup>, Varsity<sup>™</sup>, Eureka<sup>™</sup>, Bayou<sup>™</sup>, Braveheart<sup>®</sup>, Volumia<sup>™</sup>

### BEGONIA SEMPERFLORENS

**Minimum Germination Rate:** Bada, Volumia 90%, Varsity, Eureka, Bayou, Braveheart 85%

**Seed Product Form:** Pelleted, raw (Bayou pelleted only)

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 28 – 35; 4 – 6 leaves present.

**Flowering Type:** Day-neutral plant – will flower regardless of daylength.

**Specific Flowering Mechanism:** Light intensity will trigger flowering. Warm temperatures encourage flower development.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion.

Expect radicle emergence in 6 – 8 days.

**Cover:** No covering over the seed is required.

**Media:** • pH: 5.5 – 5.8  
• EC: <1

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch compared to seed germinated in the dark.

**Temperature:** 72° – 78°F (22° – 26°C) day and night from day 1 – 11.

**Moisture:** Level saturated (5), from days 1 – 11. Beginning day 12, reduce moisture level to wet (4), until day 15. Afterward, begin alternating between moisture level wet (4) and moist (3).

**Humidity:** 100% until day 10.

**Dehumidify:** On day 11, lower humidity level to 40%. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Maintain EC at <1. Fertigation water should not be greater than an EC of 0.5.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8  
• EC: 1.25 – 1.5

**Light:** Provide 3,500 – 4,500 foot candles (12 – 20 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 68° – 70°F (20° – 21°C) night and day.

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). Watch for excess algae growth. Using R/O (Reverse Osmosis) water will help reduce algae levels.

**Fertilizers:** Under high light conditions, apply an ammonium-based feed (17-5-17) at 50 – 100 ppm nitrogen. Under low light conditions, apply a calcium-based feed (14-4-14 or 14-2-14) at 50 – 100 ppm nitrogen.

**Growth Regulators:** Control growth with light, temperature, moisture and fertilizer levels.

**Fungicides:** Scout for Botrytis in plug growth stages. If needed, apply fungicides according to label directions.

### GROWING ON

**Transplant Ready:** 8 weeks from a '288' plug tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

**Media:** • pH: 5.5 – 5.8  
• EC: 1.5 – 1.75

**Light:** Provide 3,500 – 4,500 foot candles (12 – 20 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 68° – 70°F (20° – 21°C) nights, 64° – 67° (18° – 19°C) days for 14 days or until roots have reached the bottom of the container. Then temperatures may be lowered to 62° – 65°F (16° – 18°C) day and night.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow soil to reach level (3) before re-saturating to (4).

**Humidity:** 40% – 70%. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed at 100 – 150 ppm nitrogen. Under high light conditions, apply an ammonium-based feed (17-5-17). Under low light conditions, apply a calcium-based feed (14-4-14). Under high light and long or extended days, an ammonium-based feed (20-10-20) is preferred. Watch for low calcium and magnesium levels, which may result in stunted, chlorotic plants with marginal leaf burn.

**Growth Regulators:** It is best to control growth through moisture, feed and temperature management. If needed, spray Cycocel (chlormequat chloride) two weeks after transplant at 500 – 1,000 ppm. Also responds to B-Nine (daminozide), A-Rest (ancymidol), or B-Nine/Cycocel tank mix.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Fertilizer:** Potassium nitrate drench at 100 ppm nitrogen.

**Common Diseases:** Botrytis (apply preventative fungicides when long periods of low sunshine and high humidity occur)

**Common Pests:** Aphids, Thrips

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings, beds, hanging baskets	<b>Light:</b> Partial shade to full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Bada</b>	8 – 10" (20 – 25 cm)	6 – 8" (15 – 20 cm)
<b>Varsity</b>	8 – 10" (20 – 25 cm)	6 – 8" (15 – 20 cm)
<b>Eureka</b>	9 – 12" (24 – 30 cm)	7 – 9" (15 – 20 cm)
<b>Bayou</b>	14 – 16" (35 – 40 cm)	10 – 12" (25 – 30 cm)
<b>Braveheart</b>	14 – 16" (35 – 40 cm)	10 – 12" (25 – 30 cm)
<b>Volumia</b>	12 – 14" (30 – 35 cm)	12 – 14" (30 – 35 cm)

### BEGONIA SCHEDULING IN WEEKS

	Bada	Varsity	Eureka	Bayou	Braveheart	Volumia
<b>Total crop time</b>	11 – 13	12 – 14	13 – 15	12 – 14	12 – 14	12 – 14
<b>'288' plug crop time</b>	8	7 – 8	7 – 8	8	7 – 8	7 – 8
<b>Transplant to finish crop time</b>						
<b>Packs</b>	4 – 5	4 – 5	5 – 6	4 – 5	Not recommended	4 – 5
<b>4" crop</b>	5 – 6	5 – 6	6 – 7	5 – 6	5 – 6	5 – 6
<b>6" crop*</b>	5 – 7	5 – 7	6 – 8	5 – 7	5 – 7	5 – 7
<b>10" Hanging basket</b>	7 – 8	7 – 8	8 – 9	N/A	7 – 8	7 – 8

\*Depending on the number of plugs transplanted into pot.



## Go-Go™

### BEGONIA TUBEROSA

**Minimum Germination Rate:** 85%

**Seed Product Form:** Pelleted

### FLOWERING

**Time frame when plants are receptive to flower initiation:** From initial date of sowing.

**Flowering Type:** Obligate long-day plant – long days >13.5 hours are necessary for flowering.

**Specific Flowering Mechanism:** Tuberous Begonias are light accumulators. Supplemental lighting and daylength extension will hasten flower initiation.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 7 – 10 days.

**Cover:** No covering over the seed is required.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 0.75

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Temperature:** 73° – 75°F (23°C) until radicle emergence. Temperatures exceeding 80°F (27°C) will lower final germination. Reduce to 66° – 68°F (18° – 20°C) until cotyledon expansion.

**Moisture:** Saturated (5) from day 1 – 11. A saturated media and high humidity is critical to successful begonia germination. Beginning day 12, alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). It is important to start drying back the media to avoid algae growth. Seedlings are sensitive to “heavy handed” watering, which will inhibit germination and uniformity due to the roots being disturbed as the seeds are rolled around. Use a water breaker with a gentle spray and low pressure to avoid disturbing the seed.

**Humidity:** 100%. Relative humidity levels need to be kept high to avoid desiccating the exposed roots.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell and to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 1

**Light:** This species of begonia wants to form tubers and single flowers when natural daylength is <12 hours. Provide interrupted nights for a 12- 14-hour day to suppress tuber formation, promote double flowers and produce a higher quality plant. During the early plug stages, extended days will encourage a higher quality seedling and increased growth rate. Provide 3,500 – 4,500 foot candles (12 – 15 total moles or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) greatly reduce the time to flower. Do not exceed 4,500 foot candles (45,000 lux) to avoid marginal leaf burn.

**Temperature:** After radicle emergence maintain at 66° – 70°F (18° – 20°C). Leaf temperatures should not exceed 85°F (30°C) to avoid desiccation of young seedlings. After first true leaves emerge lower temperatures to 62° – 68°F (16° – 20°C). Temperatures below 60°F (16°C) will delay flowering.

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4).

**Humidity:** On day 14 when all seeds have germinated decrease the humidity to 40%.

**Fertilizers:** Feed 1 – 2 times per week. Under high light conditions, apply an ammonium-based feed (17-5-17) at 50 – 100 ppm nitrogen. Under low light conditions, apply a calcium-based feed (14-4-14) at 50 – 100 ppm nitrogen. Under high light and long or extended days, an ammonium-based feed (20-10-20) at 50 – 100 ppm nitrogen is preferred.

### GROWING ON

**Transplant Ready:** 7 – 8 weeks from sow in a ‘288’ tray. 9 – 10 weeks from sow in a ‘72’ tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container and to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 6

• EC: 1 – 1.5

**Light:** This species of Begonia wants to form tubers and single flower when natural daylength is <12 hours. Provide interrupted nights for a 12- 14-hour day to suppress tuber formation, promote double flowers and produce a higher quality plant. Plants or plugs started under long days than transplanted and placed under short days will exhibit uneven growth. To avoid leaf burn, do not exceed 3,000 foot candles (30,000 lux).

**Temperature:** Grow new transplants on at 65° – 68°F (18° – 20°C) nights. Once established, night temperatures can be reduced to 60° – 65°F (16° – 18°C).

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Alternate between a calcium-based fertilizer (13-2-13) and an ammonium-based fertilizer (17-5-17) at 100 – 150 ppm nitrogen every 2 – 3 waterings. Tall, stretched plants with few flowers indicate too much ammonium. Stunted, chlorotic plants with marginal leaf burn indicate a lack of calcium and magnesium.

**Growth Regulators:** If needed, begin Cycocel (chlormequat chloride) treatments two weeks after transplanting at 300 – 500 ppm. Cycocel will not hasten flowering, but will increase the number of flowers. A negative DIF of 2° – 3°F is also effective. If using DIF then no additional PGRs will be necessary.

**Common Diseases:** Pythium, Rhizoctonia, Botrytis Blight, Tomato Spotted Wilt Virus

**Common Pests:** Aphids, Thrips

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, hanging baskets, mass plantings	<b>Light:</b> Partial shade to filtered sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Go-Go</b>	8 – 10" (20 – 25 cm)	8 – 10" (20 – 25 cm)

### BEGONIA SCHEDULING IN WEEKS

	Go-Go
<b>Total crop time</b>	15 – 18
<b>'288' plug crop time</b>	7 – 8
<b>'72' plug crop time</b>	9 – 10
<b>Transplant to finish crop time</b>	
<b>4" crop</b>	8 – 10 from a '288'; 5-6 from a '72', If grown cool at 62°F (17°C), add one week to finish
<b>6" crop</b>	10 – 12 from a '288'; 7 – 8 from a '72'
<b>10" basket</b>	11 – 13 from a '288'; 8 – 9 from a '72'

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Isabella™

### CAMPANULA LONGISTYLA

**Minimum Germination Rate:** 85%

**Seed Product Form:** Pelleted, raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Beginning from initial sow date.

**Flowering Type:** Obligate long-day plant. Long days are required for flowering.

**Specific Flowering Mechanism:** Daylength >12 hours. Irradiance will hasten flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 6 – 8 days.

**Cover:** Do not cover the seed after sowing as this will inhibit germination.

**Media:** pH: 5.5 – 5.8; EC: <0.5

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Temperature:** 62° – 65°F (16° – 18°C). After several sets of true leaves have developed, reduce to 58° – 60°F (14° – 16°C) nights, 65° – 70°F (18° – 2°C).

**Moisture:** Wet (4) until radicle emergence. On day 9, begin alternating between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 100% until radicle emergence, then reduce to 40 – 70%. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell. To avoid premature flowering, the daylength must be kept <12 hours.

**Media:** pH: 5.5 – 5.8; EC: 0.5 – 1.0 Campanula are sensitive to high salts.

**Light:** Provide short days. Exposing very young, immature plants to long days will cause premature flowering on small plants. If flower initiation is induced too early, the plant will never size up properly.

**Temperature:** During initial root development grow at 62° – 65°F (16° – 18°C). After roots are established temperatures can be reduced to 58° – 60°F (14° – 16°C) nights and 65° – 70°F (18° – 21°C) days.

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** 75 – 150 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14) as needed.

**Growth Regulators:** Isabella is responsive to B-Nine (daminozide) or Cycocel (chlormequat chloride) sprays or drenches. Apply at a reduced rate during the plug stages.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

### GROWING ON

**Transplant Ready:** 22 – 26 weeks from sow in a '288' tray.

**Finish Bulking:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container.

**CAUTION:** Isabella is a long-day plant. To keep the crop in a vegetative phase, short days must be provided. A vegetative phase is desirable when a fuller plant is needed. Keep plants vegetative until leaves have reached the rim of the container for optimum sizing. Once initiated, the crop may not size up properly for larger containers. Do not expose to mum lighting.

**Lighting:** Short days are necessary to keep Isabella vegetative so it will size up properly.

**Media:** pH: 5.5 – 6; EC: 1. Campanula is sensitive to high salts. Leach occasionally to reduce EC levels if necessary.

**Temperature:** At transplant, grow crop on at 58° – 60°F (14° – 16°C) nights, 65° – 70°F (18° – 21°C) days. Once active root growth begins, night temperatures may be dropped to 50° – 55°F (10° – 13°C).

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed as needed to encourage growth. Under high light conditions, apply an ammonium-based feed (17-5-17) at 100 – 150 ppm nitrogen. Under low light conditions, apply a calcium-based feed (14-4-14) at 100 – 150 ppm nitrogen. Under high light and long or extended days, an ammonium-based feed (20-10-20) at 100 – 150 ppm nitrogen is preferred.

**Growth Regulators:** Isabella is responsive to B-Nine (daminozide) or Cycocel (chlormequat chloride).

**Finish Flower Initiation:** Optimum conditions to make plant receptive to flower initiation.

**NOTE:** Long-day treatments begin when the leaves have reached the edges of the container, otherwise the plant will be scarce on foliage. It takes about 5 – 6 weeks to fill out a 4" pot; and about 6 – 7 weeks to fill out a 5 – 6" pot.

**Daylength and Light:** A daylength of 14 – 16 hours is necessary to initiate blooms. Long days can be created with either interrupted nights or extended days. Long day treatments must continue throughout the remainder of the production schedule to promote additional flowers. Regardless of container size, it takes approximately 6 – 8 weeks from start of long-day treatments until first flower. Keep plants actively growing and avoid stress throughout production.

**Common Diseases:** Pythium, Rhizoctonia, Botrytis

**Common Pests:** Thrips, Spider Mites

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, rock gardens	<b>Light:</b> Partial shade to full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 9 – 1

	Garden Height	Garden Width
<b>Isabella</b>	8 – 10" (20 – 25 cm)	6 – 8" (15 – 20 cm)

### CAMPANULA SCHEDULING IN WEEKS

	Isabella
<b>Total crop time</b>	17 – 24
<b>'288' plug crop time</b>	6 – 8
<b>Transplant to finish crop time</b>	
<b>4" crop</b>	11 – 14. Vegetative phase is 5 – 6 weeks followed by long day treatments for remaining 6 – 8 weeks.
<b>6" crop</b>	13 – 16 weeks. Vegetative phase is 7 – 8 weeks followed by long day treatments for remaining 6 – 8 weeks.



## Venezia™, Jester®

### CINERARIA SENECIO

**Minimum Germination Rate:** Jester 90%, Venezia 85%

**Seed Product Form:** Jester pelleted, raw; Venezia raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** 8 – 10 leaves are present and roots are actively growing.

**Flowering Type:** Facultative short-day plant – short days enhance flowering.

**Specific Flowering Mechanism:** Maturity and short days trigger flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 4 days.

**Cover:** Do not cover the seed after sowing, as this will inhibit germination.

**Media:** • pH: 6 – 6.2  
• EC: 0.5 – 0.75

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Temperature:** 68° – 72°F (20° – 22°C) until cotyledon expansion.

**Moisture:** Wet (4) until radicle emergence. Then begin alternating between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4).

**Humidity:** 100% until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion; needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.5 – 5.8  
• EC: 0.5 – 1

**Light:** Provide short days. Provide a maximum of 2,500 foot candles (25,000 lux) maximum.

**Temperature:** 65° – 70°F (18° – 21°C) after radicle emergence. After first set of true leaves are developed, reduce temperatures to 60° – 62°F (15° – 17°C).

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Fertilize at 100 ppm nitrogen once a week with a calcium-based fertilizer (13-2-13).

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

### GROWING ON

**Transplant Ready:** 6 – 7 weeks from sow in a '288' tray.

**Finish Bulking:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container.

**Media:** • pH: 5.9 – 6.2  
• EC: 0.75 – 1

**Light:** Keep under short days. Long days will promote bolting. Provide 3,000 foot candles (30,000 maximum). Supplemental lighting at 350 – 500 foot candles will enhance shoot and root growth. Excessive light levels will result in leaf burn.

**Temperature:** After transplant, maintain cool days with 60° – 62°F (18° – 20°C) nights for approximately 2 weeks. Venezia does not require vernalization to induce flowering. With Jester, once plants are established it is necessary to begin a chilling or vernalization treatment to induce flowering (refer to Flower Initiation section). After chilling, raise temperatures to 60° – 62°F (18° – 20°C) for finishing. At this point, the crop should be about 7 – 9 weeks away from bloom. To conserve fuel costs, the crop can be finished at 55° – 60°F (13° – 16°C) nights and cool days, though flowering may be delayed.

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Fertilize at 100 – 150 ppm nitrogen weekly with a calcium-based fertilizer (13-2-13).

**Growth Regulators:** Chemical PGRs are not necessary on Jester or Venezia. Venezia is already more compact than Jester so caution must be used to keep from over growth regulating. However, for toning purposes, growth can easily be controlled with B-Nine (daminozide), DIF treatments, reduced watering or minimal use of ammonium.

**Finish Flower Initiation:** Optimum conditions to make plant receptive to flower initiation.

**Temperature:** Reduce temperatures to 38° – 58°F (3° – 14°C). This chilling treatment should continue for 4 – 5 weeks. Venezia does not require chilling.

**Fertilizers:** Ammonium-based feeds will not be beneficial when temperatures are below 45°F (8°C). Feed with a calcium-based fertilizer (13-2-13) at 100 – 150 ppm nitrogen as necessary to keep plants actively growing.

**Common Diseases:** Pythium, Botrytis, Powdery Mildew, Verticillium, Tomato Spotted Wilt Virus

**Common Pests:** Aphids, Whitefly, Thrips

PRODUCT USE	GARDEN SPECIFICATIONS
Potted plants, pots, containers, gift item	<b>Light:</b> Partial sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 4 – 1

	Garden Height	Garden Width
<b>Venezia</b>	7 – 9" (18 – 22 cm)	7 – 9" (18 – 22 cm)
<b>Jester</b>	8 – 10" (20 – 25 cm)	8 – 10" (20 – 25 cm)

### CINERARIA SCHEDULING IN WEEKS

	Venezia	Jester
<b>Total crop time</b>	14 – 16	16 – 18
<b>'288' plug crop time</b>	6 – 7	6 – 7
<b>Transplant to finish crop time</b>		
<b>Vernalization treatment</b>	None required	4 – 5
<b>4" crop</b>	8 – 9 with some growth regulation	10 – 12 with some growth regulation
<b>6" crop</b>	9 – 10 with no growth regulation	13 – 14 with no growth regulation



## Sparkler™

### CLEOME HASSLERIANA

**Minimum Germination Rate:** 75%

**Seed Product Form:** GoldSmart™ Primed

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 25 – 35; 5 – 7 leaves present.

**Flowering Type:** Facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** A combination of long days, high irradiance and warm temperatures trigger flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion.

Expect radicle emergence of GoldSmart™ Primed seed in 4 – 6 days. Advances in Goldsmith's seed technology have overcome dormancy issues in Cleome. Do NOT pre-soak trays with potassium nitrate prior to sowing. Treating primed seed with this solution may inhibit germination. Freezing or chilling the seed prior to sowing is not advisable and may damage the seed. Germinate Sparkler directly on the greenhouse bench. An alternating temperature environment is necessary for optimum germination rather than a constant temperature found in germination temperatures.

**Cover:** Cover seed with a thin layer of medium-sized vermiculite to maintain moisture levels.

**Media:** • pH: 5.5 – 5.8  
• EC: 0.75 – 1

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Temperature:** Cleome needs higher than normal temperatures to germinate successfully. Fluctuating day/night temperatures are essential for optimum germination. Provide 80° – 85°F (26° – 30°C) days and 68° – 70°F (20° – 21°C) nights.

**Moisture:** Wet (4) until radicle emergence. Then begin alternating between moisture levels wet (4) and moist (3) until cotyledon expansion. Allow media to approach level (3) before re-saturating to level (4). Media saturated for over 12 – 14 hours can inhibit germination.

**Humidity:** 90 – 100%

**Fertilizers:** Cleome is a heavy feeder. Fertilize at 100 ppm nitrogen with a calcium-based fertilizer after germination is complete.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.5 – 5.8  
• EC: 1 – 2

**Light:** 2,000 – 3,500 foot candles (20,000 – 35,000 lux) maximum.

**Temperature:** Continue fluctuating day/night temperatures at 80° – 85°F (26° – 30°C) days and 68° – 70°F (20° – 21°C) nights.

**Moisture:** Alternate between moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3). Media saturated for more than 12 hours may inhibit growth.

**Humidity:** 40 – 60%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** 100 – 150 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14). Use the higher rate when humidity levels are lower.

**Growth Regulators:** Applications of growth regulators in the plug stages will promote better basal branching and fuller plants. Sparkler responds to Bonzi (paclobutrazol) or B-Nine (daminozide).

### GROWING ON

Sparkler is a genetic dwarf form of the traditional garden Cleome, yet is still a very large bedding plant. Under a culture of high feed and growth regulation, you can produce a tight, well-branched, dark-green plant with many flower spikes.

**Transplant Ready:** 3 – 4 weeks from sow in a '288' tray. In containers smaller than 6", expect to sell Sparkler as a small green plant. Choose the largest container your market can handle for flowering sales. Transplant plugs before they become root bound.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.6 – 6 Cleome can tolerate lower pH levels than most other bedding plants.  
• EC: 1.8 – 2.5

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 75° – 80°F (22° – 27°C) days, 60° – 65°F (16° – 18°C) nights.

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3). Media saturated for more than 12 hours may inhibit growth.

**Fertilizers:** Cleome is a heavy feeder. Constant liquid feed at 300 ppm nitrogen with an ammonium-based fertilizer (20-10-20). Irrigate with clear water after every third feeding.

**Growth Regulators:** Sparkler responds to three applications of Bonzi (paclobutrazol) at 25 ppm applied 7 – 10 days apart. Begin applications one week after transplant. B-Nine (daminozide) is also an effective PGR. Apply B-Nine at 5,000 ppm as needed at weekly intervals. B-Nine may delay flowering by 4 – 7 days. A crop grown with three applications of B-Nine will flower at 14 – 18" (30 – 36 cm); with two applications at 16 – 20" (40 – 50 cm); and with one application at 24 – 30" (60 – 75 cm).

**Common Diseases:** Pythium, Powdery Mildew

**Common Pests:** Fungus gnats

PRODUCT USE	GARDEN SPECIFICATIONS
Large containers, mass plantings, add height and interest	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Sparkler</b>	3.5 – 4' (1 – 1.5 m)	24 – 36" (60 – 90 cm)

### CLEOME SCHEDULING IN WEEKS

	Sparkler
<b>Total crop time</b>	13 – 15
<b>'288' plug crop time</b>	3 – 4
<b>Transplant to finish crop time</b>	10 – 12

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



MINI SERIES: **Midori™, Miracle™, SilverHeart™, Silverado™**

INTERMEDIATE SERIES: **Canto™, Laser™, Sterling™**

STANDARD SERIES: **Concerto™, Sierra™, Sierra Synchro™, Rainier™, Winter Ice™**

#### CYCLAMEN PERSICUM

**Minimum Germination Rate:** 85%

**Seed Product Form:** Raw

#### FLOWERING

**Time frame when plants are receptive to flower initiation:** 8 – 12 leaves present.

**Flowering Type:** Day-neutral plant – will flower regardless of daylength.

**Specific Flowering Mechanism:** Maturity and irradiance in combination with cool temperatures. High light levels are needed to increase bud count.

#### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 21 – 25 days. Successful cyclamen plug production is dependent upon darkness and high humidity. Place the plugs in a dark chamber with fog where temperature and humidity can easily be manipulated. At day 14, begin checking the seed flats daily, to see if the radicle has emerged. Take care not to expose trays to light when inspecting. Once corm has formed, darkness is no longer necessary. To avoid seedling stretch, do not wait for all corms to throw up a leaf. When the radicle has emerged the seed has germinated and needs to be removed from the chamber.

**Cover:** Do not cover. Covering will make it difficult to inspect for radicle emergence.

**Media:** pH: 5.5 – 5.8. EC: 0.5

**Light:** Complete darkness is essential for germination. Cover the seed flats with black plastic to ensure constant darkness and to avoid accidental light exposure.

**Temperature:** 62° – 64°F (17° – 18°C). Temperatures >68°F (20°C) will inhibit germination giving non-uniform stands.

**Moisture:** Alternate between moisture levels saturated (5) and wet (4). Allow media to approach level (4) before re-saturating to level (5).

**Humidity:** 100%

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 1.0

**Light:** Increase light levels gradually during plug culture to 3,500 foot candles (35,000 lux) maximum. Excessive light levels will burn the tender young leaves.

**Temperature:** After radicle emergence provide 62° – 65°F (16° – 18°C) nights; 65° – 68°F (18° – 20°C) days.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 90%+ is essential to enable the mother leaf to throw off the seed coat. If the seed coat dries out, the mother leaf may not emerge. After the seed coat is shed, gradually reduce humidity to 85 – 90%.

**Fertilizers:** Initially feed at 50 – 100 ppm nitrogen with calcium nitrate (15-5-15) every 2 – 3 waterings. After first true leaves have emerged, begin alternating ammonium (21-5-20) and calcium nitrate (15-5-15) at 75 – 100 ppm nitrogen. Ammonium will help push leaf growth. Calcium nitrate will produce a sturdier young plant. If growth is soft, reduce frequency of ammonium applications.

**Fungicides:** A preventative fungicide program is encouraged.

#### GROWING ON

For all cyclamen, strict sanitation practices will increase the quality of a cyclamen crop. Always use new pots, sanitize the benches, and discourage algae growth anywhere in the greenhouse which may encourage fungus gnats and shore fly outbreaks (carriers of disease). Immediately rogue out diseased plants or isolate suspected diseased plants.

**Transplant Ready:** 10 – 12 weeks from sow in a '288' tray depending on time

of year and variety. Containers too large for the plant habit will make the final product look out of proportion with the flowers. Transplant plug with at least a third of the corm above the soil surface directly into the finish container. Staging growth in intermediate-sized containers will delay flowering.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** Select a porous media that drains well. This is particularly important during the cool season when temperatures and light levels are low, and media is slow to dry. pH: 5.8 – 6.2. EC: 1, max 1.2. Cyclamen are sensitive to elevated soluble salt levels. Allow leaching to occur when fertilizing to avoid root problems due to high salt levels.

**Light:** Provide shade to allow a maximum of 4,400 foot candles (44,000 lux). Flowers will not be initiated if light levels drop below 2,000 foot candles (20,000 lux). Supplemental lighting at 300 – 500 foot candles (3,000 – 5,000 lux) for a 14-hour day will increase bud count.

**Temperature:** After transplant, maintain cool days, with 65°F (18°C) nights. Once rooted to the sides, drop nights to 62°F (17°C) to help facilitate flowering. When roots reach bottom of pot, reduce night temperature further to 58° – 60°F (14° – 16°C) to keep the crop compact the last month of finishing. Hold finished crops at 55° – 60°F (13° – 15°C) nights, and cool days. Night temperatures above 62° – 65°F (17° – 18°C) will decrease bud counts. Average day temperatures above 75°F (24° C) will delay flower initiation.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** Minimum of 60% during the day and a maximum of 80 – 85% at night. Low humidity contributes to leaf yellowing and high humidity will produce elongated, weak foliage that is susceptible to fungus attack.

**Fertilizers:** Begin fertilization when roots push out of the plug. Feed weekly or every 2 – 3 waterings with a nitrogen:potassium (N:K) ratio of 1:2. Fertilize at an EC rate of 1.5. On young plants, alternate between potassium nitrate and calcium nitrate fertilizers. An extra solution of potassium nitrate is given with an EC of 2 – 2.4 every two weeks. If new leaves do not expand fully, an occasional application of ammonium will promote leaf expansion. When plants reach the desired size, alternate between three applications of potassium nitrate to one application of potassium sulfate, at a fertilizer EC rate of 1.5 for finishing.

**Fungicides:** A preventative fungicide program is encouraged.

**Spacing:** Grow pot tight until foliage reaches the pot rim. Additional spacing is needed to allow for leaf growth but not so close that the plants touch each other. Good air circulation is necessary for quality growth. Crowding the plants will favor a climate for disease development and irreversible stretching.

**Common Diseases:** Botrytis, Fusarium, Erwinia, Cylindrocarpus (Nectria) and Gloeosporium

**Common Pests:** Aphids, Thrips and Cyclamen Mites. Shore Flies are disease vectors for Erwinia; Fungus gnats are disease vectors for Fusarium.

PRODUCT USE	GARDEN SPECIFICATIONS
Potted crop, gift item, containers, landscape plant	<b>Light:</b> Partial shade to filtered sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 7 – 1

	Garden Height	Garden Width
<b>Mini</b>	6 – 10" (15 – 25 cm)	6 – 10" (15 – 25 cm)
<b>Intermediate</b>	10 – 12" (25 – 30 cm)	10 – 12" (25 – 30 cm)
<b>Standard</b>	12 – 16" (30 – 40 cm)	12 – 16" (30 – 40 cm)

continued on next page



MINI SERIES: **Midori™, Miracle™, SilverHeart™, Silverado™**

INTERMEDIATE SERIES: **Canto® , Laser™, Sterling™**

STANDARD SERIES: **Concerto™, Sierra™, Sierra Synchro™, Rainier™, Winter Ice™**

#### CYCLAMEN SCHEDULING IN WEEKS

	Mini: Midori, Miracle, Silver-Heart, Silverado	Intermediate: Canto, Laser, Sterling	Standard: Concerto, Sierra, Sierra Synchro, Rainier, Winter Ice
<b>'288 plug crop time</b>	10 – 12 depending on the time of the year and series		
<b>Transplant to Finish crop times</b>			
<b>4" crop</b>	14 – 16	Laser: 15 – 17; Canto, Sterling: 16 – 18	N/A
<b>6" crop</b>	N/A	N/A	Sierra: 16 – 18; Concerto, Rainier, Winter Ice: 18 – 20
<b>'60 – 72' plug crop time</b>	Transplant 8 – 10 week '288' plugs into '60 – 72' plug tray for an additional 5 – 6 weeks. (Some growers prefer a '50' size plug tray.)		
<b>Transplanted '60 – 72' plug crop to finish crop times</b>			
<b>4" crop</b>	12 – 14	Laser: 13 – 15; Canto, Sterling: 14 – 16	N/A
<b>6" crop</b>	N/A	N/A	Sierra: 14 – 16; Concerto, Rainier, Winter Ice: 16 – 18

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Fresco™, Harlequin™, Hello!™

### DAHLIA X HYBRIDA

**Minimum Germination Rate:** Hello! 80%, Fresco, Harlequin 70%

**Seed Product Form:** Hello! raw; Fresco, Harlequin raw, film coated

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 28 – 35; 5 – 7 leaves present.

**Flowering Type:** Obligate long-day plant – long days are necessary for flowering.

**Specific Flowering Mechanism:** Maturity and long days trigger flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in two days.

**Cover:** Cover seeds with a thin layer of medium-sized vermiculite to maintain moisture levels.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 0.75

**Light:** Provide long days starting at sow. Dahlias want to form tubers under short days. Provide interrupted nights for a 12 – 14-hour day to suppress tuber formation.

**Temperature:** 68° – 72°F (20° – 22°C) until radicle emergence. Reduce to 65° – 68°F (18° – 20°C) until cotyledon expansion.

**Moisture:** Saturated (5) until days 2 – 3 or radicle emergence. On days 4 – 7, reduce to moisture level (4). Beginning day 8; start alternating moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 100% until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 0.75

**Light:** Keep plug trays under long days. Dahlias want to form tubers under short days. Provide interrupted nights for a 12 – 14-hour day to suppress tuber formation.

**Temperature:** 65° – 68°F (18° – 20°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** <50%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed with a calcium-based fertilizer (13-2-13 or 14-4-14) at 75 – 150 ppm nitrogen.

**Growth Regulators:** If necessary, B-Nine (daminozide) can be applied at 750 – 1,500 ppm.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

### GROWING ON

**Transplant Ready:** 3 – 4 weeks from sow in a '288' tray. Transplant deep so that the cotyledons are at the soil surface. This will produce a more stable plant.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8

• EC: 0.8 – 1

**Light:** Provide long days. Interrupted nights may be needed to simulate long days. Flowering is inhibited by tuber formation, which is only influenced by daylength. Days shorter than 12 hours will promote tuber formation instead of flowering.

**Temperature:** For early spring flowering, optimal growth is best obtained by growing plants at 65° – 70°F (18° – 20°C) nights. Temperature influences the speed of growth and the overall quality of the habit. Temperatures cooler than 62°F (17°C) will slow growth and produce more compact plants, but be sure that interrupted nights or long days are provided to avoid tuber formation.

**Average Daily Temperature (ADT):** 67° (19°C). ADT above 80°F (27°C) will inhibit or abort flower initiation.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Watering early in the day and providing good ventilation is important to producing a strong, healthy crop. Do not let plants wilt. Too little water will produce small plants.

**Humidity:** <50%. Dahlias prefer low humidity.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Constant liquid feed at 150 ppm nitrogen with a complete fertilizer containing micronutrients. Increasing potassium at finish will darken the foliage color.

**Pinching:** Due to the naturally branching habit of Hello!, no pinching is necessary.

**Growth Regulators:** If necessary, apply B-Nine (daminozide) at 750 – 1,500 ppm. Also responds to A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniclazonol), or B-Nine/Cycocel (chlormequat chloride) tank mix. Bonzi can be used at finish to shorten peduncles and not affect the flower size.

**Common Diseases:** Botrytis, Mildew, Smut, Tomato Spotted Wilt Virus

**Common Pests:** Thrips, Red Spider Mites, Whiteflies, Aphids, Leafminers

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, bed borders, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 12 – 3

	Garden Height	Garden Width
<b>Fresco</b>	10 – 12" (25 -30 cm)	7 – 9" (17 – 23 cm)
<b>Harlequin</b>	12 – 14" (30 -35 cm)	7 – 9" (17 – 23 cm)
<b>Hello!</b>	7 – 9" (17 – 23 cm)	7 – 9" (17 – 23 cm)

### DAHLIA SCHEDULING IN WEEKS

	Fresco	Harlequin	Hello!
<b>Total crop time</b>	9 – 10	8 – 9	9 – 12
<b>'288' plug crop time</b>	3 – 4	3 – 4	3 – 4
<b>Transplant to finish crop time</b>	6 – 7	5 – 6	7 – 8
<b>4" crop</b>	6 – 8	6 – 7	6 – 8



# Barbarini<sup>®</sup>, Charms<sup>™</sup>, Diabunda<sup>™</sup>, Dulce<sup>™</sup>, Elation<sup>™</sup>, Fandango<sup>™</sup>, Super Parfait<sup>™</sup>

## DIANTHUS HYBRIDA

**Minimum Germination Rate:** Barbarini, Charms, Dulce, Elation, Fandango, Super Parfait 85%; Diabunda 90%

**Seed Product Form:** Pelleted, raw

## FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 16 – 21; 3 – 4 leaves present.

**Flowering Type:** Facultative long-day plant (minor impact) – long days enhance flowering.

**Specific Flowering Mechanism:** Dianthus is an irradiance plant. Maturity and high light levels will trigger flowering.

## PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion.

**Cover:** Seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** pH: 5.5 – 5.8. NOTE: Dianthus will show iron deficiency symptoms at a pH greater than 6.2. EC: <1

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch compared to seed germinated in the dark.

**Temperature:** 72° – 74°F (22° – 23°C) from day 1 – 3. Then lower temperature to 65° – 68°F (18° – 19°C).

**Moisture:** Level wet (4), from day 1 – 5 or until radicle emergence. Beginning day 6, reduce moisture level to moist (3) and re-saturate to (4) until day 11, or to full cotyledon expansion. Afterward, begin alternating between moisture levels moist (3) to medium (2).

**Humidity:** 100% from day 1 – 3.

**Dehumidify:** On day 4, reduce to 40%. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Maintain EC at <1. Fertigation water should not be greater than an EC of 0.5. Dianthus are sensitive to high salt levels.

**Plug Bulking/Flower Initiation** – Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8. EC: 1 – 1.5

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth. Extending daylength past 10 hours will hasten flowering.

**Temperature:** 67° – 68°F (20°C) from day 7 – 18. Then 67°F (19°C) night temperature and 62°F (17°C) day temperature.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). Watch for excess algae growth. Using R/O (Reverse Osmosis) water will help reduce algae levels.

**Fertilizers:** Under high light conditions, apply an ammonium-based feed (17- 5-17) at 50 – 75 ppm nitrogen. Under low light conditions, apply a calcium-based feed (14-4-14) at 50 – 75 ppm nitrogen.

**Growth Regulators:** If needed, apply Cycocel (chlormequat chloride) at 750 – 1,000 ppm, Bonzi (paclobutrazol) spray at 2 – 5 ppm, or Sumagic (uniclazonol) at 3 – 5 ppm.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

## GROWING ON

**Transplant Ready:** 6 – 7 weeks from a '288' plug tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** pH: 5.5 – 5.8. EC: 1.25 – 1.5

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower development. Long days may enhance growth.

**Temperature:** 62° – 65°F (17° – 18°C) day temperatures; 65° – 68°F (19° – 20°C) night temperatures with a 5 – 10 degree negative DIF from 5 – 9 a.m.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4), and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Under high light conditions, apply an ammonium-based feed (17- 5-17) at 100 – 150 ppm nitrogen. Under low light conditions, apply a calcium-based feed (14-4-14) at 100 – 150 ppm nitrogen.

**Growth Regulators:** If needed, apply either 1 – 2 sprays of Bonzi (paclobutrazol) spray at 5 – 8 ppm, Sumagic (uniclazonol) at 3 – 5 ppm, or BNine (daminozide) at 2,500 – 3,000 ppm.

## TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 3,000 ppm.

**Fertilizer:** Potassium nitrate drench at 100 ppm nitrogen.

**Common Diseases:** Fusarium (a common disease of Dianthus, but Fandango and Dulce have a high tolerance to this pathogen), Alternaria leaf spot, Botrytis, Rust. To reduce disease pressure, provide good air circulation and maintain humidity levels at 40% – 50%. Keep foliage dry going into nighttime hours. Apply appropriate fungicides as needed according to label rates.

**Common Pests:** Fungus Gnats, Shore Flies, Thrips, Aphids, Spider Mites. Scout plants on a regular basis and apply appropriate pesticides according to label rates.

### PRODUCT USE

Containers, combinations, mass plantings. Fandango can also be used as a home garden cut flower.

### GARDEN SPECIFICATIONS

**Light:** Full sun  
**USDA Hardiness Zone:** 5  
**AHS Heat Zone:** 9-1

	Garden Height	Garden Width
<b>Barbarini</b>	8– 10" (20 – 25 cm)	10 – 12" (25 – 30 cm)
<b>Charms</b>	8 – 10" (20 – 25 cm)	6 – 8" (15 – 20 cm)
<b>Diabunda</b>	8– 10" (20 – 25 cm)	8– 10" (20 – 25 cm)
<b>Dulce</b>	10 – 12" (25 – 30cm)	10 – 12" (25 – 30 cm)
<b>Elation</b>	6 – 8" (15 – 20 cm)	8 – 10" (20 – 25 cm)
<b>Fandango</b>	16 – 18" (40 – 45 cm)	18 – 20" (45 – 50 cm)
<b>Super Parfait</b>	6 – 8" (15 – 20 cm)	8 – 10" (20 – 25 cm)

## DIANTHUS SCHEDULING IN WEEKS

	Barbarini	Charms, Dulce	Diabunda	Elation	Fandango	Super Parfait
<b>Total crop time</b>	15-18	15 – 18	9 – 11	9 – 11	16 – 19	15 – 18
<b>'288' plug crop time</b>	5 – 6	5 – 6	4 – 5	5 – 6	6 – 7	5 – 6
<b>Transplant to finish crop time</b>						
<b>Packs</b>	9 – 11	9 – 11	5 – 7	4 – 5	N/A	9 – 11
<b>4" crop</b>	9 – 12	9 – 12	6 – 8	6 – 8	9 – 12	9 – 12
<b>6" crop or 1 gallon</b>	10 – 12	10 – 12	6 – 9	7 – 9	10 – 12	10 – 12



## Camelot™

### DIGITALIS PURPUREA

**Minimum Germination Rate:** 85%

**Seed Product Form:** Pelleted

### FLOWERING

**Time frame when plants are receptive to flower initiation:** 8 – 12 leaves are present.

**Flowering Type:** Facultative long-day plant (secondary) – long days enhance flowering.

**Specific Flowering Mechanism:** High light enhances flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 4 days.

**Cover:** Do not cover seed.

**Media:** • pH: 5.8 – 6.2  
• EC: 0.5 – 0.75

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Temperature:** 65° – 70°F (18° – 21°C) until cotyledon expansion.

**Moisture:** Medium (2) until radicle emergence. Then begin alternating between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3). NOTE: Saturated media will discourage the roots from penetrating into the media.

**Humidity:** Days 1 – 6 maintain 90 – 95% or until radicle emergence and initial roots penetrate the media. On day 7, reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.8 – 6.2  
• EC: <0.75

**Light:** Provide a light shade.

**Temperature:** 60° – 65°F (16° – 18°C)

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed established seedlings at 75 – 150 ppm nitrogen every 2 – 3 waterings with a calcium based fertilizer (13-2-13 or 14-4-14).

**Growth Regulators:** PGRs applied in the plug stage will produce a more compact plant that is easier to ship. Camelot will respond to B-Nine (daminozide) at 2,500 – 3,500 ppm or Sumagic (uniconazole) at 3 ppm.

### GROWING ON

**Transplant Ready:** 4 – 6 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

In trials, plants grown in greenhouses with additional lights exhibited stretched habits and loose flower spikes. Crops grown cool in protected cold frames will produce compact plants with good lateral development of secondary spikes.

**Media:** • pH: 5.8 – 6.2  
• EC: 0.75 – 1.5

**Light:** Time to flower and the number of flowers produced increase proportionally with light levels. Though classified as a shade plant, Digitalis can handle high light conditions with adequate moisture and cool temperatures.

**Temperature:** 45° – 55°F (8° – 12°C) nights are optimal though crop will tolerate a range of 40° – 65°F (4° – 16°C). Under short days, cool temperatures can benefit flowering response. Camelot does not need a chilling period to set flower, however cooler temperatures will produce a higher quality plant with an increased number of flower stems.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Constant liquid feed at 100 – 150 ppm nitrogen with an ammonium-based fertilizer (15-5-15 or 15-0-15). Increase feed with increasing light intensity and temperature. Digitalis can benefit from additional iron and calcium. Avoid ammonium levels >20%.

**Growth Regulators:** Digitalis responds to B-Nine (daminozide), A-Rest (ancymidol), Bonzi (paclobutrazol), or Sumagic (uniconazole). Apply before flower spike begins to elongate.

**Common Diseases:** Botrytis

**Common Pests:** Aphids

PRODUCT USE	GARDEN SPECIFICATIONS
Large pots, containers, shade and sun plantings, mass plantings, home and commercial cut flower.	<b>Light:</b> Partial shade to full sun <b>USDA Hardiness Zone:</b> 5 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Camelot</b>	3.5 – 4' (1 – 1.5 m)	24 – 30" (60 – 75 cm)

### DIGITALIS SCHEDULING IN WEEKS

	Camelot
<b>Total crop time</b>	20 – 24
<b>'288' plug crop time</b>	4 – 6
<b>Transplant to finish crop time</b>	Gallon crop: 16 – 20

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Cinderella™, Twinkle™

*EUSTOMA GRANDIFLORUM*  
(*LISIANTHUS*) CUTFLOWER

**Minimum Germination Rate:** 85%

**Seed Product Form:** Pelleted, raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** 6 – 8 sets of true leaves are present.

**Flowering Type:** Facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** A combination of long days and high light trigger flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 10 – 14 days. Lisianthus prefers large, deep plug cells, which will promote a better root system.

**Cover:** Do not cover.

**Media:** • pH: 6.8 – 7. Amend media with additional lime to adjust for a neutral pH. Lower pH levels may stunt plant growth.

• EC: 0.5 – 0.75

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Temperature:** 70° – 75°F (20° – 21°C). Throughout the germination process, Lisianthus seeds are sensitive to temperatures in excess of 75°F (24°C). If not utilizing a germination chamber, place plug trays in a cool environment to prevent rosetting.

**Average Daily Temperature (ADT):** 67°F (19°C). ADT in excess of 78°F (25°C) can trigger rosetting in the young plant stage.

**Moisture:** Saturated (5) for days 10 – 14 until radicle emergence. Afterward, begin alternating between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 100% for days 1 – 14 or until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

Lisianthus has a sensitive root system that needs to keep actively growing. Development of a good root system is critical for the success of a Lisianthus crop. Seedlings are slow to grow. Do not over-water.

**Media:** pH: 6.8 – 7. EC: 0.75 – 1

**Light:** Under low light conditions, supplemental lighting at 300 – 400 foot candles (3,000 – 4,000 lux) for a 16-hour day will promote earlier flowering.

**Temperature:** 60° – 65°F (15° – 18°C) nights; 70° – 75°F (21° – 24°C) days. Days should not exceed 75°F (24°C) and nights should not drop below 60°F (15°C) to avoid inducing rosetting.

**Average Daily Temperature (ADT):** 67°F (19°C). ADT in excess of 78°F (25°C) can trigger rosetting in the young plant stage.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Do not over-water. Algae is indicative of a too-wet environment. Provide airflow over the trays to encourage evapotranspiration to pull excessive water from the media.

**Dehumidify:** Lisianthus is native to arid regions. Excessive humidity will encourage disease. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Lisianthus are light to moderate feeders during the early plug stages. Fertilize at 50 – 150 ppm nitrogen twice a week with a calcium-based fertilizer (13-2-13 or 14-4-14) to promote strong shoot and root growth.

### GROWING ON

Twinkle and Cinderella are considered early season varieties and will flower under short days. Cut flower Eustoma is typically transplanted directly into the ground. Raised beds are preferred. Provide support to the growing stems to produce high-quality stems. Good ventilation is necessary to create strong plants and reduce the incidence of disease.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

**Transplant Ready:** 8 – 10 weeks from sow in a '288' tray. Transplant into beds when at least 2 – 3 pairs of true leaves are visible and before plugs become root bound. The plug surface should be planted slightly above the soil surface to prevent Rhizoctonia infection. NOTE: Seedlings held too long in the plug tray will form twisted root balls that will result in delayed flowering on shorter stems. Take precautions to minimize root damage to the seedling during transplant. Stress of any kind will delay active root and stem growth and may promote rosetting.

**Spacing:** Space on 4"-x-6" squares or 64 – 80 plants per square meter.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

The key to growing a successful Lisianthus crop is the development of a well established root system. Good ventilation is necessary to create strong plants and reduce the incidence of disease.

**Media:** pH: 6.5 – 7 Lisianthus prefers a neutral media. EC: 0.5 – 1. Pasteurize the beds on a regular basis between crops. Eustoma are not tolerant of non-disinfected soils. Amend soils as needed to provide good drainage and air porosity. This is particularly important during the cool season when temperatures and light levels are low, and media is slow to dry.

**Light:** Twinkle can bloom under short days and supplemental lighting may not be necessary. Under low light conditions, supplemental lighting will promote stronger flowering. Lisianthus need 14 – 16-hour days to promote early flowering and active growth. High light levels (5,000+ foot candles, 50,000 lux) during the standard day will help to intensify flower color. Extreme light levels may lead to leaf edge burning on young leaves.

**Temperature:** Soil temperatures should not drop below 60°F (15°C). Provide soil surface heating if necessary. Finish the crop at 60° – 65°F (15° – 18°C) nights; 70° – 75°F (21° – 24°C) days. Low temperatures will produce stronger stems, but will increase crop time.

**Average Daily Temperature (ADT):** 67°F (19°C). ADT in excess of 78°F (25°C) can trigger rosetting in the young plant stage.

**Moisture:** Drip irrigation is the preferred method of irrigation. Immediately after transplant, keep the media moist (3) to the touch until bud set. Once flowers have initiated, begin alternating between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). It is important to water early in the day and provide good ventilation to produce a strong, healthy crop. Rapid drying of the foliage will discourage disease outbreaks. Do not let plants wilt. Drought stress can promote premature flowering.

**Humidity:** High daytime humidity, low nighttime humidity is necessary the first 10 – 14 days after transplant. Maintain low humidity conditions after transplants are established to prevent disease outbreaks. High humidity and overwatering will promote disease outbreaks. Drought stress in combination with low humidity levels may promote marginal leaf burn. Stem breakage can be attributed to sudden fluctuations in temperature and humidity.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Initially start fertilization with a nitrogen:potassium (N:K) ratio of 1:1 at 100 – 150 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14). Once flower buds are visible, change the N:K ratio to 1:2 at 100 – 150 ppm nitrogen with a near neutral ammonium-based fertilizer (15-10-30) to keep plant compact.

**Common Diseases:** Botrytis, Fusarium, Rhizoctonia and Peronospora, Powdery Mildew, Thielaviopsis, Pythium, Phytophthora, Tomato Spotted Wilt Virus, Impatiens Necrotic Spot Virus, Tobacco Mosaic Virus. Viruses are commonly transmitted by Thrips.

**Common Pests:** Aphids, Thrips and Leafminer. Fungus gnats are a major pest of young seedlings. The larvae feed on roots causing many problems from delayed stem growth, flowering and stunted stems.

### PRODUCT USE

Commercial cut flower; vase life: 9 – 13 days

### EUSTOMA SCHEDULING IN WEEKS

	Cinderella, Twinkle
<b>Total crop time</b>	22 – 26
<b>'288' plug crop time</b>	8 – 10
<b>Transplant to finish crop time</b>	Low light conditions: 14 – 16 High light conditions: 12 – 14



## Lizzy™

### EUSTOMA GRANDIFLORUM (LISIANTHUS) DWARF

**Minimum Germination Rate:** 85%

**Seed Product Form:** Pelleted, raw

#### FLOWERING

**Time frame when plants are receptive to flower initiation:** 6 – 8 sets of true leaves are present.

**Flowering Type:** Facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** A combination of long days and high light trigger flowering.

#### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion.

Expect radicle emergence in 10 – 14 days. Lisianthus prefers large deep plug cells which will promote a better root system.

**Cover:** Do not cover seed.

**Media:** • pH: 6.8 – 7. Amend media with additional lime to adjust for a neutral pH. Lower pH levels may stunt plant growth.  
• EC: 0.5 – 0.75

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Temperature:** 70° – 75°F (20° – 21°C) until cotyledon expansion. Throughout the germination process, Lisianthus seeds are sensitive to temperatures in excess of 75°F (24°C). If not utilizing a germination chamber, place plug trays in a cool environment to prevent rosetting.

**Average Daily Temperature (ADT):** 67°F (19°C). ADT in excess of 78°F (25°C) can trigger rosetting in the young plant stage.

**Moisture:** Saturated (5) for days 10 – 14 until radicle emergence. Afterward, begin alternating between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 100% for days 1 – 14 or until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

Lisianthus has a sensitive root system that needs to keep actively growing. Development of a good root system is critical for the success of a Lisianthus crop. Seedlings are very slow to grow. Do not overwater.

**Media:** pH: 6.8 – 7  
EC: 0.75 – 1

**Light:** Under low light conditions, supplemental lighting at 300 – 400 foot candles (3,000 – 4,000 lux) for a 16-hour day will promote earlier flowering.

**Temperature:** 60° – 65°F (15° – 18°C) nights; 70° – 75°F (21° – 24°C) days. To avoid rosetting, days should not exceed 75°F (24°C) and nights should not drop below 60°F (15°C).

**Average Daily Temperature (ADT):** 67°F (19°C). ADT in excess of 78°F (25°C) can trigger rosetting in the young plant stage.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Algae is indicative of a too-wet environment. Provide airflow over the trays to encourage evapotranspiration to pull excessive water from the media.

**Dehumidify:** Lisianthus is native to arid regions. Excessive humidity will encourage disease.

**Fertilizers:** Lisianthus are light to moderate feeders during the early plug stages. Fertilize at 50 – 150 ppm nitrogen twice a week with a calcium-based fertilizer (13-2-13 or 14-4-14) to promote strong shoot and root growth.

**Growth Regulators:** Not necessary during plug production.

#### GROWING ON

**Transplant Ready:** 8 – 10 weeks from sow in a '288' tray. Transplant in the finish container when at least 2 – 3 pairs of true leaves are visible and before plugs

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

become root bound. The plug surface should be planted slightly above the soil surface to prevent Rhizoctonia infection. NOTE: Seedlings held too long in the plug tray will form twisted root balls that will result in delayed flowering on shorter stems. Take precautions to minimize root damage to the seedling during transplant. Stress of any kind will delay active root and stem growth and may promote rosetting.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

The key to growing a successful Lisianthus crop is the development of a well established root system. Good ventilation is necessary to create strong plants and reduce the incidence of disease.

**Media:** Select a porous media that drains well. Lisianthus requires a soil rich in organic material to promote active root growth. Lisianthus root systems have high oxygen requirements. Provide good air porosity. Soils with high calcium and rich phosphate content are preferred by Lisianthus.

- pH: 6.5 – 7 Lisianthus prefers a neutral media.
- EC: 0.5 – 1

**Light:** Lisianthus need 14 – 16-hour days to promote early flowering and active growth. Interrupted nights i.e. lighting from 10 p.m. – 2 a.m. under short days at 30 – 45 foot candles (300 – 450 lux) will promote earlier flowering. Begin treatments after six sets of true leaves are present. High light levels (5,000+ foot candles, 50,000 lux) during the standard day will help to intensify flower color.

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

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). After flowers have initiated, alternate between wet (4) and dry (1.5). Allow media to approach level (1.5) before re-saturating to level (4). Watering early in the day and providing good ventilation is important to producing a strong, healthy crop. Rapid drying of the foliage will discourage disease outbreaks. Do not let plants wilt.

**Humidity:** High daytime humidity, low nighttime humidity is necessary the first 10 – 14 days after transplant. Maintain low humidity conditions after transplants are established to prevent disease outbreaks. High humidity and overwatering will promote disease outbreaks. Drought stress in combination with low humidity levels may promote marginal leaf burn. Stem breakage can be attributed to sudden fluctuations in temperature and humidity.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Initially start fertilization with a nitrogen:potassium (N:K) ratio of 1:1 at 100 – 150 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14). Once flower buds are visible, change the N:K ratio to 1:2 at 100 – 150 ppm nitrogen with a near neutral ammonium-based fertilizer (15-10-30) to keep plant compact.

**Growth Regulators:** PGRs may be necessary during periods of high heat >85°F (30°C).

**Common Diseases:** Botrytis, Fusarium, Rhizoctonia and Peronospora, Powdery Mildew, Thielaviopsis, Pythium, Phytophthora, Tomato Spotted Wilt Virus, Impatiens Necrotic Spot Virus, Tobacco Mosaic Virus. Viruses are commonly transmitted by Thrips.

**Common Pests:** Aphids, Thrips and Leafminer. Fungus gnats are a major pest of young seedlings. The larvae feed on roots causing many problems from delayed stem growth, flowering and stunted stems.

PRODUCT USE	GARDEN SPECIFICATIONS
Potted crop, containers, bedding plant	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 8 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Lizzy</b>	10 – 12" (25 – 30 cm)	8 – 10" (20 – 25 cm)

#### EUSTOMA SCHEDULING IN WEEKS

	Lizzy
<b>Total crop time</b>	22 – 26
<b>'288' plug crop time</b>	8 – 10
<b>Transplant to finish crop time</b>	Green packs: 8 – 10



## Plume™

### GAILLARDIA PULCHELLA

**Minimum Germination Rate:** 70%

**Seed Product Form:** Raw

### FLOWERING

**Specific Flowering Mechanism:** The first 7 – 6 weeks supply short days (10 – 12 hours) to develop a full plant then supply 14+ hours to initiate flowering.

**Flowering Type:** Facultative long-day plant – 14 hours or more needed to have a uniform flowering crop.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 14 – 21): From the time a seed is sown until radicle emergence takes place; usually with the root penetrating the media and some cotyledon development. Humidity in the air is 95 – 98% (humidification); media moisture wet (4 – 4.5). Expect radicle emergence in 4 – 5 days.

**Cover:** Do not cover seeds, as light will assist in germination.

**Media:** Use a well-drained growing media. Avoid media compaction to allow for root penetration.

- pH: 6 – 6.2.
- EC: 0.5 – 0.75

**Light:** Light will assist in germination.

**Moisture:** Wet (4+), keep soil uniformly moist during stage 1.

**Humidity:** 100% until radicles emerge, then begin lowering.

**Temperature:** 68° – 74°F (20° – 23°C) until day 14 – 21.

**Fertilizers:** Maintain electrical conductivity (EC) of 0.5 – 0.75.

**Germination 2** (approximately day 14 – 21): From the time cotyledon is observed until it is fully expanded. The roots have expanded throughout the media. Dehumidify from 98% to 50 % in the air. Media moisture during the wet cycle is usually 4 – 5, and 3 – 4 during the dry cycle; this wet-dry cycle should take place within 12 – 24 hours.

- Media:**
- pH: 6 – 6.2
  - EC: 0.5 – 0.75

**Light:** 2,000 – 3,000 foot candles (20,000 – 30,000 lux); 6 - 10 mols of light.

**Moisture:** Dry back media to wet (4) and alternation to moist (3) within 18 hours at radicle emergence.

**Dehumidify:** Lower relative humidity to 40%. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 68° – 72°F (20° – 22°C).

**Fertilizers:** 14-4-14 or 17-5-17 at 50 – 75 ppm nitrogen as needed for an EC in the soil of 0.5 – 0.75.

**Fungicides:** None required

**Plug Bulking/Flower Initiation:** The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media. Induction and initiation may occur. If buds are present, they should be few in number and small in size.

- Media:**
- pH: 6 – 6.2
  - EC: 0.7 – 1.2

**Light:** 2,500 – 3,000 foot candles.

**Temperature:** 65° – 68°F (15 – 20°C)

**Moisture:** Alternate between moisture level wet (4) to medium (2). Allow the soil to approach medium (2), before re-saturating to wet (4). If media is allowed to dry back further than (2), root damage may occur.

**Fertilizers:** 14-4-14 or 17-5-17 at 100 – 175 ppm nitrogen, as needed for an EC in the soil of 0.7 – 1.2.

**Growth Regulators:** None required.

**Fungicides:** None needed.

**Initiated Bulking:** 7 – 8 weeks after sowing seedlings are receptive to initiation and flower bud development.

**Light:** Provide 4,750 – 7,500 foot candles (47,500 – 75,000 lux) or 17 – 28 mols of light.

**Temperature:** 60°F ( 15°C)

**Fertilizer:** 14-4-14 or 17-5-17 at 125 – 150 ppm nitrogen, as needed for an EC in the soil of 1.25 – 1.75.

**Fungicides:** None needed.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish** (approximately day 36 – 84): Optimize plant shoot and root growth, which is usually a 1:1 ratio. Flower buds are usually present and developing.

- Media:**
- pH: 6 – 6.2
  - EC: 1.5 – 2

**Light:** Provide 5,000 – 7,500 foot candles (50,000 – 75,000) or 18 – 28 mols.

**Temperature:** 55 – 60°F (13.5° – 15°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to wet (4).

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 175 – 225 ppm, as needed for an EC in the soil of 1.5 – 2.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 5,000 ppm. If plants grown cool PGRs should not be required.

**Fungicides:** None should be required.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 3,000 ppm.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** INSV, White Smut, Powdery Mildew. Monitor moisture and humidity levels.

**Common Pests:** Fungus Gnats and Thrips. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 8 <b>AHS Heat Zone:</b> 10

	Garden Height	Garden Width
<b>Plume</b>	12 – 14" (30 – 35 cm)	12 – 14" (30 – 35 cm)

### GAILLARDIA SCHEDULING IN WEEKS

	Plume
<b>Total crop time</b>	12 – 15
<b>'128' plug crop time</b>	8 – 9
<b>'200' plug crop time</b>	7 – 8
<b>'288' plug crop time</b>	5 – 7
<b>Transplant to finish crop time</b>	
<b>4" crop</b>	7 – 8, depending on number of plugs transplanted
<b>6" crop</b>	8 – 9, depending on number of plugs transplanted
<b>8" crop</b>	9 – 10, depending on number of plugs transplanted

The shortest crops times may be achieved when following recommended optimal culture. Deviation in environmental conditions will result in longer crop times.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Gazoo™, Kiss™, Big Kiss™

### GAZANIA SPLENDENS

**Minimum Germination Rate:** Kiss, Big Kiss 90%, Gazoo 80%

**Seed Product Form:** Raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 16 – 20; 6 – 8 true leaves present.

**Flowering Type:** Facultative long-day plant – long days enhance for flowering.

**Specific Flowering Mechanism:** Maturity and warm temperatures trigger flowering. Irradiance will improve bud counts.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion.

Expect radicle emergence in 4 – 6 days.

**Cover:** Cover seeds with a thin layer of medium-sized vermiculite to maintain moisture levels.

**Media:** • pH: 5.8 – 6.2

• EC: 0.5 – 0.75

**Light:** Light has no effect on germination of Kiss Gazania. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Moisture:** Moist (3) for days 1 – 3 or until radicle emergence. On days 4 – 14, reduce moisture to medium (2). Beginning day 15, alternate between moisture levels moist (3) and medium (2) until cotyledon expansion. Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 70° – 75°F (21° – 24°C) until radicle emergence, then lower to 65° – 68°F (18° – 20°C) until cotyledon expansion.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.8 – 6.2

• EC: 0.75 – 1

**Light:** Under low light conditions, supplemental light for a 14 – 16-hour day may be necessary to produce a compact, sturdy seedling.

**Temperature:** 65° – 68°F (18° – 20°C). Gradually reduce temperatures to 62° – 65°F (16° – 18°C) as the seedlings mature.

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed 1 – 2 times per week at 100 – 200 ppm nitrogen. Under high light conditions, apply an ammonium-based feed (17-5-17). Under low light conditions, apply a calcium-based feed (14-4-14). Under high light and long or extended days, an ammonium-based feed (20-10-20) is preferred.

**Growth Regulators:** Kiss has been bred for a naturally bushy compact habit. Growth regulators are not required under normal growing regimes. If desired, apply B-Nine (daminozide) at 2,500 ppm.

### GROWING ON

**Transplant Ready:** 5 – 6 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.8 – 6.2

• EC: 1 – 1.5

**Light:** Provide full sun.

**Temperature:** After transplants are established, reduce night temperatures to 55° – 60°F (12° – 16°C), with moderate day temperatures.

**Moisture:** Alternate between moisture levels wet (4) and dry (1.5) Allow media to approach level (1.5) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** 150 – 200 ppm nitrogen as needed with a fertilizer containing low amounts of ammonium and phosphorus.

**Growth Regulators:** Kiss has been bred for a naturally bushy compact habit. Growth regulators are not required under normal growing regimes. If needed, Gazania responds to Cyocel (chlormequat chloride) or B-Nine (daminozide). When temperatures exceed 80°F (26°C), a tank mix of B-nine/Cyocel may prove more effective.

**Common Diseases:** Botrytis, Rhizoctonia, Sclerotinia

**Common Pests:** Thrips, Spider Mite, Aphids

PRODUCT USE	GARDEN SPECIFICATIONS
Large packs, pots, containers, border edgings, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 8 <b>AHS Heat Zone:</b> 12 – 3

	Garden Height	Garden Width
<b>Gazoo</b>	10 – 12" (25 – 30 cm)	10 – 12" (25 – 30 cm)
<b>Kiss</b>	8 – 10" (20 – 25 cm)	8 – 10" (20 – 25 cm)
<b>Big Kiss</b>	10 – 12" (25 – 30 cm)	10 – 12" (25 – 30 cm)

### GAZANIA SCHEDULING IN WEEKS

	Gazoo	Kiss	Big Kiss
<b>Total crop time</b>	12 – 14	13 – 15	13 – 15
<b>'288' plug crop time</b>	5 – 6	5 – 6	5 – 6
<b>Transplant to finish crop time</b>			
<b>4" crop</b>	8 – 10	8 – 10	8 – 10
<b>6" crop</b>	9 – 11	9 – 11	9 – 11

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



# BullsEye™, Elite™, Maverick™, Pinto™, Multibloom™, Orbit™, Orbit Synchro™, Ringo 2000™

## GERANIUM PELARGONIUM X HORTORUM

**Minimum Germination Rate:** 90%

**Seed Product Form:** Coated

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 18 – 24; 4 – 6 leaves present.

**Flowering Type:** Geraniums are day-neutral plants.

**Specific Flowering Mechanism:** Light and temperature trigger flowering. Geraniums are light accumulators, the more light received, the faster the growth and earlier the flowering. DIF treatments may negate flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 1 – 3 days.

**Cover:** Cover seeds with a thin layer of medium-sized vermiculite to maintain moisture levels.

**Media:** • pH: 6.4 – 6.5 pH levels <6 may promote shoot tip abortion and allow sodium, iron and manganese to becoming toxic. Symptoms of nutrient toxicity will exhibit itself on the lower leaves.

• EC: 0.75 – 1 High EC discourages rooting into the media.

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Moisture:** Saturated (5) for day 1 – 3. On days 4 – 8 reduce to moist (3). Beginning day 9, reduce moisture further to medium (2). Geraniums have a high oxygen requirement at the root level.

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 73°F (23°C). Thermodormancy, which causes erratic germination, is induced when temperatures exceed 76°F (25°C). Temperatures below 71°F (22°C) decrease the speed and uniformity of germination.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** pH: 6.4 – 6.5. EC: 1 – 2

**Light:** Supplemental lighting at 350 – 450 foot candles (3,500 – 4,500 lux) for a 16 – 18-hour day will promote earlier flowering. Supplemental lighting may not be necessary with Multibloom.

**Temperature:** 65° – 70°F (18° – 20°C). Gradually reduce to 62° – 65°F (16° – 18°C) to hold plugs.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Alternate between calcium-based fertilizers (13-2-13 or 14-4-14) and potassium nitrate (15-5-15) at 50 – 75 ppm nitrogen. Phosphorus should not exceed 10 ppm. Geraniums are sensitive to ammonium. Ammonium levels should not exceed 5 ppm to prevent stretch.

**Gases:** Supplemental carbon dioxide can be applied at 1,000 ppm to enhance flowering under high light conditions.

**Growth Regulators:** Begin applications of Cycocel (chlormequat chloride) at 750 ppm when 3 – 5 true leaves are present.

### GROWING ON

NOTE: Multibloom culture is slightly different than typical Geraniums. Multibloom will set bud in 6 – 7 weeks

from sowing, therefore, it is necessary to keep Multibloom actively growing. Do not stress Multibloom by withholding water or fertilizer. Otherwise, the culture remains the same for all Geraniums.

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** pH: 6.2 – 6.5. Low pH symptoms include yellowing of leaves, interveinal chlorosis and necrosis. EC: 1.2 – 1.5 High salts may encourage roots to become very brittle.

**Light:** Provide 3,500 – 4,500 foot candles (15 – 20 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low-light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth. Lighting after transplant for 2 – 3 weeks, at 300 – 500 foot candles (3,000 – 5,000 lux) for 14 – 18 hours a day will induce early flowering.

**Temperature:** 60° – 65°F (16° – 18°C) nights and 70° – 75°F (21° – 24°C) days. Manipulation of night temperatures after buds are visible can speed up or slow down flower development to meet a sales date.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). Excessive drying of the media moisture level will concentrate salts around the root system and burn the root hairs. Symptoms of excessive drying include lower leaves turning reddish to yellow, and root tip die-back.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration under cool, low-light conditions.

**Fertilizers:** Constant liquid feed at 200 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14).

**Growth Regulators:** A total of 4 – 5 applications of Cycocel (chlormequat chloride) at 750 ppm beginning when 3 – 5 true leaves are present will control growth. NOTE: Do not apply Cycocel after the buds have emerged above the foliage. Small and/or malformed flowers will result from late applications of Cycocel. Also responds to A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniconazole) or B-Nine/Cycocel (chlormequat chloride) tank mix.

**Common Diseases:** Botrytis, Pythium, Alternaria, Pseudomonas, Rust

**Common Pests:** Thrips

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings. Multibloom and Elite can also be used in packs.	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Elite, Multibloom</b>	10 – 12" (25 – 30 cm)	10 – 12" (25 – 30 cm)
<b>Orbit, Ringo 2000</b>	12 – 14" (30 – 35 cm)	10 – 12" (25 – 30 cm)
<b>BullsEye</b>	13 – 15" (33 – 38 cm)	11 – 13" (28 – 33 cm)
<b>Maverick</b>	14 – 16" (35 – 40 cm)	12 – 14" (30 – 35 cm)
<b>Pinto</b>	14 – 16" (35 – 40 cm)	12 – 14" (30 – 35 cm)
<b>Ringo</b>	12 – 14" (30 – 35 cm)	10 – 12" (25 – 30 cm)

### GERANIUM SCHEDULING IN WEEKS

	BullsEye	Elite	Maverick	Pinto	Multibloom	Orbit, Orbit Synchro	Ringo 2000
<b>Total crop time</b>	13 – 15	13 – 14	12 – 15	12 – 14	11 – 12	13 – 14	11 – 13
<b>'288' plug crop time</b>	4 – 5	4 – 5	4 – 5	4 – 5	4 – 5	4 – 5	4 – 5
<b>Transplant to finish crop time</b>							
<b>Packs</b>	N/A	11 – 12	N/A	N/A	6 – 7	N/A	7 – 8
<b>4" crop</b>	7 – 10	7 – 10	7 – 10	7 – 10	6 – 8	7 – 10	6 – 8
<b>6" crop</b>	10 – 12	10 – 12	10 – 12	10 – 12	N/A	10 – 12	N/A

Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.



## Tornado™

### GERANIUM PELARGONIUM PELTATUM

**Minimum Germination Rate:** 80%

**Seed Product Form:** Film coated

#### FLOWERING

**Flowering Mechanism:** Irradiance (primary); plants initiate on approximately days 20 – 24, 4 – 6 leaves present with HID light for 16-18 hours OR total 12 – 16 mols (3,500 – 4,500 ft. candles) for 3 – 4 weeks at 65° – 70°F (18° – 20°C).

**Flowering Type:** Geraniums are day-neutral plants.

**Specific Flowering Mechanism:** Light and temperature trigger flowering. Geraniums are light accumulators, the more light received, the faster the growth and earlier the flowering. DIF treatments may negate flowering.

#### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 4): From the time a seed is sown until radicle emergence takes place; usually with the root penetrating the media and some cotyledon development. Humidity in the air is 95 – 98% (humidification); media moisture (4+ – 5). Expect radicle emergence in 4 days.

**Cover:** Cover seeds with a thin layer of medium-sized vermiculite to maintain moisture levels.

**Media:** • pH: 6 – 6.2 Ivy Geraniums are not as sensitive to a lower pH as other Geraniums and can show signs of iron and magnesium deficiencies at a pH above 6.3; these are expressed as inter-veinal chlorosis on the new growth.

• EC: 0.75 – 1 High EC discourages rooting into the media.

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Moisture:** Saturated (5) for day 1 – 4. On days 5 – 8 reduce to moist (3). Beginning day 9, reduce moisture further to medium (2). Geraniums have a high oxygen requirement at the root level.

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 73°F (23°C). Thermodormancy, which causes erratic germination, is induced when temperatures exceed 76°F (25°C). Temperatures below 71°F (22°C) decrease the speed and uniformity of germination.

**Germination 2** (approximately day 5 – 14): From the time cotyledon is observed until it is fully expanded. The roots have expanded throughout the media. Dehumidify from 98% to 50% moisture in the air. Media moisture during the wet cycle is usually 4 – 5, and 2 – 3 during the dry cycle; this wet-dry cycle should take place within 12 – 24 hours for most plants.

**Media:** • pH: 6 – 6.2  
• EC: 1 – 1.5

**Light:** Supplemental lighting at 350 – 450 foot candles (3,500 – 4,500 lux) for a 16 – 18-hour day will promote earlier flowering.

**Temperature:** 68° – 70°F (20° – 21°C). Gradually reduce to 65° – 70°F (18° – 20°C).

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Lower relative humidity to 40% (approximately day 8). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Alternate between calcium-based fertilizers (13-2-13 or 14-4-14) and potassium nitrate (15-5-15) at 50 – 75 ppm nitrogen. Phosphorus should not exceed 10 ppm. Geraniums are sensitive to ammonium. Ammonium levels should not exceed 5 ppm to prevent stretch.

**Gases:** Supplemental carbon dioxide can be applied at 1,000 ppm to enhance flowering under high light conditions.

**Growth Regulators:** Tornado Geraniums are naturally self branching and compact growing. If growth regulators are applied, use lower rates. Begin

applications of Cycocel (chlormequat chloride) at 300 ppm when 3 – 5 true leaves are present.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis.

**Plug Bulking/Flower Initiation** (approximately day 15 – 24): The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media. Induction and initiation may occur; if buds are present, they should be few in number and small in size.

**Media:** • pH: 6 – 6.2  
• EC: 1 – 1.5

**Light:** Provide 3,000 – 3,500 foot candles (10 – 12 total mols or 30,000 – 35,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 65° – 70°F (18° – 20°C). Gradually reduce to 62° – 65°F (16° – 18°C) to hold plugs.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Fertilizers:** Alternate between calcium-based fertilizers (13-2-13 or 14-4-14) and potassium nitrate (15-5-15) at 75 – 100 ppm nitrogen. Phosphorus should not exceed 10 ppm.

**Growth Regulators:** If needed, spray Cycocel (chlormequat chloride) at 300 ppm.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis.

**Initiated Bulking** (approximately day 25 – 34): Seedlings develop from juvenile to mature, usually determined by the number of leaves present (cultivar specific). Seedlings are receptive to initiation and flower bud development.

**Light:** Provide 3,500 – 4,500 foot candles (35,000 - 45,000 lux) or 12 – 16 mols of light.

**Temperature:** 62° - 68°F (17° – 20°C)

**Fertilizer:** Alternate between calcium-based fertilizers (13-2-13 or 14-4-14) and potassium nitrate (15-5-15) at 100 – 150 ppm nitrogen. Phosphorus should not exceed 10 ppm. Under high-light conditions a 20-10-20 fertilizer can be used. Leach with fresh water every third watering.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis.

#### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish** (approximately day 35 – 98): Optimize plant shoot and root growth; which is usually a 1:1 ratio. Flower buds are usually present and developing.

**Media:** • pH: 6 – 6.2  
• EC: 1.2 – 1.5 High salts may encourage roots to become very brittle.

**Light:** Provide 3,500 – 4,500 foot candles (15 – 20 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth. Lighting after transplant for 2 – 3 weeks, at 300 – 500 foot candles (3,000 – 5,000 lux) for 14 – 18 hours a day will induce early flowering.

**Temperature:** 60° – 65°F (16° – 18°C) nights and 70° – 75°F (21° – 24°C) days

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). Excessive drying of the media moisture level will concentrate salts around the root system and burn the root hairs. Symptoms of excessive drying include lower leaves turning reddish to yellow, and root tip die-back.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration under cool, low-light conditions.

**Humidity:** 40%

**Fertilizers:** Constant liquid feed at 150 - 200 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14). Under high light conditions, a 20-10-20 fertilizer can be used. Leach with fresh water every third watering.

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## Tornado™ (continued)

**Growth Regulators:** If needed, spray Cycocel (chlormequat chloride) at 300 – 500 ppm. NOTE: Do not apply Cycocel after the buds have emerged above the foliage. Small and/or malformed flowers will result from late applications of Cycocel.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Pythium, Rhizoctonia and Thielaviopsis. Monitor moisture and humidity levels and use preventative fungicide drenches.

**Common Pests:** Fungus Gnats, Shore Flies and Thrips. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Part to full sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Tornado</b>	8 – 10" (20 – 25 cm)	12 – 14" (30 – 35 cm)

### GERANIUM SCHEDULING IN WEEKS:

	Tornado
<b>Total crop time</b>	12 – 16
<b>'128' plug crop time</b>	7 – 8
<b>'200' plug crop time</b>	6 – 7
<b>'288' plug crop time</b>	5 – 6
<b>Transplant to finish crop time from a '288' plug</b>	
<b>4" crop</b>	8 – 9
<b>6" crop</b>	9 – 10, depending on number of plugs transplanted
<b>8" crop</b>	9 – 10, depending on number of plugs transplanted
<b>8" basket crop</b>	10 – 11, depending on number of plugs transplanted

The shortest crops times may be achieved when following recommended optimal culture. Deviation in environmental conditions will result in longer crop times.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Jaguar™

**GERBERA JAMESONII**

**Minimum Germination Rate:** 90%

**Seed Product Form:** Raw

### FLOWERING

**Flowering Mechanism:** Irradiance (primary); plants initiate at the 4 – 5 leaf stage on approximately day 28 with HID light for 16 hours OR total 14 – 24 mols (4,050 – 6,500 foot candles) for 3 – 4 weeks.

**Flowering Type:** Facultative long-day plant – high irradiance, temperatures higher than 68°F (20°C) will enhance flowering.

### PLUG CULTURE:

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 4): From the time a seed is sown until radicle emergence takes place; usually with the root penetrating the media and some cotyledon development. Humidity in the air is 95 – 98% (humidification); media moisture saturated (5). Expect radicle emergence in 3 – 4 days.

**Cover:** No cover is needed. Seeds require light for germination.

**Media:** Avoid media compaction to allow for root penetration.

- pH: 5.3 – 5.5; higher pH will promote iron and manganese deficiency.
- EC: 1 – 1.2

**Light:** If using a germination chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination. Optimum daylength during **Germination:** 16 hours.

**Moisture:** Saturated (5), from day 1 – 3 or until radical emergence (approximately day 4). If you are unable to dehumidify on day 4, decrease the starting moisture level from saturated (5) to a wet (4+).

**Humidity:** 95 – 98% from day 1 – 4 or until seed coats are shed.

**Temperature:** 76°F (24°C) until radical emergence.

**Fertilizers:** 14-4-14 or 17-5-17 at 60 – 70 ppm nitrogen to maintain an EC of 1 – 1.2.

**Germination 2** (approximately day 5 – 7): From the time cotyledon is observed until it is fully expanded. The roots have expanded throughout the media. Dehumidify from 98% to 40% moisture in the air.

**Media:** • pH: 5.3 – 5.5

- EC: 1.2 – 1.5

**Light:** 2,000 – 2,500 foot candles (20,000 – 25,000 lux); 6 – 8 mols of light.

**Moisture:** Media moisture should alternate between a saturated (5) to moist (3) within 18 hours at radical emergence. Approximately day 5: Begin alternating between a wet (4) and a moist (3).

**Dehumidify:** Lower relative humidity to 40 – 50% (approximately day 5). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 74°F (23°C) and gradually reduce further to 72°F (22°C) in the next 2 – 3 days.

**Fertilizers:** 17-5-17 at 60 – 75 ppm nitrogen as needed to maintain an EC in the soil of 1.2 – 1.5.

**Fungicides:** Preventative fungicide may be applied for soilborne diseases between day 5 and 7.

**Plug Bulking/Flower Initiation** (approximately day 8 – 28): The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media. Induction and initiation may occur; if buds are present, they should be few in number and small in size.

**Media:** • pH: 5.5 – 5.8

- EC: 1.20 – 1.5

**Light:** 3,500 – 5,000 foot candles (35,000 – 50,000 lux); 12 – 18 mols of light.

**Temperature:** 68° – 70°F (20° – 21°C) with a 5 – 8°F (2° – 4°C) DIF or drop in the morning two hours before sunrise to approximately 9 a.m.

**Moisture:** It is critical to allow adequate dry back between watering. Alternate between moisture level wet (4) to medium (2). Allow the soil to approach medium (2), before re-saturating to wet (4). If media is allowed to dry back further than (2), root damage may occur resulting in a lack of iron uptake.

**Fertilizers:** 17-5-17 or 20-10-20 depending on light levels, at 125 – 150 ppm nitrogen and to maintain an EC of 1.25 – 1.5 in the soil. Supply 8 – 12 ppm phosphorus, supply 1.5 ppm iron and 0.5 ppm boron.

**Growth Regulators:** At this stage, no growth regulators should be needed.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia, Pythium and Phytophthora.

**Initiated Bulking** (approximately day 29 – 48): Seedlings develop from juvenile to mature, usually determined by the number of leaves present (cultivar specific). Seedlings are receptive to initiation and flower bud development.

**Light:** Provide 3,500 – 5,500 foot candles (35,000 – 55,000 lux) or 12 – 20 mols of light.

**Temperature:** 68° – 72°F (20° – 22°C) with a 5° – 10°F (2° – 5°C) DIF or drop in the morning two hours before sunrise to approximately 9 a.m.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow plants to dry back completely between watering. Too much water and fertilizer will cause deformed plants with a thick leaf. Drying back the plants should take place within an 18-hour period.

**Fertilizers:** 17-5-17 or 20-10-20 depending on light levels, at 125 – 150 ppm nitrogen and to maintain an EC of 1.25 – 1.5 in the soil. Supply 8 – 12 ppm phosphorus, supply 1.5 ppm iron.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia, Pythium, and Phytophthora.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

Use care not to plant too deep, slightly higher than the soil line from the plug tray. Place plants pot to pot to be final spaced in approximately three weeks.

**Transplant to Finish** (approximately day 49 to finish): Optimize plant shoot and root growth, which is usually a 1:1 ratio. Flower buds are usually present and developing.

**Media:** • pH: 5.5 – 5.8

- EC: 1.5 – 1.75

**Light:** Provide 4,000 – 6,000 foot candles (40,000 – 60,000 lux); 14 – 22 mols. Provide 11 – 13-hour daylength.

**Temperature:** Start at 70° – 72°F (21° – 22°C) for the first two weeks and then lower the temperature to 65° – 68°F (19° – 20°C); using a 5° – 10°F (2° – 5°C) negative DIF or drop in the morning two hours before sunrise to approximately 9 a.m.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to wet (4).

**Humidity:** 40 – 50%

**Fertilizers:** Constant feeding with a 17-5-17 fertilizer at 150 – 200 ppm to maintain an EC in the soil of 1.75 – 2.5. Under high light conditions a 20-10-20 fertilizer can be used. Supply 8 – 12 ppm phosphorus, supply 1.5 ppm iron.

**Growth Regulators:** Jaguar normally does not need growth regulators. Under long day conditions >16 hours they can help reduce leaf size and tone the crop. For smaller containers and 4" (10 cm) pots, apply B-Nine (daminozide) at 2,500 7 – 10 days after potting.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia, Pythium and Phytophthora.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Foliar – Alternaria, Botrytis and Powdery Mildew; soilborne – Phytophthora, Rhizoctonia and Pythium. Monitor moisture and humidity levels and use preventative fungicide drenches.

**Common Pests:** Aphids, Fungus Gnats, Shore Flies, Broad Mites, Cyclamen Mites, Spider Mites, Thrips, Whitefly and Leafminers. Use pesticides according to label directions.

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## Jaguar™ (continued)

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Part to full sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Jaguar</b>	8 – 10" (20 – 25 cm)	6 – 8" (15 – 20 cm)

### GERBERA SCHEDULING IN WEEKS:

	Jaguar
<b>Total crop time</b>	Winter and Spring 17 – 19 Summer 16 – 18
<b>'72' plug crop time</b>	7 – 8
<b>'128' plug crop time</b>	5 – 6
<b>Transplant to finish crop time from a '288' plug</b>	
<b>4" crop, '72' plug</b>	Winter and Spring 11 – 12; Summer 9 – 10
<b>5" crop, '72' plug</b>	Winter and Spring 11 – 12; Summer 9 – 10
<b>6" crop, '72' plug</b>	Winter and Spring 12 – 13; Summer 10 – 11
<b>10" basket crop</b>	Winter and Spring 12 – 14, Summer 10 – 12

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Blue Wonder™

### HELIOTROPIUM ARBORESCENS

**Minimum Germination Rate:** 65%

**Seed Product Form:** Raw

#### FLOWERING

**Flowering Mechanism:** Facultative long-day – long days enhance flowering.

**Flowering Type:** Facultative long-day – high irradiance will enhance flowering.

**Specific Flowering Mechanism:** Heliotrope is a light accumulator; supplemental lighting and daylength extension will hasten flower initiation.

#### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 10): From the time a seed is sown until radicle emergence takes place, usually with the root penetrating the media and some cotyledon development. Humidity in the air is 95 – 98% (humidification); media moisture 4+ – 5. Expect radicle emergence in 4 – 8 days.

**Cover:** Seeds may be covered with a light layer of coarse vermiculite or growing medium to maintain optimum moisture levels and so roots will penetrate growing media.

**Media:** Avoid media compaction to allow for root penetration.

- pH: 5.5 – 5.8

- EC: <.5 – 0.75

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

**Moisture:** Moist (4), for 7 – 10 days or until radicle emergence (approximately day 4 – 8). Then start decreasing the moisture level from moist (4) to a medium (3).

**Humidity:** 100% from day 4 – 8 or until radicle emerges then reduce to 40% – 70%.

**Temperature:** 70° – 72°F (21° – 22°C) for 7 – 10 days.

**Fertilizers:** Maintain EC of 0.5 – 0.75.

**Germination 2** (approximately day 11 – 18): From the time cotyledon is observed until it is fully expanded and the roots have expanded throughout the media. Dehumidify from 98% to 50% moisture in the air. Media moisture level should be maintained at medium (2) – moist (3). This wet-dry cycle should take place within 12 – 24 hours for most plants. Heliotrope has a fine root hair system that can easily be damaged by excessive moisture or heavy media.

**Media:** • pH: 5.5 – 5.8

- EC: 0.5 – 0.75

**Light:** 500 – 1,000 foot candles light levels above 1,000 may stress plants.

**Moisture:** Dry back media to wet (4) and alternation to moist (3) within 18 hours at radicle emergence (approximately day 8).

**Dehumidify:** Lower relative humidity to 40% (approximately day 8). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 68° – 70°F (20° – 21°C).

**Fertilizers:** 14-4-14 or 17-5-17 at 60 – 100 ppm nitrogen as needed for an EC in the soil of 1 – 1.25.

**Fungicides:** Preventative fungicide may be applied for Pythium and Rhizoctonia between day 11 and 18.

**Plug Bulking/Flower Initiation** (approximately day 19 – 26): The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media. Induction and initiation may occur. If buds are present, they should be few in number and small in size.

**Media:** • pH: 5.5 – 5.8

- EC: 0.5 – 0.75

**Light:** 500 – 1,000 foot candles.

**Temperature:** Gradually lower to 64° – 68°F (18° – 20°C)

**Moisture:** Alternate between moisture level wet (4) to moist (3). Allow the soil to approach moist (3), before re-saturating to wet (4). If media is allowed to dry back further than 2.5, root damage may occur resulting in leaf burning.

**Fertilizers:** 14-4-14 or 17-5-17 at 50 – 75 ppm nitrogen, as needed for an EC in the soil of 0.50 – 0.75.

**Growth Regulators:** If needed, spray Cycocel at 500 – 1,000 ppm. Height can

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

also be controlled by withholding phosphorus and ammonium nitrate.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia and Pythium.

**Initiated Bulking:** Seedlings develop from juvenile to mature, usually determined by the number of leaves present (cultivar specific). Seedlings are receptive to initiation and flower bud development.

**Light:** Provide 1,500 – 2,000 foot candles.

**Temperature:** 64° – 68°F (18° – 20°C)

**Fertilizer:** 14-4-14 or 17-5-17 at 50 – 75 ppm nitrogen, as needed for an EC in the soil of 0.5 – 0.75.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia and Pythium.

#### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish:** Optimize plant shoot and root growth, which is usually a 1:1 ratio. Flower buds are usually present and developing.

**Media:** • pH: 5.5 – 5.8

- EC: 0.75 – 1

**Light:** Provide 4,500 – 7,000 foot candles.

**Temperature:** 66° – 72°F (18.5° – 22°C). When grown too warm, Heliotrope will get stretchy and soft.

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level moist (3) before re-saturating to wet (4). Avoid overwatering or water stress with Heliotrope as this will cause leaf damage.

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 100 – 150 ppm, as needed for an EC in the soil of 1 – 1.1. Heliotrope can be sensitive to salts.

**Growth Regulators:** Cycocel at 500 – 1,000 ppm, 2 – 3 times if needed.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia and Pythium.

**Pinching:** When plants are established in finish container they should be pinched to the fifth or sixth leaves to produce a well branched plant with multiple flower heads.

#### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Fertilizer:** Potassium nitrate drench at 100 ppm nitrogen.

**Common Diseases:** Rhizoctonia, Pythium and Botrytis. Monitor moisture and humidity levels and use preventative fungicide drenches.

**Common Pests:** Aphids, Thrips, White fly and Spider Mites. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Full sun to partial shade <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 7 – 8

	Garden Height	Garden Width
<b>Blue Wonder</b>	12 – 15" (30 – 37.5 cm)	12 – 15" (30 – 37.5 cm)

#### HELIOTROPE SCHEDULING IN WEEKS:

	Blue Wonder
<b>Total crop time</b>	12 – 14
<b>'128' plug crop time</b>	7 – 8
<b>'200' plug crop time</b>	6 – 7
<b>'288' plug crop time</b>	4 – 5
<b>Transplant to finish crop time from a '288' plug</b>	
<b>4" crop</b>	7 – 9, depending on number of plugs transplanted
<b>6" crop</b>	9 – 10, depending on number of plugs transplanted

The shortest crops times may be achieved when following recommended optimal culture. Deviation in environmental conditions will result in longer crop times.



## Accent™, Shimmer®, Blitz 3000™, Mosaic™, Victorian™, Jambalaya®, Xtreme™

### IMPATIENS WALLERANA

**Minimum Germination Rate:** Accent, Jambalaya, Shimmer and Xtreme 95%; Blitz 3000, Mosaic 90%; Victorian 85%

**Seed Product Form:** Raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 12 – 14; 2 – 4 leaves present.

**Flowering Type:** Day-neutral plant – will flower regardless of daylength.

**Specific Flowering Mechanism:** Irradiance has no effect. Drought stress will induce early flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 5 days.

**Cover:** Seeds may be covered with a light layer of medium vermiculite to maintain moisture levels.

**Media:** pH: 6.2 – 6.5 Low pH (<5.5) may promote shoot tip abortion and allow sodium to become toxic. EC: 0.5 – 0.75

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Moisture:** Saturated (5) for days 1 – 2 or until radicle emergence. On days 3 – 7 reduce moisture to wet (4). On days 4 – 10 reduce moisture further to moist (3). After day 11, reduce again to medium (2) until cotyledon expansion. Do not allow seedlings to go into nighttime hours with wet foliage, as this may encourage tip abortion.

**Humidity:** 100% until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 72° – 75°F (22° – 24°C). Temperatures exceeding 77°F (25°C) may induce thermodormancy, which inhibits germination of Impatiens. Temperature below 71°F (21°C) will decrease the speed and uniformity of germination. Temperatures below 65°F (18°C) may cause tip abortion and leaf malformation.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** pH: 6.2 – 6.5. EC: 0.75: The total nutrients from the water and fertilizer should not exceed 1 EC to avoid leaf malformations. If media EC is >1.25, shoot tip abortion may occur.

**Light:** Provide 2,500 foot candles (25,000 lux). Supplemental lighting at 350 – 450 foot candles (3,500 – 4,500 lux) for two weeks will help to produce vigorous, strong-stemmed seedlings in regions where light levels are low. Lighting for more than two weeks during early plug stages can result in bleaching or yellowing of leaves (photo-oxidation).

**Temperature:** 66° – 68°F (18° – 20°C) until first set of true leaves. Reduce to 62° – 65°F (16° – 18°C) to tone and hold.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 50% and higher.

**Fertilizers:** Fertilize from day 2 through day 9 at 25 – 50 ppm nitrogen with a calcium-based fertilizer (14-0-14). Then continue feed at 75 – 100 ppm nitrogen every 2 – 4 waterings with a fertilizer containing both potassium and calcium nitrate. Minimal use of fertilizer will keep seedlings compact and promote flowering. Avoid phosphorus, which may stretch Impatiens seedlings. Injection of phosphoric acid to water lines may also affect plug quality.

**Growth Regulators:** Impatiens is responsive to B-Nine (daminozide), Bonzi (paclobutrazol) or Sumagic (uniconazole). However, careful monitoring of water, light and fertilizer applications can keep growth

in check. Downward cupping or twisting of immature leaves may be caused by over use of PGRs. Xtreme has a different PGR regime than other impatiens. On Xtreme, it is recommended to use PGRs in the plug stages and control growth later through water and fertilizer management in the finishing stages. Under high temperature and humidity conditions, PGRs may help tone the crop.

### GROWING ON

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** pH: 6.2 – 6.5. EC: 0.75 – 1

**Light:** Provide a light shade.

**Temperature:** 60° – 65°F (16° – 19°C) nights; 70° – 75°F (21° – 24°C) days.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** 75 – 100 ppm nitrogen every 2 – 3 waterings with a calcium-based fertilizer (13-2-13 or 14-4-14). Minimal fertilizer will keep plants compact and promote flowering. Tall, lush, dark-green plants with flowers beneath the foliage, or late flowering indicates too much fertilizer.

**Growth Regulators:** Impatiens is responsive to B-Nine (daminozide), Bonzi (paclobutrazol) or Sumagic (uniconazole). However, careful monitoring of water, light and fertilizer applications can keep growth in check.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to shipping

**Growth Regulators:** Spray application of B-Nine (daminozide) at 2,500 – 3,500 ppm

**Fertilizer:** Potassium nitrate at 150 ppm.

**Common Diseases:** Pythium Root Rot, Botrytis Blight, Tomato Spotted Wilt Virus, Impatiens Necrotic Virus, Alternaria Leaf Spot, Pseudomonas and Rhizoctonia.

**Common Pests:** Fungus Gnats, Thrips, Aphids and Spider Mites

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, containers, hanging baskets, mass plantings	<b>Light:</b> Partial shade to filtered sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 9 – 1

	Garden Height	Garden Width
<b>Xtreme</b>	8 – 10" (20 – 25 cm)	8 – 10" (20 – 25 cm)
<b>Accent, Victorian</b>	10 – 12" (25 – 30 cm)	10 – 12" (25 – 30 cm)
<b>Mosaic</b>	12 – 14" (30 – 35 cm)	12 – 14" (30 – 35 cm)
<b>Shimmer</b>	10 – 12" (25 – 30 cm)	10 – 12" (25 – 30 cm)
<b>Blitz 3000</b>	12 – 14" (30 – 35 cm)	12 – 14" (30 – 35 cm)
<b>Jambalaya</b>	8 – 10" (20 – 25 cm)	8 – 10" (20 – 25 cm)

### IMPATIENS SCHEDULING IN WEEKS

	Accent	Shimmer	Blitz 3000	Mosaic	Victorian	Jambalaya	Xtreme
<b>Total crop time</b>	10 – 11	10 – 11	11 – 12	10 – 11	10 – 11	10 – 11	9 – 10
<b>'288' crop time</b>	4 – 5	4 – 5	4 – 5	4 – 5	4 – 5	4 – 5	4 – 5
<b>Transplant to finish crop time</b>							
<b>Packs</b>	5 – 6	5 – 6	6 – 7	5 – 6	5 – 6	5 – 6	5 – 6
<b>4" crop</b>	6 – 7	6 – 7	7 – 8	6 – 7	6 – 7	6 – 7	6 – 7
<b>6" crop</b>	7 – 8	7 – 8	8 – 9	7 – 8	7 – 8	7 – 8	7 – 8
<b>10" hanging basket</b>	9 – 10	9 – 10	10 – 11	9 – 10	10 – 11	9 – 10	9 – 10

Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.



## Starshine™

### LAURENTIA AXILLARIS F1

**Minimum Germination Rate:** 80%

**Seed Product Form:** Raw, MultiPellets

### FLOWERING

**Time frame when plants are receptive to flower initiation:** 6 – 10 leaves are present

**Flowering Type:** Facultative long-day plant – long days enhance flowering.

**Flowering Mechanism:** Daylength greater than 13 hours. Irradiance will hasten and enhance flowering and branching.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination** (approximately day 1 – 14): From the time a seed is sown until radicle emergence takes place; usually with the root penetrating the media and some cotyledon development. Expect radicle emergence in 10 – 14 days.

**Cover:** No covering is required over the seed.

**Media:** Avoid media compaction to allow for root penetration; pH: 5.5 – 6. EC: <5 – 1

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Moisture:** Saturated (5), from day 1 – 14 or until radicle emergence (approximately day 10).

**Humidity:** 100% from day 1 – 14

**Temperature:** 65° – 68°F (18° – 20°C) until day 14.

**Fertilizers:** Maintain EC of 0.5 – 1.

**Plug Bulking** (approximately day 14 – 28): From the time cotyledon is observed until it is fully expanded. The roots have expanded throughout the media. Dehumidify from 100% to 50 % moisture in the air.

**Media:** pH: 5.5 – 5.8. EC: 1 – 1.25

**Light:** 2,000 – 3,000 foot candles (20,000 – 30,000 lux); 6 – 10 mols of light. Begin long days (greater than 13 hours of light) on day 28 – 35.

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4) (approximately day 8 – 15).

**Dehumidify:** Lower relative humidity to 50% (approximately day 14). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 64° – 68°F (18° – 20°C).

**Fertilizers:** 14-4-14 or 17-5-17 at 60 – 100 ppm nitrogen as needed for an EC in the soil of 1 – 1.25.

**Plug Bulking/Flower Initiation** (approximately day 28 – 35): The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media. Induction and initiation may occur; if buds are present, they should be few in number and small in size.

**Media:** pH: 5.5 – 5.8. EC: 1.25 – 1.75

**Light:** 3,500 – 5,500 foot candles (35,000 – 55,000 lux); 12 – 20 mols of light.

**Temperature:** 64° – 68°F (18° – 20°C)

**Moisture:** Alternate between moisture level wet (4) to medium (2). Allow the soil to approach medium (2), before re-saturating to wet (4). If media is allowed to dry back further than (2), root damage may occur.

**Fertilizers:** 14-4-14 or 17-5-17 at 75 – 125 ppm nitrogen, as needed for an EC in the soil of 1.25 – 1.75.

**Growth Regulators:** If needed, spray B-Nine (daminozide) at 1,500 – 2,500 ppm.

**Fungicides:** Preventative fungicide may be applied for Botrytis, Rhizoctonia, Pythium.

**Initiated Bulking** (approximately day 35 – 49): Seedlings develop from juvenile to mature (cultivar specific). Seedlings are receptive to initiation and flower bud development.

**Light:** Provide 3,500 – 5,500 foot candles (35,000 – 55,000 lux) or 12 – 20 mols of light.

**Temperature:** 64° – 68°F (18° – 20°C)

**Fertilizer:** 14-4-14 or 17-5-17 at 75 – 150 ppm nitrogen, as needed for an EC in the soil of 1.25 – 1.75.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia, Pythium, and Phytophthora.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant Ready:** 6 – 7 weeks from a '288' plug tray

**Transplant to Finish** (approximately day 42 – 78): Flower buds are usually present and developing.

**Media:** pH: 5.5 – 5.8. EC: 1.25 – 1.50

**Light:** Continue long days (greater than 13 hours) until flower buds are visible. Supplemental lighting under low light conditions at 350 – 450 foot candles (3,500 – 4,500 lux) will enhance shoot and root growth.

**Temperature:** 62° – 64°F (17° – 18°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to wet (4).

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 100 – 175 ppm, as needed for an EC in the soil of 1.25 – 1.5.

**Growth Regulators:** B-Nine (daminozide) spray at 2,500 ppm; A-Rest (ancymidol) spray at 2 – 4 ppm; Bonzi (paclobutrazol) drench at 1 – 2 ppm.

**Fungicides:** Preventative fungicide may be applied for Botrytis, Rhizoctonia, Pythium, and Phytophthora.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 3,000 ppm.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Botrytis, Rhizoctonia, Pythium. Monitor moisture and humidity levels and use preventative fungicide drenches.

**Common Pests:** Aphids, Fungus Gnats, Shore Flies and Thrips. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers and hanging baskets	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
Starshine	8 – 12" (20 – 30 cm)	8 – 12" (20 – 30 cm)

### LAURENTIA SCHEDULING IN WEEKS

	Starshine
<b>Total crop time</b>	17 – 20
<b>'128' plug crop time</b>	8 – 10
<b>'200' plug crop time</b>	7 – 8
<b>'288' plug crop time</b>	7 – 8
<b>Transplant to finish crop time</b>	
<b>4" crop</b>	10 – 11
<b>10" basket crop</b>	11 – 14, depending on number of plugs transplanted

The shortest crops times may be achieved when following recommended optimal culture. Deviation in environmental conditions will result in longer crop times.

Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.



# Antigua™, Inca II™, Lunacy™, Moonsong™, Moonstruck®, Perfection™

## TAGETES ERECTA

**Minimum Germination Rate:** 85%

**Seed Product Form:** Detailed, coated

## FLOWERING

**Time frame when plants are receptive to flower initiation:** Perfection is receptive from day of sow.

**Flowering Type:** Lunacy, Moonstruck, Perfection are obligate short-day plants. Short days enhance flowering. Antigua and Inca II are not as sensitive to daylength.

**Flowering Mechanism:** Short day treatments must begin the moment of sowing.

## PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 5 days.

**Cover:** Seeds may be covered with a thin layer of medium vermiculite to maintain moisture levels.

**Media:** • pH: 6.2 – 6.5. pH levels <6 may induce iron, manganese or sodium toxicity in Marigolds. Symptoms are exhibited on the lower leaves. Marigolds can be used as an indicator plant for low pH.

• EC: <0.75

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination dramatically compared to seed germinated in the dark.

**Moisture:** Saturated (5) for days 1 – 3 or until radicle emergence. On days 4 – 7 reduce moisture to moist (3). Once actively growing, begin alternating between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 72° – 75°F (22° – 24°C)

**Average Daily Temperature (ADT):** 67°F (19°C)

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell. Avoid premature flowering in the plug stages. Plants will not size up properly after transplanted if budded in the plug tray.

**Media:** • pH: 6.2 – 6.5

• EC: 0.5 – 1

**Light:** Maintain light levels below 2,500 foot candles (25,000 lux). Higher light levels may promote premature flowering in the plug. Short days will ensure blooms on a short compact plant.

**Temperature:** 68° – 70°F (20° – 21°C). Gradually reduce to 62° – 65°F (17° – 18°C) as seedlings mature.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). Avoid drought stress in plug stages to prevent premature flowering in the plug. Repeated drying down of plug may eventually promote bud abortion. However, saturated media will encourage the development of a weak root system.

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration under cool, low light conditions.

**Fertilizers:** Feed 1 – 2 times per week at 100 – 150 ppm nitrogen with a calcium-based fertilizer (14-2-14). Boron levels in media should be at least 0.5 ppm.

**Flower Initiation:** Optimum conditions to make plant receptive to flower initiation.

**Light:** Perfection is daylength sensitive, but can be tricked into blooming on short compact plants by giving them short days (9-hour days) for 2 weeks beginning at the time of initial sowing. Short days are recommended on crops sown after Feb. 15 in southern regions and March 15 in northern regions. Antigua and Inca II are not as sensitive to daylength and need not be induced in the plug stages.

## GROWING ON

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 6.2 – 6.5 African Marigolds can be used as an indicator plant for low pH conditions. Typical symptoms of low pH (<6) include yellowing of lower leaves, or browning/burning of leaf edges.

• EC: 1

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 55° – 65°F (13° – 18°C) nights, 65° – 70°F (18° – 23°C) days. Heat stress will encourage flower heads to be reduced in size. Antigua Primrose tends to be cool-temperature sensitive. New growth will appear "bleached" when temperatures are too cool in early spring. Plants will "green up" once night temperatures are increased.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Alternate between a calcium-based fertilizer (15-0-15) and an ammonium-based fertilizer (20-10-20) at 150 – 200 ppm nitrogen. Excessive ammonium applications will encourage vegetative growth.

**Growth Regulators:** If needed, 1 – 2 applications of B-Nine (daminozide) at 5,000 ppm will control growth. Also responds to A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniclazonol) or B-Nine/Cycocel (chlormequat chloride) tank mix. Antigua is a dwarf variety and may not need any PGRs.

**Common Diseases:** Alternaria Leaf Spot, Botrytis Blight, Pythium Root Rot

**Common Pests:** Spider mite, Thrips, Leafminer, Aphids, Whitefly

PRODUCT USE	GARDEN SPECIFICATIONS
Packs and larger pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Antigua</b>	10 – 12" (25 – 30 cm)	10 – 12" (25 – 30 cm)
<b>Inca II</b>	12 – 14" (30 – 35 cm)	12 – 14" (30 – 35 cm)
<b>Perfection</b>	14 – 16" (35 – 40 cm)	12 – 14" (30 – 35 cm)
<b>Lunacy</b>	10 – 12" (25 – 30 cm)	8 – 12" (20 – 30 cm)
<b>Moonsong</b>	12 – 15" (30 – 38 cm)	11 – 14" (29 – 35 cm)
<b>Moonstruck</b>	12 – 14" (30 – 35 cm)	12 – 14" (30 – 35 cm)

## MARIGOLD SCHEDULING IN WEEKS

	Antigua	Inca II	Lunacy	Moonsong	Moonstruck	Perfection
<b>Total crop time</b>	10 – 12	12 – 13	12 – 13	10 – 12	12 – 13	13 – 14
<b>'288' plug crop time</b>	4 – 5	4 – 5	4 – 5	4	4 – 5	4 – 5
<b>Transplant to finish crop time</b>						
<b>Packs</b>	6 – 7	7 – 8	7 – 8	6 – 7	7 – 8	9
<b>4" crop</b>	7 – 8	8 – 9	8 – 9	6 – 8	8 – 9	9 – 10

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Medallion™

### MELAMPODIUM PALUDOSUM

**Minimum Germination Rate:** 75%

**Seed Product Form:** Raw

### FLOWERING

**Flowering Mechanism:** Day-neutral plant – will flower regardless of daylength.

**Flowering Type:** Day neutral – high irradiance will enhance flowering.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 –10): From the time a seed is sown until radicle emergence takes place; usually with the root penetrating the media and some cotyledon development. Humidity in the air is 95 – 98% (humidification). Expect radicle emergence in 6 – 8 days.

**Cover:** Seeds may be covered lightly with coarse vermiculite to maintain optimum moisture levels during germination.

**Media:** • pH: 5.8 – 6.2

• EC: 0.5 – 0.75

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

**Moisture:** Saturated (5), from day 1 – 8 or until radicle emergence (approximately day 8). If you are unable to dehumidify on day 8, decrease the starting moisture level from saturated (5) to a wet (4+).

**Humidity:** 100% from day 1 – 8 or until seed coats are shed.

**Temperature:** 65°F (18°C) until day 10.

**Fertilizers:** Maintain EC of 0.5 – 0.75.

**Germination 2** (approximately day 11 – 18): From the time cotyledon is observed until it is fully expanded. The roots have expanded throughout the media.

Dehumidify from 98% to 50% in the air. Media moisture during the wet cycle is usually 4 and 3 during the dry cycle; this wet-dry cycle should take place within 12 – 24 hours for most plants. Melampodium has a fairly high water demand. Don't let plants dry out too often or too severely, or leaf edges can burn.

**Media:** pH: 5.8 – 6.2. EC: 0.75 – 1

**Light:** 2,000 – 3,000 foot candles (20,000 – 30,000 lux); 6 – 10 mols of light.

**Moisture:** Dry back media to wet (4) and alternation to moist (3) within 18 hours at radicle emergence (approximately day 8).

**Dehumidify:** Lower relative humidity to 40% (approximately day 8). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 60°F (16°C).

**Fertilizers:** 14-4-14 or 17-5-17 at 60 – 100 ppm nitrogen as needed for an EC in the soil of 0.75 – 1.

**Fungicides:** Preventative fungicide may be applied for Thielaviopsis and Rhizoctonia between day 7 and 10.

**Plug Bulking/Flower Initiation** (approximately day 19 – 28): The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media.

**Media:** pH: 5.8 – 6.2, EC: 1 – 1.50

**Light:** 3500 – 5500 foot candles (35,000 – 55,000 lux); 12 – 20 mols of light.

**Temperature:** 60°F (16°C)

**Moisture:** Alternate between moisture level wet (4) to moist (3). Allow the soil to approach moist (3), before re-saturating to wet (4). If media is allowed to dry back further than (3), root damage may occur resulting in leaf edge burn.

**Fertilizers:** 14-4-14 or 17-5-17 at 75 – 125 ppm nitrogen, as needed for an EC in the soil of 1 – 1.5.

**Growth Regulators:** If needed, spray B-Nine (daminozide) at 1,500 – 2,500 ppm rates higher than 2,500 ppm may cause distortion of the foliage.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia, Pythium, and Phytophthora.

**Initiated Bulking** (approximately day 29 – 35): Seedlings develop from juvenile

to mature, usually determined by the number of leave present (cultivar specific). Seedlings are receptive to initiation and flower bud development.

**Light:** Provide 4,750 – 7,500 foot candles (47,500 – 75,000 lux) or 17 – 28 mols of light.

**Temperature:** 60°F (16°C)

**Fertilizer:** 14-4-14 or 17-5-17 at 75 – 150 ppm nitrogen, as needed for an EC in the soil of 1.25 – 1.75.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia, Pythium, and Phytophthora.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish** (approximately day 36 -70): Optimize plant shoot and root growth; usually 1:1 ratio. Flower buds are usually present and developing.

**Media:** pH: 5.8 – 6.2, EC: 1.25 – 1.75

**Light:** Provide 5,000 – 7,500 foot candles (50,000 – 75,000) or 18 – 28 mols.

**Temperature:** 55° – 59°F (12° – 15.6°C)

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to wet (4).

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 100 – 175 ppm, as needed for an EC in the soil of 1.7 – 2.

**Growth Regulators:** B-Nine (daminozide) at 1,500 – 2,500 ppm.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia, Pythium, and Phytophthora.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 1,500 – 2,500 ppm.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Pythium, Rhizoctonia and Phytophthora. Monitor moisture and humidity levels and use preventative fungicide drenches.

**Common Pests:** Aphids, White Flies and Thrips. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> NA <b>AHS Heat Zone:</b> NA

	Garden Height	Garden Width
<b>Medallion</b>	20 – 25" (50 – 62 cm)	20 – 25" (50 – 62 cm)

### MELAMPODIUM SCHEDULING IN WEEKS

	Medallion
<b>Total crop time</b>	8 – 10
<b>'128' plug crop time</b>	5 – 6
<b>'200' plug crop time</b>	4 – 5
<b>'288' plug crop time</b>	3 – 4
<b>Transplant to finish crop time</b>	
<b>6" crop</b>	10 – 11, depending on number of plugs transplanted
<b>8" crop</b>	11 – 12, depending on number of plugs transplanted

The shortest crops times may be achieved when following recommended optimal culture. Deviation in environmental conditions will result in longer crop times.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Saratoga™

### NICOTIANA X ALATA

**Minimum Germination Rate:** 85%

**Seed Product Form:** Pelleted, raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 26 – 30; 4 – 6 leaves present.

**Flowering Type:** Day-neutral plant – will flower regardless of daylength.

**Specific Flowering Mechanism:** Nicotiana is an irradiance plant. High light triggers flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 5 days.

**Cover:** No covering over the seed is required.

**Media:** • pH: 5.5 – 5.8  
• EC: 0.75 – 1

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Temperature:** 70° – 75°F (21° – 24°C) days 1 – 5 or until radicle emergence. Reduce to 65° – 68°F (18° – 20°C) until cotyledon expansion.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Saturated (5) for days 1 – 5 or until radicle emergence. On days 6 – 10 reduce moisture to moist (3). Beginning day 11 begin alternating between moisture levels moist (3) and medium (2) until cotyledon expansion. Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 100% until radicle emergence then reduce to 40%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8  
• EC: 1.5 – 2

**Light:** Provide 3,500 – 4,500 foot candles (15 – 20 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 65° – 68°F (18° – 20°C)

**Moisture:** Alternate between moisture levels wet (4) and dry (1) Allow media to approach level (1) before re-saturating to level (4). Do not let seedlings wilt.

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Nicotiana is a moderate to heavy feeder. Feed at 100 – 150 ppm nitrogen. Under high light conditions, apply an ammonium-based feed (17-5-17). Under low light conditions, apply a calcium-based feed (14-4-14). Under high light and long or extended days, an ammonium-based feed (20-10-20) is preferred.

**Growth Regulators:** Established plug trays respond to B-Nine (daminozide) Bonzi (paclobutrazol), Sumagic (uniconazol) or Cycocel (chlormequat chloride).

### GROWING ON

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.8 – 6.2  
• EC: 1 – 1.5

**Light:** Under low light conditions, supplemental lighting at 300 – 400 foot candles (3,000 – 4,000 lux) for an 18-hour day will induce early flowering.

**Temperature:** 65° – 68°F (18° – 20°C). Warmer temperatures will speed up flowering.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between wet (4) and dry (1.5) Allow media to approach level (1.5) before re-saturating to level (4). Nicotiana prefers to be grown on the dry side without wilting. Cabbage-like leaves are indicative of overwatering.

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Nicotiana is a moderate to heavy feeder. Feed at 100 – 150 ppm nitrogen. Under high light conditions, apply an ammonium-based feed (17-5-17). Under low light conditions, apply a calcium-based feed (14-4-14). Under high light and long or extended days, an ammonium-based feed (20-10-20) is preferred. Additional potash applications can be applied until first flower color appears.

**Growth Regulators:** Established transplants can be treated initially with B-Nine (daminozide) at 5,000 ppm. Subsequent applications can be made every 3 – 4 weeks at 2,500 ppm until buds are visible. Also responds to A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniconazol) or B-Nine/Cycocel (chlormequat chloride) tank mix or negative DIF treatments.

**Common Diseases:** Downy Mildew

**Common Pests:** Aphids, Whitefly, Thrips, Cutworms

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings	<b>Light:</b> Partial shade to full sun <b>USDA Hardiness Zone:</b> 9 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Saratoga</b>	10 – 12" (25 – 30 cm)	10 – 12" (25 – 30 cm)

### NICOTIANA SCHEDULING IN WEEKS

	Saratoga
<b>Total crop time</b>	9 – 11
<b>'288' plug crop time</b>	4 – 5
<b>Transplant to finish crop time</b>	
<b>Packs</b>	5 – 6
<b>4" crop</b>	6 – 7
<b>6" crop</b>	7 – 8

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



# Ornamental Pepper



## Explosive™

*CAPSICUM ANNUUM*

**Minimum Germination Rate:** 85%

**Seed Product Form:** Raw

### FLOWERING

**Flowering Mechanism:** Maturity and irradiance, high light and long days will shorten time to flower.

**Flowering Type:** Day-neutral plant — will flower regardless of daylength.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 7): From the time a seed is sown until radicle emergence takes place; usually with the root penetrating the media and some cotyledon development. Humidity in the air is 95 – 98% (humidification); media moisture 4+. Expect radicle emergence in 10 – 20 days.

**Cover:** Cover seeds with a thin layer of coarse vermiculite.

**Media:** Avoid media compaction to allow for root penetration. pH: 5.5 – 5.8. EC: 0.5 – 1.

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

**Moisture:** Wet (4+), from day 1 – 7 or until radicle emergence (approximately day 10). It is important not to avoid over watering. Dehumidify on day 10 or when the radicle has emerged.

**Humidity:** 95 – 98% from day 1 – 10 or until seed coats are shed.

**Temperature:** 72° – 76°F (24° – 24°C) until day 10.

**Fertilizers:** Maintain EC of 0.5 – 1.

**Germination 2** (approximately day 8 – 14): From the time cotyledon is observed until it is fully expanded. The roots have expanded throughout the media.

Dehumidify from 98% to 50 % in the air. Media moisture during the wet cycle is usually 4+ – 3, and 2 – 3 during the dry cycle; this wet-dry cycle should take place within 12 – 24 hours for most plants.

**Media:** pH: 5.5 – 5.8. EC: 1 – 1.25

**Light:** 2,000 – 3,000 foot candles (20,000 – 30,000 lux); 6 – 10 mols of light.

**Moisture:** Dry back media to moist (3) and alternation to medium (2) within 18 hours at radicle emergence (approximately day 10).

**Dehumidify:** Lower relative humidity to 40% (approximately day 10). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 68° – 72°F (20° – 22°C).

**Fertilizers:** 14-4-14 or 17-5-17 at 60 – 75 ppm nitrogen as needed for an EC in the soil of 1 – 1.25.

**Fungicides:** Preventative fungicide may be applied for Pythium and Rhizoctonia between day 10 and 14.

**Plug Bulking/Flower Initiation** (approximately day 15 – 21): The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media. Induction and initiation may occur; if buds are present, they should be few in number and small in size.

**Media:** pH: 5.5 – 5.8. EC: 1.25 – 1.5

**Light:** 3,500 – 5,500 foot candles (35,000 – 55,000 lux); 12 – 20 mols of light.

**Temperature:** 68° – 72°F (20° – 22°C)

**Moisture:** Alternate between moisture level wet (4) to medium (2). Allow the soil to approach medium (2), before re-saturating to wet (4). If media is allowed to dry back further than (2), root damage may occur resulting in a lack of iron uptake. Watering or fertilizing late in the day may increase the susceptibility to airborne disease.

**Fertilizers:** High fertilizer levels will have a negative affect resulting in vegetative growth with long internodes. Use a 14-4-14 or 17-5-17 fertilizer at 75 – 100 ppm nitrogen, as needed for an EC in the soil of 1 – 1.25.

**Growth Regulators:** If needed, spray B-Nine (daminozide) at 1,500 – 2,500 ppm.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia, Pythium, and Phytophthora.

**Initiated Bulking** (approximately day 22 – 28): Seedlings develop from juvenile to mature, usually determined by the number of leaves present (cultivar specific). Seedlings are receptive to initiation and flower bud development.

**Light:** Provide 4,500 – 6,000 foot candles (45,000 – 60,000 lux) or 16 – 22 mols of light.

**Temperature:** 68° – 72°F (20° – 22°C); with a 5 – 8°F (2° – 4°C) negative DIF or drop in the morning from 2 hours before sunrise until approximately 9 a.m.

**Fertilizer:** 14-4-14 or 17-5-17 at 75 – 100 ppm nitrogen, as needed for an EC in the soil of 1 – 1.25.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia, Pythium, and Phytophthora.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish** (approximately day 29 – 98): Optimize plant shoot and root growth, which is usually a 1:1 ratio. Flower buds are usually present and developing.

**Media:** pH: 5.5 – 5.8. EC: 1.25 – 1.5

**Light:** Provide 5,000 – 7,500 foot candles (50,000 – 75,000) or 18 – 28 mols.

**Temperature:** Days 72° – 75°F (22° – 23°C); Night 62° – 65°F (17° – 19°C); ADT 70°F (21°C); using a 5° – 10°F (2° – 5°C) negative DIFF or drop in the morning from 2 hours before sunrise until approximately 9 a.m.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to wet (4). Avoid overwatering; a slight wilt between watering is acceptable.

**Humidity:** 40%

**Fertilizers:** Fertilize weekly with a 14-4-14 or 17-5-17 at 100 – 150 ppm, as needed for an EC in the soil of 1.25 – 1.5.

**Growth Regulators:** B-Nine (daminozide) at 2,500 ppm. Avoid late applications of growth regulators since it can reduce the fruit size. Plant growth is best regulated by moisture management, watering when plants are thoroughly dry.

**Fungicides:** Preventative fungicide may be applied for Rhizoctonia, Pythium, and Phytophthora.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 2,500 ppm.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Botrytis, Rhizoctonia, Phytophthora and Pythium. Monitor moisture and humidity levels and use preventative fungicide drenches.

**Common Pests:** Aphids, Fungus Gnats, Shore Flies, Spider Mites, Thrips and Whitefly. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Blast</b>	5 – 6" (12 – 15 cm)	6 – 8" (15 – 20 cm)
<b>Ember</b>	10 – 12" (25 – 30 cm)	10 – 12" (25 – 30 cm)
<b>Ignite</b>	3 – 5" (8 – 12 cm)	12 – 14" (30 – 35 cm)

### ORNAMENTAL PEPPER SCHEDULING IN WEEKS

	Explosive
<b>Total crop time</b>	17 – 20
<b>'128' plug crop time</b>	5 – 6
<b>'200' plug crop time</b>	4 – 5
<b>'288' plug crop time</b>	3 – 4
<b>Transplant to finish crop time</b>	
<b>Jumbo packs</b>	13 – 14 from a '288' plug
<b>4" crop</b>	13 – 16 from at '288' plug
<b>6" crop</b>	13 – 16 from a '288' plug and three plants per pot

Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.



## Asti™

### OSTEOSPERMUM ECKLONIS

**Minimum Germination Rate:** 85%

**Seed Product Form:** Raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 21 – 28 days; 4 – 6 leaves present.

**Flowering Type:** Day-neutral plant – will flower regardless of daylength.

**Specific Flowering Mechanism:** Maturity of plants, cool nights and high irradiance will promote more flowers per plant.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 8 – 12 days.

**Cover:** Cover seeds with a thin layer of medium sized vermiculite to maintain moisture levels.

**Media:** • pH: 5.8 – 6.2  
• EC: <1

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch compared to seed germinated in the dark.

**Temperature:** 68° – 70°F (21° – 22°) day and night from day 1 until day 8 – 12, or when cotyledons appear.

**Moisture:** Begin with a saturated (5), days 1 – 4 days. On day 5, drop to moisture level wet (4) until day 8. Afterward, begin alternating between moisture levels wet (4) to medium (2).

**Humidity:** 100% until day 9.

**Dehumidify:** On day 10, lower humidity level to 40%. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** None

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.8 – 6.2  
• EC: 1 – 1.2

**Light:** Supplemental light at 350 – 500 foot candles (3,500 – 5,000 lux) for a daily total of 3,500 foot candles (35,000 lux) will enhance root and shoot growth.

**Temperature:** 65° – 68°F (18° – 20°C) from day 13 – 21. Then 65° – 67°F (18° – 19°C) night temperature and 62° – 64°F (17° – 18°C) day temperature.

**Average Daily Temperature (ADT):** 65°F (18°C)

**Moisture:** Alternate between moisture levels wet (4) and (2) moist. Allow media to approach level (3) before re-saturating to level (4). Watch for excess algae growth. Using R/O (Reverse Osmosis) water will help reduce algae levels.

**Fertilizers:** Under high light conditions, apply an ammonium-based feed (17-5-17) at 75 – 100 ppm nitrogen. Under low light conditions, apply a calcium-based feed (14-4-14) at 75 – 100 ppm nitrogen.

**Growth Regulators:** Control growth with light, temperature, moisture and fertilizer levels.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

### GROWING ON

**Transplant Ready:** 3 – 4 weeks from a '288' plug tray; 5 weeks in a '128' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.8 – 6.2  
• EC: 1.5 – 1.75

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower development.

**Temperature:** Days 61° – 68°F (16° – 21°C); nights 52° – 61°F (11° – 16°C).

**Average Daily Temperature (ADT):** 60°F (16°C)

**Moisture:** Alternate between moisture levels wet (4), and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Under high light conditions, apply an ammonium-based feed (17-5-17) at 125 – 175 ppm nitrogen. Under low light conditions, apply a calcium-based feed (14-4-14) at 125 – 175 ppm nitrogen.

**Growth Regulators:** An application of B-Nine at low rates to plugs will help avoid hypocotyl stretch. If grown cool, PGRs should not be necessary after transplant. B-Nine (daminozide) at 2,500 – 5,000 ppm may be applied if desired. Cycocel (chlormequat chloride) at 750 – 1,000 ppm may also be applied.

**Pinch:** No pinch is necessary during spring production under cool low light conditions since this will delay flowering. For fall production under high light and high temperature a pinch can be beneficial to increase branching. In areas with high night temperature, consider finishing later in the fall.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 3,000 ppm if needed.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Pythium, Rhizoctonia, Phytophthora, Botrytis. To reduce disease pressure, provide good air circulation and keep humidity levels at 40 – 50%. Keep foliage dry going into night-time hours. Apply appropriate fungicides as needed according to label rates.

**Common Pests:** Fungus Gnats, Shore Flies, Thrips, Aphids. Scout plants on a regular basis and apply appropriate pesticides according to label rates.

PRODUCT USE	GARDEN SPECIFICATIONS
Containers, combinations, blooming potted plant	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 6 – 1

	Garden Height	Garden Width
<b>Asti</b>	17 – 20" (43 – 50 cm)	17 – 20" (43 – 50 cm)

### OSTEOSPERMUM SCHEDULING IN WEEKS

	Asti
<b>Total crop time</b>	14 – 18 weeks depending on the time of year
<b>'288' plug crop time</b>	4
<b>'128' plug crop time</b>	5
<b>Transplant to finish crop time</b>	
<b>4" crop</b>	10 – 14 (9 – 10 from a '128' size plug )
<b>6" crop</b>	12 – 15



## Colossus™, Mammoth™

VIOLA WITTROCKIANA

**Minimum Germination Rate:** 90%

**Seed Product Form:** Raw, GoldSmart™ Primed

### FLOWERING

**Flowering Mechanism:** Irradiance (primary); plants initiate on approximately day 15 with HID light for 16-18 hours OR total 15 – 20 mols (4,250 – 5,500 foot candles or 42,500 – 55,000 lux) for 2 – 4 weeks at 67°F (19.5°C). Bud/flower initiation at approximately 3 – 5 leaves, days 12 – 28. An average daily temperature of 67 – 70°F (19.5 – 21°C) will enhance flowering.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 5): Humidity in the air 100% (humidification) from the time the crop is sown until radicle emergence takes place; root initial has penetrated media; some cotyledon development. Expect radicle emergence in 2 – 5 days; 3 – 5 days for non-primed seed.

**Cover:** Cover seeds lightly with coarse vermiculite to maintain moisture levels.

**Media:** Avoid media compaction to allow for root penetration. pH: 5.5 – 5.8; higher pH levels will encourage Thielaviopsis outbreak and boron deficiency which may cause tip abortion and stunted growth. Initial pH of presow medium should be on the low side of pH range because media pH tends to increase under saturated conditions. EC: <0.5

**Light:** If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination.

**Moisture:** Saturated (5) for days 1 – 5 or until radicle emergence.

**Humidity:** 100% until radicle emergence.

**Temperature:** 65° – 68°F (18 – 20°C) until radicle emergence.

**Germination 2** (approximately day 6 – 14): Change the humidity in the air (dehumidification) to 40%. The result is better root expansion; cotyledons fully expanded; roots are expanding throughout the growing substrate.

**Media:** pH: 5.5 – 5.8. EC: 0.5 – 0.75

**Light:** 2,000 – 2,500 foot candles (20,000 – 25,000 lux); 6 – 8 mols of light.

**Moisture:** Dry back media to wet (4) and alternate to moist (3) within 18 hours at radicle emergence (approximately day 6).

**Dehumidify:** Lower relative humidity to 40% (approximately day 6). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 64° – 67°F (17.5° – 19.5°C); -2 to -3°F (-1.5 to -2°C) DIF or morning drop.

**Fertilizers:** 14-4-14 or 17-5-17 at 60 – 75 ppm nitrogen as needed for an EC in the soil of 0.5 – 0.75. Maintain a boron concentration of 0.5 ppm in the soil.

**Growth Regulators:** B-Nine spray at 2,500 ppm if stem stretch is observed

**Plug Bulking/Flower Initiation** (approximately day 15 – 21\*): Length of vegetative period – time necessary for roots to reach the edge of the plug, for shoots to fill out container, and for plants to become receptive to flower initiation. Before initiation starts, the plants should be a proper size, which includes optimum shoot development, large number of auxiliary shoots and good presentation from pot size to plant size.

\*An additional week may be necessary to ensure sufficient shoot growth when the ADT is 80F (26.5C) and irradiance is greater than 18 mols.

**Media:** pH: 5.5 – 5.8. EC: 0.75 – 1

**Light:** 3,500 – 5,000 foot candles (35,000 – 50,000 lux); 12 – 18 mols

**Temperature:** 64° – 67°F (17.5° – 19.5°C); DIF or morning drop of -3 – 5°F (-2 – -3°C) can be used.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to dry back to level (2) within 18 hours before re-saturating to level (4).

**Fertilizers:** 14-4-14 or 15-5-15 at 75 – 100 ppm nitrogen, 8 – 12 ppm phosphorus. Maintain a boron concentration of 0.5 ppm in the soil.

**Growth Regulators:** A-Rest (ancymidol) at 5 ppm. Increased concentrations may be necessary when the average daily temperature is greater than 75°F (24°C)

**Fungicide:** Apply fungicide drench for Thielaviopsis.

**Initiated Bulking** (approximately day 22 – 35): Plants are receptive to flowering.

Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.

**Light:** Provide 4,250 – 5,500 foot candles (42,500 – 55,000 lux) or 15 – 20 mols of light.

**Temperature:** 64° – 67°F (17.5° – 19.5°C); -5 to -10°F (-3 to -6°C) DIF or morning drop.

**Fertilizer:** 14-4-14 or 17-5-17 at 100 – 125 ppm, 8 – 12 ppm phosphorus. Maintain a boron concentration of 0.5 ppm in the soil.

**Growth Regulators:** B-Nine spray at 2,500 – 7,500 ppm; A-Rest 2 – 3 ppm.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish** (approximately day 36 – 82)

**Media:** pH: 5.5 – 5.8. EC: Avoid EC above 1.5

**Light:** 4,000 – 6,000 foot candles (40,000 – 60,000 lux); 14 – 22 mols

**Temperature:** 64° – 67°F (17.5° – 19.5°C); -5 to -10°F (-3 – -6°C) DIF or morning drop.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to dry back to level (2) within 18 hours before re-saturating to level (4).

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 100 – 125 ppm nitrogen, 8 – 12 ppm phosphorus. During cool weather production, ammonium-based feeds may encourage root rot problems. High nitrogen concentrations may promote stretching.

**Nutrition:** At an average daily temperature of 80°F (30°C) a calcium spray at 150 ppm per week may be necessary to prevent upward cupped leaves; a boron spray at 1 ppm per week may be necessary to prevent tip abortion.

**Growth Regulators:** Colossus is genetically more compact, requiring less growth regulators. B-nine (daminozide) at 2,500 – 5,000 ppm. Also responds to negative DIF treatments, A-Rest (ancymidol), or B-Nine/Cycocel (chlormequat chloride) tank mix.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping

**Growth Regulators:** Spray B-Nine (daminozide) at 2,500 – 3,500 ppm

**Fertilizer:** Potassium nitrate at 150 ppm nitrogen

**Temperature:** A DIF of as much as -15°F may be applied for spring production

**Common Diseases:** Alternaria Leaf Spot, Downy Mildew, Thielaviopsis Root Rot, Cercospora Leaf Spot

**Common Pests:** Aphids

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 4 <b>AHS Heat Zone:</b> 9 – 1

	Garden Height	Garden Width
<b>Colossus</b>	4 – 5" (10 – 12 cm)	6 – 8" (15 – 20 cm)
<b>Mammoth</b>	6 – 8" (15 – 20 cm)	6 – 8" (15 – 20 cm)

### PANSY SCHEDULING IN WEEKS

	Colossus	Mammoth
<b>Total crop time</b>	11 – 12 for fall market; 13 – 14 for spring market	10 – 12 for fall market; 12 – 14 for spring market
<b>'288' plug crop time</b>	4 – 5 for fall market; 5 – 7 for spring market	4 – 5 for fall market; 5 – 7 for spring market
<b>Transplant to finish crop time</b>		
<b>Pack</b>	4 – 5 for fall market; 5 – 7 for spring market	4 – 5 for fall market; 5 – 7 for spring market
<b>4" crop</b>	5 – 6 for fall market; 6 – 7 for spring market	5 – 6 for fall market; 6 – 7 for spring market

The shortest crop times may be achieved when following recommended optimal culture. Deviation in environmental conditions will result in longer crop times.



## Delta™, Karma™, Mariposa™, Sky™

### VIOLA WITTROCKIANA

**Minimum Germination Rate:** Mariposa 85%; Delta, Karma, Sky 90%

**Seed Product Form:** Raw, GoldSmart™ Primed

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 12 – 28; 3 – 5 leaves present.

**Flowering Type:** Day-neutral plant – will flower regardless of daylength.

**Specific Flowering Mechanism:** High light and long days shorten time to flower.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 2 – 4 days.

**Cover:** Cover seeds lightly with coarse vermiculite to maintain moisture levels.

**Media:** pH: 5.5 – 5.8 Higher pH levels will encourage Thielaviopsis outbreaks and boron deficiencies which may cause tip abortion and stunted growth. EC: <0.5

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination dramatically compared to seed germinated in the dark.

**Moisture:** Saturated (5) for days 1 – 4 or until radicle emergence. On days 5 – 9 reduce moisture to moist (3). Reduce further beginning day 10 to medium (2).

**Humidity:** 100% until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 65° – 68°F (18 – 20°C) until radicle emergence. Then reduce gradually to 62° – 65°F (17° – 18°C) as seedlings mature.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** pH: 5.5 – 5.8. EC: 0.5 – 1

**Light:** 2,500 – 3,500 foot candles (25,000 – 35,000 lux).

**Temperature:** 65°F (18°C) nights; 65° – 70°F (18° – 21°C) days. On established seedlings, reduce night temperatures to 59°F (15°C) to initiate early flowering.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration under cool, low light conditions.

**Fertilizers:** Feed established seedlings with a calcium-based fertilizer (14-4-14) at 50 – 150 ppm nitrogen. Use the lower rates on younger seedlings. An ammonium concentration >5 ppm nitrogen will cause seedling stretch.

**Growth Regulators:** Pansies can be treated when the first true leaves are fully developed. Apply B-Nine (daminozide) at 2,500 – 5,000 ppm. Pansy also responds to negative DIF treatments, A-Rest (ancymidol) or Bonzi (paclobutrazol).

### GROWING ON

**Transplant Ready:** 5 – 7 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** pH: 5.5 – 5.8; EC: Avoid EC above 1.5. Pansy roots are sensitive to ammonium salts.

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 68°F (20°C) days or as cool as possible during warm weather conditions. During the cool season, a night temperature of 59°F (15°C) will promote early flowering. Temperatures below 59°F (15°C) will promote a hardier plant, but will increase crop time and delay flowering.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed as needed at 100 – 150 ppm nitrogen with a calcium-based fertilizer (14-4-14). During cool weather production, ammonium-based feeds may encourage root rot problems. High nitrogen concentrations may promote stretching.

**Nutrition:** Malformed and puckered leaves indicate calcium deficiencies. To prevent this, fertilize with calcium nitrate or add calcium sulfate to the growing media before transplant. Boron deficiencies can be distinguished by tip abortion, upper leaf stunting, puckering and thickening of leaves, along with shortened internodes and/or a gnarled mass of lateral shoots. Boron deficiency is more prevalent during warm weather with frequent watering. pH levels below 6 will ensure boron is more readily available to the plant. A one-time application of Solubor will help overcome these problems. NOTE: An overdose of Bonzi (paclobutrazol) may also produce symptoms similar to boron or calcium deficiencies.

**Growth Regulators:** Apply B-nine (daminozide) at 2,500 – 5,000 ppm. Also responds to negative DIF treatments, A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniconazol) or B-Nine/Cycocel (chlormequat chloride) tank mix.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping

**Growth Regulators:** Spray B-Nine (daminozide) at 2,500 – 3,500 ppm

**Fertilizer:** Potassium nitrate at 150 ppm nitrogen

**Common Diseases:** Alternaria Leaf Spot, Downy Mildew, Thielaviopsis Root Rot, Cercospora Leaf Spot

**Common Pests:** Aphids

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 4 <b>AHS Heat Zone:</b> 9 – 1

	Garden Height	Garden Width
<b>Delta</b>	4 – 6" (10 – 15 cm)	6 – 8" (15 – 20 cm)
<b>Karma</b>	6 – 8" (15 – 20 cm)	6 – 8" (15 – 20 cm)
<b>Mariposa</b>	6 – 8" (15 – 20 cm)	6 – 8" (15 – 20 cm)
<b>Sky</b>	5 – 6" (12 – 15 cm)	6 – 8" (15 – 20 cm)

### PANSY SCHEDULING IN WEEKS

	Delta	Karma	Mariposa	Sky
<b>Total crop time</b>	10 – 12 for fall market; 11 – 13 for spring market	10 – 12 for fall market; 12 – 14 for spring market	10 – 12 for fall market; 12 – 14 for spring market	11 – 13 for fall market; 11 – 13 for spring market
<b>'288' plug crop time</b>	5 – 6	5 – 6	5 – 6	5 – 6
<b>Transplant to finish crop time</b>				
<b>Packs</b>	4 – 5	4 – 5	4 – 5	5 – 6
<b>4" crop</b>	5 – 6	5 – 6	5 – 6	6 – 7

Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.



## Pinacolada™

**PENSTEMON BARBATUS**

**Minimum Germination Rate:** 75%

**Seed Product Form:** Raw

### FLOWERING

**Specific Flowering Mechanism:** Daylength and irradiance have no effect. Maturity of plants and cool night temperatures will promote more flowers per plant. No vernalization is required. However, long days or vernalization will improve flowering uniformity.

**Flowering Type:** Day-neutral plant.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 21): From the time a seed is sown until radicle emergence takes place; usually with the root penetrating the media and some cotyledon development. Expect radicle emergence in 14 – 21 days. Recommend 2 – 3 seeds per cell.

**Cover:** A very thin layer of medium sized vermiculite may be applied to maintain moisture levels if desired, but light is required for germination.

**Media:** pH: 5.5 – 6. EC: <.75 High EC discourages rooting into the media and could decrease final count of useable seedlings.

**Light:** Light is necessary for germination. Provide a light source of 10 – 100 foot candles if utilizing a chamber.

**Moisture:** Saturated (5) for day 1 – 14 or when radicles have emerged and penetrated the soil. Then reduce moisture level to wet (4).

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 64° – 68°F (18° – 20°C).

**Germination 2** (approximately day 15 – 24): From the time cotyledon is observed until it is fully expanded. The roots have expanded throughout the media. Dehumidify from 100% to 40% in the air.

**Media:** pH: 5.5 – 6. EC: 1 – 1.5

**Light:** Supplemental lighting at 350 – 450 foot candles (3,500 – 4,500 lux) during a 10 – 12-hour day will enhance plant growth.

**Temperature:** 60° – 64°F (16° – 18°C).

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). Do not allow seedlings to dry down.

**Humidity:** 40 – 50%

**Dehumidify:** Lower relative humidity to 40% (approximately day 15). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Alternate between calcium-based fertilizers (13-2-13 or 14-4-14) and potassium nitrate (15-5-15) at 50 – 75 ppm nitrogen. Phosphorus should not exceed 10 ppm.

**Growth Regulators:** Penstemon Pinacolada has a compact growth habit and should not require PGR applications. If needed in the plug stages, a 1,500 – 2,500 B-Nine application may be supplied as a spray.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis, Botrytis and/or Powdery Mildew.

**Plug Bulking/Flower Initiation** (approximately day 24 – 32): The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media.

**Media:** pH: 5.5 – 6. EC: 1 – 1.5

**Light:** Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 60° – 64°F (16° – 18°C).

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Do not allow plants to wilt.

**Humidity:** 40 – 70%

**Fertilizers:** Alternate between calcium-based fertilizers (13-2-13 or 14-4-14) and potassium nitrate (15-5-15) at 75 – 100 ppm nitrogen.

**Growth Regulators:** If needed, spray B-Nine at 1,500 – 2,500 ppm. B-Nine can be used to tone the plants.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis, Botrytis and/or Powdery Mildew.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

**Initiated Bulking** (approximately day 32 – 49): Seedlings develop from juvenile to mature, usually determined by the number of leaves present. Seedlings are receptive to initiation and flower bud development.

**Light:** Provide 3,500 – 4,500 foot candles (35,000 - 45,000 lux) or 12 – 16 mols of light.

**Temperature:** 60° – 64°F (16° - 18°C)

**Fertilizer:** Alternate between calcium-based fertilizers (13-2-13 or 14-4-14) and potassium nitrate (15-5-15) at 100 – 150 ppm nitrogen. Under high light conditions a 17-5-17 fertilizer can be used; leach with fresh water every third watering.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis, Botrytis and/or Powdery Mildew.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish** (approximately day 49 – 98): Optimize plant shoot and root growth; which is usually a 1:1 ratio. Flower buds are usually present and developing.

**Media:** pH: 5.5 – 6. EC: 1.2 – 1.5 High salts may result in root loss.

**Light:** Provide 3,500 – 4,500 foot candles (15 – 20 total mols or 35,000 – 45,000 lux) to enhance shoot and root growth.

**Temperature:** 65° – 70°F (18° – 21°C) days; 55° – 60°F (13° – 15°C) nights.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Excessive drying of the media moisture level will concentrate salts around the root system and may burn the root hairs.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration under cool, low light conditions.

**Humidity:** 40%

**Fertilizers:** Constant liquid feed at 150 – 200 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14). Under high light conditions a 17-5-17 fertilizer can be used. Leach with fresh water every third watering.

**Growth Regulators:** If needed, spray B-Nine at 1,500 – 3,500 ppm, or drench Bonzi at 1 – 2 ppm.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis, Botrytis and/or Powdery Mildew.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Pythium, Rhizoctonia, Thielaviopsis, Botrytis, Powdery Mildew. Monitor moisture and humidity levels and use preventative fungicide drenches.

**Common Pests:** Fungus Gnats, Shore Flies, Aphids and Thrips. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Part to full sun <b>USDA Hardiness Zone:</b> 3 <b>AHS Heat Zone:</b> 8

	Garden Height	Garden Width
<b>Pinacolada</b>	8 – 10" (20 – 30 cm)	8 – 10" (20 – 30 cm)

### PENSTEMON SCHEDULING IN WEEKS

	Pinacolada
<b>Total crop time</b>	14 – 18
<b>'128' plug crop time</b>	7 – 8
<b>'200' plug crop time</b>	6 – 7
<b>'288' plug crop time</b>	6 – 7
<b>Transplant to finish crop time</b>	
<b>4" crop</b>	7 – 8
<b>6" crop</b>	8 – 9, 3 plugs per pot
<b>8" crop</b>	Not recommended



## Starla™

### PENTAS LANCEOLATA

**Minimum Germination Rate:** 85%

**Seed Product Form:** Pelleted, raw

#### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 16 – 21; 3 – 5 leaves.

**Flowering Type:** Facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** Maturity in combination with high light and warm temperatures.

#### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 7 – 10 days.

**Cover:** No covering over the seed is required.

**Media:** • pH: 6.4 – 6.6 Watch for decreases of pH; below 6, Pentas show iron toxicity.

• EC: <1

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch compared to seed germinated in the dark.

**Temperature:** 73° – 76°F (22° – 24°C) day and night from day 1 – 9.

**Moisture:** Begin with a saturated (5), from days 1 – 10. Beginning day 11, reduce moisture level to wet (4), until day 14. Afterward, begin alternating between moisture level wet (4) and moist (3).

**Humidity:** 100% until day 10.

**Dehumidify:** On day 9, lower humidity level to 40%. Maintain air flow over trays in order to dry back media moisture and allow good oxygen penetration.

**Fertilizers:** Maintain EC at <1. Fertigation water should not be greater than an EC of 0.5. On day 9, drench a nitrate based, low-phosphorous feed (14-2-14) at 50 – 60 ppm nitrogen.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 6.4 – 6.6

• EC: 1 – 1.2

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) over a 13 – 14 hour period to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 68° – 72°F (20° – 22°C) night and day temperatures.

**Average Daily Temperature (ADT):** 70°F (21°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Watch for excess algae growth. Using R/O (Reverse Osmosis) water will help reduce algae levels.

**Fertilizers:** Under high light conditions, apply an ammonium-based feed (17-5-17) at 50 – 100 ppm nitrogen. Under low light conditions, apply a calcium-based feed (14-4-14 or 14-2-14) at 50 – 100 ppm nitrogen.

**Growth Regulators:** If needed, spray B-Nine (daminozide) at 2,500 ppm.

#### GROWING ON

**Transplant Ready:** 8 – 10 weeks from a '288' plug tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 6.4 – 6.6

• EC: 1 – 1.2

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth. Extending the daylength to 13 – 14 hours (12 – 15 total mols of light) will hasten flower development. High light intensity, 3,500 – 5,000 foot candles (35,000 – 50,000 lux) will promote compact growth.

**Temperature:** 66° – 68°F (19° – 20°C) day temperatures; 68° – 72°F (20° – 22°C) night temperatures with a 0 – 5 degree negative DIF from 5 – 7:30 a.m.

**Average Daily Temperature (ADT):** 68°F (20°C)

**Moisture:** Alternate between level (4) moist and medium (2). Allow soil to reach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Alternate with calcium and nitrate based fertilizers (17-5-17 at 60 – 75 ppm nitrogen, 14-4-14 at 60 – 75 ppm nitrogen). Watch for low calcium and magnesium levels which may result in stunted, chlorotic plants with marginal leaf burn.

**Growth Regulators:** If needed, spray either B-Nine (daminozide) at 2,500 – 5,000 ppm, Bonzi (paclobutrazol) spray at 2 – 3 ppm, or A-Rest (ancymidol) spray at 2 – 4 ppm.

#### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 3,000 ppm.

**Fertilizer:** Potassium nitrate drench at 100 ppm nitrogen.

**Common Diseases:** Pythium, Rhizoctonia, Botrytis. Avoid over-saturated conditions, drench and/or spray appropriate fungicides as needed.

**Common Pests:** Thrips, Whitefly, Aphids, Spider Mites. Scout crops on a regular basis; apply appropriate insecticides as needed.

PRODUCT USE	GARDEN SPECIFICATIONS
Beds, mass plantings, containers, mixed combinations	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
Starla	14 – 18" (35 – 45 cm)	16 – 20" (40 – 50 cm)

#### PENTAS SCHEDULING IN WEEKS

	Starla
<b>Total crop time</b>	15 – 18
<b>'288' plug crop time</b>	7 – 9 early spring, 6 – 7 late spring
<b>Transplant to finish crop time</b>	
<b>Packs</b>	8 – 9
<b>4" crop</b>	9 – 10
<b>6" crop</b>	10 – 11

Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.



## Frost™, Storm™, Bravo™, Ultra™, Hurrah™, PrimeTime™

### PETUNIA GRANDIFLORA/PETUNIA MULTIFLORA

**Minimum Germination Rate:** Storm, Ultra: 90%; Frost, Bravo, Hurrah, PrimeTime: 85%

**Seed Product Form:** Pelleted, raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 14 – 21; 3 – 4 leaves.

**Flowering Type:** Facultative long-day plant – long days required for flowering.

**Specific Flowering Mechanism:** Flowering is affected by daylength, irradiance and temperature.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion.

Expect radicle emergence in 3 – 5 days.

**Cover:** Do not cover the seeds.

**Media:** • pH: 5.5 – 5.8

• EC: 0.75 – 1

**Light:** Light is necessary for germination. Provide a light source of 10 – 100 foot candles (100 – 1,000 lux) if utilizing a chamber.

**Moisture:** Saturated (5) for days 1 – 3. On days 4 – 6 reduce moisture to wet (4). Reduce further beginning day 7 to medium (2).

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 72° – 76°F (22° – 24°C) until radicle emergence. Gradually reduce to 62° – 65°F (16° – 19°C) as cotyledons expand.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 1

**Light:** Provide 2,500 – 3,000 foot candles (2,500 – 3,000 lux). Supplemental lighting at 400 foot candles (4,000 lux) for a 14-hour day will induce early flowering.

**Temperature:** 65° – 68°F (18° – 20°C). Once seedlings are established, gradually reduce night temperatures to 59 F (15 C) to initiate early flowering.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Upon initial germination begin feeding early on with 50 ppm nitrogen. Pay attention to the addition of boron since low boron can cause tip abortion. Feed established seedlings at 100 – 150 ppm nitrogen. Under high light conditions, apply an ammonium-based feed (17-5-17). Under low light conditions, apply a calcium-based feed (14-4-14). Under high light and long or extended days, an ammonium-based feed (20-10-20) is preferred. For more shoot growth, add an additional ammonium treatment to the schedule. To prevent stretching under low light and cool temperatures, reduce ammonium and apply only calcium-based fertilizer.

**Growth Regulators:** Apply two applications of B-Nine (daminozide) at 3,500 – 5,000 ppm after the first true leaves have appeared. Petunias are also responsive to a negative DIF treatment, Bonzi (paclobutrazol) and Sumagic (uniconazole).

### GROWING ON

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8 Yellow upper leaves may indicate iron deficiencies when pH is > 6.6.

• EC: 1 – 1.5

**Light:** Petunias need long days to flower. To initiate bud under short days, extend day length to 13 hours. Under long day, low light conditions, supplemental lighting of 350 – 500 foot candles (3,500 – 5,000 lux) may be necessary.

**Temperature:** After transplant, Petunias require temperatures > 55°F (13°C) nights for the first 6 weeks to initiate flower bud development. After bud set, the night temperatures can be lowered to 50°F (10°C) to encourage basal branching and compactness. However, lower temperatures may also substantially decrease the number of flowers initiated. Downward cupping of leaves may indicate too-cool temperatures in combination with overwatering.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and dry (1) Allow media to approach level (1) before re-saturating to level (4).

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration under cool, low light conditions.

**Fertilizers:** Under high light conditions, apply an ammonium-based feed (17-5-17). Under low light conditions, apply a calcium-based feed (14-4-14). Under high light and long or extended days, an ammonium-based feed (20-10-20) is preferred. To prevent stretching under low light and cool temperatures, reduce ammonium and apply only calcium-based fertilizer.

**Growth Regulators:** Petunias are responsive to B-Nine (daminozide) at 2,500 – 5,000 ppm. Apply B-Nine before the buds are visible. Late applications will distort flower color and size. Also responds to DIF treatments, Bonzi (paclobutrazol), Sumagic (uniconazole) or B-Nine/Cycocel (chlormequat chloride) tank mix.

**Common Diseases:** Botrytis, Rhizoctonia

**Common Pests:** Thrips

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 8 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Frost, Storm, Ultra</b>	12 – 14" (30 – 35 cm)	14 – 16" (35 – 50 cm)
<b>PrimeTime</b>	10 – 12" (25 – 30 cm)	14 – 16" (35 – 50 cm)
<b>Bravo</b>	10 – 12" (25 – 30 cm)	12 – 14" (30 – 35 cm)
<b>Hurrah</b>	8 – 10" (20 – 25 cm)	12 – 14" (30 – 35 cm)

### PETUNIA SCHEDULING IN WEEKS

	Frost	Storm	Bravo	Ultra	Hurrah	PrimeTime
<b>Total crop time</b>	9 – 11	9 – 11	8 – 11	9 – 11	8 – 11	9 – 11
<b>'288' plug crop time</b>	4 – 5	4 – 5	4 – 5	4 – 5	4 – 5	4 – 5
<b>Transplant to finish crop time</b>						
<b>Packs</b>	4 – 5	4 – 5	4 – 5	4 – 5	4 – 5	4 – 5
<b>4" crop</b>	5 – 6	5 – 6	5 – 6	5 – 6	5 – 6	5 – 6

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Plush™, Ramblin'™

### PETUNIA X HYBRIDA / TRAILING

**Minimum Germination Rate:** 85%

**Seed Product Form:** Pelleted, raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 18 – 24; 3 – 6 leaves present.

**Flowering Type:** Facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** Flowering is affected by daylength, irradiance and temperature.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 5 days.

**Cover:** Seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** • pH: 5.5 – 5.8  
• EC: 0.75 – 1

**Light:** Light is necessary for germination. Provide a light source of 10 – 100 foot candles (100 – 1,000 lux) if utilizing a chamber.

**Moisture:** Saturated (5) for days 1 – 3 or until radicle emergence. On days 4 – 6 reduce moisture to wet (4). Reduce further beginning day 7 to medium (2).

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 72° – 76°F (22° – 24°C) until radicle emergence. Gradually reduce to 65° – 68°F (18° – 20°C) as cotyledons expand.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8 Yellow upper leaves may indicate iron deficiencies when pH is > 6.6  
• EC: 1 – 1.5

**Light:** Petunias need long days to flower. To initiate bud under short days, extend day length to 13.5 – 14 hours. Under long day, low light conditions, supplemental lighting of 350 – 500 foot candles (3,500 – 5,000 lux) may be necessary.

**Temperature:** After transplant, Petunias require temperatures > 55°F (13°C) nights for the first 6 weeks to initiate flower bud development. After bud set, the night temperatures can be lowered to 50°F (10°C) to encourage basal branching and compactness. However, lower temperatures may also substantially decrease the number of flowers initiated. Downward cupping of leaves may indicate too cool temperatures in combination with overwatering.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and dry (1) Allow media to approach level (1) before re-saturating to level (4).

**Humidity:** 40 – 50%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Upon initial germination begin feeding early on with 50 ppm nitrogen. Pay attention to the addition of boron since low boron can cause tip abortion. Feed established seedlings at 100 – 150 ppm nitrogen. Under high light conditions, apply an ammonium-based feed (17-5-17). Under low light conditions, apply a calcium-based feed (14-4-14). Under high light and long or extended days, an ammonium-based feed (20-10-20) is preferred. For more shoot growth, add an additional ammonium treatment to the schedule. To prevent stretching under low light and cool temperatures, reduce ammonium and apply only calcium-based fertilizer.

**Growth Regulators:** Petunias are responsive to B-Nine (daminozide) at 2,500 – 5,000 ppm. Apply B-Nine before the buds are visible. Late applications will distort flower color and size. Also responds to DIF treatments, Bonzi (paclobutrazol), Sumagic (uniconazole) or B-Nine/Cycocel (chlormequat chloride) tank mix.

### GROWING ON

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray. Transplant as soon as root system is established. Root bound plugs do not transplant well. Plush and Ramblin' Petunia require less growth regulators and are not as daylength sensitive as other trailing types of Petunias, making them very economical to grow. Grow Plush and Ramblin' similar to other spreading Petunias.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8  
• EC: 1.5 – 2

**Light:** Petunias need long days to flower. To initiate bud under short days, extend day length to 14 hours. Under long day, low light conditions, supplemental lighting of 350 – 500 foot candles (3,500 – 5,000 lux) may be necessary. Plush is very early flowering under short day and low light conditions.

**Temperature:** After transplant, Petunias require temperatures > 55°F (13°C) nights for the first 6 weeks to initiate flower bud development. After bud set, the night temperatures can be lowered to 50°F (10°C) to encourage basal branching and compactness. However, lower temperatures may also substantially decrease the number of flowers initiated. Downward cupping of leaves may indicate too cool temperatures in combination with overwatering.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between wet (4) and dry (1) Allow media to approach level (1) before re-saturating to level (4).

**Humidity:** 40 – 50%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed at 100 – 200 ppm nitrogen. Under high light conditions, apply an ammonium-based feed (17-5-17). To prevent stretching under low light conditions, apply a calcium-based feed (14-4-14). Under high light and long or extended days, an ammonium-based feed (20-10-20) is preferred.

**Growth Regulators:** B-Nine (daminozide) as needed at 3,500 ppm. Apply B-Nine before the buds are visible. Late applications will distort flower color and size. Also responds to DIF treatments, Bonzi (paclobutrazol), Sumagic (uniconazole) or B-Nine/Cycocel (chlormequat chloride) tank mix.

**Common Diseases:** Botrytis, Rhizoctonia

**Common Pests:** Aphids

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, trellises, hanging baskets, mass plantings, retaining walls	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 8 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Plush</b>	10 – 14" (25 – 35 cm)	24 – 28" (60 – 70 cm)
<b>Ramblin'</b>	10 – 14" (25 – 35 cm)	30 – 36" (75 – 90 cm)

### PETUNIA SCHEDULING IN WEEKS

	Plush	Ramblin'
<b>Total crop time</b>	9 – 11	10 – 12
<b>'288' plug crop time</b>	4 – 5	4 – 5
<b>Transplant to finish crop time</b>		
<b>4" crop</b>	4 – 5	5 – 6
<b>10" hanging basket</b>	6 – 8	7 – 8

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Picobella™

### PETUNIA MILLIFLORA

**Minimum Germination Rate:** 90%

**Seed Product Form:** Pelleted, raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 10 – 12; 3 – 4 leaves.

**Flowering Type:** Obligate long day and irradiance

**Specific Flowering Mechanism:** Flowering is affected by daylength, irradiance and temperature. Plants will flower under a day length of 9 hours, 12 mols of light; flower development is enhanced in temperatures of 67°F (19.4°C).

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 5 days.

**Cover:** Do not cover the seeds.

**Media:** • pH: 5.8 – 6  
• EC: 0.5 – 0.75

**Light:** Light is necessary for germination. Provide a light source of 10 – 100 foot candles (100 – 1,000 lux) if utilizing a chamber.

**Moisture:** Saturated (5) for days 1 – 5. On day 6 reduce moisture to wet (4) drying back to a moist (3) within 18 hours.

**Humidity:** 100% until radicle emergence (approximately day 6), then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 72° – 76°F (22° – 24°C) until radicle emergence. Gradually reduce to 65 – 67°F (18° – 19.5°C) with -2 to -3°F (-1.5 to -2°C) DIF or morning drop as cotyledons expand.

**Fertilizers:** 14-4-14- or 17-5-17 at 60 – 75 ppm nitrogen to maintain an EC of 0.5 – 0.75; add 8 – 10 ppm phosphorous.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

\*To keep plants vegetative, provide less than 9 hours of day length and may benefit from less than 6 mols of light

**Media:** • pH: 5.8 – 6  
• EC: 0.75 – 1.50

**Light:** Provide 2,000 – 2,500 foot candles (20,000 – 25,000 lux or 6 – 8 mols).

**Temperature:** 65° – 68°F (18° – 20°C) with a -3 to -5°F (-2 to -3°C) DIF or drop

**Moisture:** Alternate between saturate (5) and wet (3); dry back must occur within 18 hours

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 or 20-10-20 at 100 – 150 ppm nitrogen; 8 – 12 ppm phosphorous.

**Growth Regulators:** Plant growth regulators are usually not necessary on genetic dwarf Petunias.

### GROWING ON

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8 Yellow upper leaves may indicate iron deficiencies when pH is > 6.6.  
• EC: 1.25 – 1.75

**Light:** 3,000 – 4,000 foot candles (30,000 – 40,000 lux or 10 – 14 mols) Petunias need long days to flower. To initiate bud under short days, extend day length to 12 hours.

**Temperature:** 65° – 68°F (18° – 20°C) with a -3 to -5°F (-2 to -3°C) DIF or drop

**Moisture:** Alternate between saturate (5) and wet (3); dry back must occur within 18 hours.

**Fertilizers:** 14-4-14 or 17-5-17 or 20-10-20 at 100 – 150 ppm nitrogen; 8 – 12 ppm phosphorous.

**Growth Regulators:** Plant growth regulators are usually not necessary on genetic dwarf Petunias.

**Common Diseases:** Botrytis, Rhizoctonia

**Common Pests:** Thrips

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 8 <b>AHS Heat Zone:</b> 9 – 1

	Garden Height	Garden Width
<b>Picobella</b>	8 – 10" (20 – 25 cm)	8 – 10" (20 – 25 cm)

### PETUNIA SCHEDULING IN WEEKS

	Picobella
<b>Total crop time</b>	8 – 11
<b>'288' plug crop time</b>	4 – 5
<b>Transplant to finish crop time</b>	
<b>Packs</b>	4 – 5
<b>4" crop</b>	5 – 6

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Miss Tilly™

### PLATYCODON GRANDIFLORA

**Minimum Germination Rate:** 90%

**Seed Product Form:** Raw

### FLOWERING

**Flowering Type:** Platycodon grandiflora is day-neutral.

**Specific Flowering Mechanism:** Long days and high light enhance flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 4 days.

**Cover:** Seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** • pH: 5.5 – 6  
• EC: 0.5 – 0.75

**Light:** Light is necessary for germination. Provide a light source of 10 – 100 foot candles (100 – 1,000 lux) if utilizing a chamber.

**Moisture:** Saturated (5) for days 0 – 5 or until radicle emergence. On days 6 – 18 reduce moisture to moist (3) until cotyledon expansion.

**Humidity:** 100% until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 68° – 70°F (20° – 21°C) until radicle emergence. Reduce to 65° – 68°F (18° – 20°C) until cotyledon expansion.

**Fertilizers:** Fertigation water should not be greater than an EC of 0.5.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.5 – 6  
• EC: 0.75 – 1

**Light:** Maximum 3,000 foot candles (30,000 lux). Avoid direct sunlight.

**Temperature:** 65° – 68°F (18° – 20°C)

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed established seedlings at 50 – 150 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14).

**Growth Regulators:** If necessary apply B-Nine (daminozide) at 1,000 ppm to prevent stretching.

### GROWING ON

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray. Transplant before plug cells become root bound. Platycodons do not like to be transplanted.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 6  
• EC: 1

**Light:** Young plants need to be shaded from direct sun. Once established, plants can tolerate higher light levels up to 4,000 foot candles (40,000 lux).

**Temperature:** 55° – 60°F (13° – 18°C) nights; 68° – 75°F (20° – 24°C) days.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Constant liquid feed at 200 ppm nitrogen with a nitrate-based fertilizer (17-5-17) to promote a strong root system.

**Growth Regulators:** Apply B-Nine (daminozide) at 1,000 ppm as needed to control plant habit. Higher rates may burn leaf edges. Begin applications 2 – 3 weeks after transplant.

**Common Diseases:** Botrytis

**Common Pests:** Spider Mite

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, rock gardens	<b>Light:</b> Filtered sun to full sun <b>USDA Hardiness Zone:</b> 6 <b>AHS Heat Zone:</b> 9 – 1

	Garden Height	Garden Width
<b>Miss Tilly</b>	6 – 8" (15 – 20 cm)	6 – 8" (15 – 20 cm)

### PLATYCODON SCHEDULING IN WEEKS

	Miss Tilly
<b>Total crop time</b>	14 – 18
<b>'288' plug crop time</b>	4 – 5
<b>Transplant to finish crop time</b>	
<b>4" crop</b>	10 – 13

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Orion<sup>®</sup>, Primera<sup>™</sup>

### PRIMULA ACAULIS

**Minimum Germination Rate:** 80%

**Seed Product Form:** Raw, GoldSmart<sup>™</sup> Primed

### FLOWERING

**Time frame when plants are receptive to flower initiation:** 8 – 10 leaves present.

**Flowering Type:** Facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** Maturity and irradiance (12 – 15 mols) trigger flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion.

**Cover:** Cover seeds with a thin layer of medium-sized vermiculite to maintain moisture levels.

**Media:** • pH: 5.5 – 5.8  
• EC: <1

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch compared to seed germinated in the dark.

**Temperature:** 64° – 68°F (18° – 20°C) until cotyledon expansion; then 60° – 62°F (16° – 17°C) to prevent stretch. Temperatures above 76°F (24°C) will result in a lower germination percentage.

**Moisture:** Saturated (5), from day 1 – 7. On day 7, lower to moisture level wet (4), and re-saturate to level (5) until day 12, or to full cotyledon expansion. Afterward, alternate between moisture level wet (4) to moist (3).

**Humidity:** 100% until day 8 – 10. Make sure that germination is complete before lowering humidity or lower germination percentages may result if humidity is reduced too early.

**Dehumidify:** On day 8 – 10, lower humidity level to 40 – 50%. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** None needed until cotyledon expansion (approximately day 9 – 10), then feed 50 ppm nitrogen with a nitrogen:potassium (N:K) ratio of 1:2 as needed. NOTE: Primula are light feeders.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8  
• EC: .75 – 1

**Light:** 3,000 – 4,000 foot candles (30,000 – 40,000) lux. Avoid direct sunlight.

**Temperature:** 60° – 65°F (16° – 18°C). After roots are established and plants have 6 – 8 true leaves, lower temperatures to 45° – 50°F (7° – 10°C) for 4 – 5 weeks. NOTE: A juvenile plant will not respond to cool temperatures and will result in blind plants. Do not drop temperatures if young plant has not established 6 – 8 true leaves.

**Moisture:** Alternate between moisture level moist (3) and medium (2). Allow the soil to approach level (2) before re-saturating to level (3). Watch for excess algae growth. Using R/O (Reverse Osmosis) water will help reduce algae levels.

**Fertilizers:** Under high light conditions, alternate with an ammonium-based feed (17-5-17) at 50 – 75 ppm nitrogen and a calcium-based feed (12-4-20) at 50 – 75 ppm nitrogen. Under low light conditions, apply a calcium-based feed (14-2-14) at 50 – 75 ppm nitrogen. Emphasis should be on potassium during the majority of the crop's production cycle.

**Growth Regulators:** None at this time.

### GROWING ON

**Transplant Ready:** 6 – 8 weeks from a '288' plug tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8  
• EC: 1 – 1.5

**Light:** Provide 3,000 – 4,000 foot candles (12 – 15 total mols or 30,000 – 40,000 lux) to hasten flower development. Long days may enhance growth. Avoid direct sunlight as leaf scorch may occur. NOTE: do not allow light level to exceed 3,500 foot candles (35,000 lux) for an extended length of time.

**Temperature:** Days 50° – 55°F (10° – 12°C); Nights 55° – 60°F (12° – 16°C) with a negative DIF of 5° – 10°F (1° – 3°C) from 5 – 9 a.m.

**Average Daily Temperature (ADT):** 54°F (12°C)

**Moisture:** Alternate between moisture level moist (3) and medium (2). Allow soil to reach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Finish plants with an N:K ratio of 1:3. In cool weather, maintain low ammonium levels to avoid excessive vegetative growth and root-rot problems. Alternate with calcium-based and nitrate-based fertilizers (12-4-20 at 100 – 150 ppm nitrogen, 14-4-14 at 100 – 150 ppm nitrogen).

**Growth Regulators:** If grown cool, PGRs should not be necessary. If needed, apply B-Nine (daminozide) spray at 2,500 – 5,000 ppm.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) spray at 2,500 ppm may be applied if desired.

**Fertilizer:** Potassium nitrate at 150 ppm nitrogen.

**Common Diseases:** Ramularia and Botrytis. Provide adequate ventilation between plants and avoid over-saturated conditions. Apply fungicides as needed according to label rates and directions.

**Common Pests:** Cutworms, Whitefly, Fungus Gnats, Shore Flies, Leafminers, Aphids and Thrips. Scout plants on a regular basis and apply appropriate pesticides according to label rates.

PRODUCT USE	GARDEN SPECIFICATIONS
Beds and borders during cool season months. Primrose is a novelty blooming plant in winter months.	<b>Light:</b> Full sun to light shade <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 4 – 1

	Garden Height	Garden Width
<b>Primera, Orion</b>	5 – 6" (13 – 15 cm)	5 – 6" (13 – 15 cm)

### PRIMULA ACAULIS SCHEDULING IN WEEKS

	Primera	Orion
<b>Total crop time</b>	20 – 22	21 – 23
<b>'288' plug crop time</b>	6 – 7	6 – 7
<b>Transplant to finish crop time</b>		
<b>4" crop</b>	13 – 14	14 – 15

Traditionally, Primrose is sown in July. Primera is an early season variety for blooming October – January. Orion is a mid season variety for blooming December – March.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Embrace™, Grace™, Libre™

### PRIMULA OBCONICA

**Minimum Germination Rate:** Libre, Embrace 80%; Grace 70%

**Seed Product Form:** Raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** 8 – 10 leaves present.

**Flowering Type:** Facultative short-day plant (minor) – short days enhance flowering.

**Specific Flowering Mechanism:** Maturity and irradiance trigger flowering. Unlike other Primula, cold temperatures are not necessary to set flower on Primula obconica.

### PLUG CULTURE

**Note:** Primula obconica requires higher germination temperatures than other types of Primula.

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 7 days.

**Cover:** Seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 0.75

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles will improve germination dramatically compared to seed germinated in the dark.

**Moisture:** Saturated (5) for days 0 – 5 or until radicle emergence. On days 6 – 18 reduce moisture to moist (3). Beginning day 19 reduce further to medium (2).

**Humidity:** 100% until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 72° – 75°F (22° – 24°C) until radicle emergence. Reduce to 65° – 68°F (18° – 20°C) until cotyledon expansion.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 0.75

**Light:** Maximum 3,000 foot candles (30,000 lux). Avoid direct sunlight.

**Temperature:** 65° – 68°F (18° – 20°C). As seedlings mature, gradually reduce temperatures to 62° – 65°F (16° – 18°C).

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** After cotyledon emergence, fertilize weekly at 50 ppm nitrogen with a calcium-based fertilizer (14-4-14).

### GROWING ON

**Transplant Ready:** 6 – 7 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8

• EC: 1 Primula obconica is sensitive to high salts.

**Light:** To avoid leaf burn, provide a light shade when transplanting in the summer.

**Temperature:** After transplant, maintain night temperatures at 60° – 65°F (16° – 18°C). Once roots are established lower night temperatures to 50° – 55°F (10° – 13°C) with 60° – 70°F (16° – 21°C) days. Cool temperatures will help produce a more free-flowering, compact plant. Finishing during periods of excessive high temperatures will produce plants with large leaves and few flowers.

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Primula obconica are light feeders. Fertilize with a calcium-based fertilizer (14-4-14) at 100 – 150 ppm nitrogen as needed to promote active growth. The use of ammonium in combination with high temperatures may promote excessive vegetative growth. Heavy fertilization practices can result in large leaf development.

**Growth Regulators:** If needed, Libre will respond to B-Nine (daminozide) at 5,000 ppm.

**Common Diseases:** Tomato Spotted Wilt Virus, Pythium Root Rot

**Common Pests:** Whitefly, Leafminers, Aphids and Thrips

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, gift item, indoor color	<b>Light:</b> Filtered sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 4 – 1

	Garden Height	Garden Width
<b>Embrace, Grace, Libre</b>	8 – 10" (20 – 25 cm)	6 – 8" (15 – 20 cm)

### PRIMULA OBCONICA SCHEDULING IN WEEKS

	Embrace	Grace	Libre
<b>Total crop time</b>	16 – 20	16 – 20	16 – 20
<b>'288' plug crop time</b>	6 – 7	6 – 7	6 – 7
<b>Transplant to finish crop time</b>			
<b>4" crop</b>	8 – 9	8 – 9	8 – 9
<b>6" crop</b>	10 – 12	10 – 12	10 – 12

Unlike other Primula, cold temperatures are not necessary to set flower on Primula obconica. Libre can be cropped year round.

Primula Obconica Grace is not primine free.

Special note: Certain varieties of primula obconica plants can cause allergic reactions, including skin rash and swelling, on some people. This is caused by the presence of the chemical primine. Wear latex gloves and long sleeves when handling; wash gloves and affected clothing thoroughly after use. If irritation occurs, call a physician.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Maché™, Magic™

### RANUNCULUS ASIATICUS

**Minimum Germination Rate:** 80%

**Seed Product Form:** Pelleted, raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** 10 – 12 leaves are present.

**Flowering Type:** Obligate long-day plant – long days required for initiation.

**Specific Flowering Mechanism:** Days greater than 13.5 hours with high irradiance (15 – 20 mols) will induce and enhance flowering. After initiation and while buds are immature, provide short day to enhance flower size and uniformity.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 14 – 21 days. Remove plug trays from the chamber when immature cotyledons growth is observed.

**Cover:** Seeds may be covered with a thin layer of medium-grade vermiculite to maintain moisture levels.

**Media:** • pH: 5.8 – 6  
• EC: 0.75 – 1

**Light:** Light is not required for germination. Day 15 – 29 provide 1,500 – 2,000 foot candles (15,000 – 20,000 lux or 4 – 6 mols of light).

**Moisture:** Saturated (5) for days 0 – 14 or until radicle emergence. On day 15, alternate between saturate (5) and moist (3); dry back must occur within 18 hours.

**Humidity:** 100% until radicle emergence (approximately day 14).

**Dehumidify:** 40% on day 15 after radicle emergence

**Temperature:** 50 – 55°F (10 – 13°C) for highest number of usable seedlings and young plant quality. As temperature increases to 56 – 65°F (13.5 – 18.5°C) usable seedling quality will be reduced and young plant quality will decrease. Apply at -3 to -5°F DIF or morning drop day 15 – 29.

**Fertilizers:** 14-4-14 or 17-5-17 at 60 – 75 ppm nitrogen to maintain an EC of 0.75 – 1.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.8 – 6  
• EC: 1.25 – 1.75

**Light:** 2,500 – 3,000 foot candles (25,000 – 30,000 lux or 8 – 10 mols of light). Make sure plants remain under short days (less than 13 hours) to avoid premature flowering and corm development. After approximately day 52, provide 4,000 – 5,000 foot candles (40,000 – 50,000 lux or 14 – 18 mols of light).

**Temperature:** 52 – 55°F (11 – 13°C) with a -4 to -6°F (-2 to -3.5°C) DIF or morning drop.

**Moisture:** Alternate between saturate (5) and moist (3); dry back must occur within 18 hours.

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 75 – 125 ppm nitrogen to maintain an EC of 1.25 – 1.75. Provide 8 – 12 ppm phosphorus.

**Growth Regulators:** May be necessary if optimal conditions have not been provided. B-Nine spray at 1,500 – 2,500 ppm.

### GROWING ON

High quality Ranunculus is best obtained with cool night temperatures and short day conditions. Low temperatures and high light levels will result in large flowers with an intense color.

**Transplant Ready:** 8 – 10 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** Select a porous media that drains well. This is important during the cool season when temperatures and light levels are low, and media is slow to dry.

- pH: 5.8 – 6
- EC: 1.25 – 1.75

**Light:** 4,500 – 5,000 foot candles (45,000 – 50,000 lux or 16 – 18 mols of light). Ranunculus initiates the highest flower count and the best growth under the natural days for spring production. Daylength extension in combination with high light will promote earlier flowering.

**Temperature:** 58° – 62°F (14° – 16°C) 2 – 3 weeks, until the roots have reached the edges of pots. Once established lower temperature to 50° – 55°F (10° – 13°C) OR maintain 58°F (14°C) with a -5 to -10°F (-3° to -5.5°C) DIF or morning drop. Temperatures above 68°F (20°C) may reduce vegetative growth, increase stem length and speed up flowering. High temperatures in combination with long days will stimulate corm formation or promote leaf yellowing.

**Moisture:** Alternate between saturate (5) and moist (3); dry back must occur within 18 hours. Avoid a wilting state to prevent leaf yellowing.

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 100 – 150 ppm to maintain an EC of 1.25 – 1.75. Provide 10 – 15 ppm phosphorus.

**Growth Regulators:** B-Nine (daminozide) at 2,500 ppm. Apply first treatment when flower buds are visible in the crown. A second application is made when flower stems are 2" (4 – 5 cm) in length. If needed, subsequent applications can be applied until flowers begin to open.

**Common Diseases:** Cercospora ranunculi, Pythium Root Rot, Botrytis, Tomato Spotted Wilt Virus

**Common Pests:** Aphids, Whitefly, Leaf miner, Thrips, Fungus Gnats

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings, gift item, garden cut flowers	<b>Light:</b> Partial shade <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 4 – 1

	Garden Height	Garden Width
<b>Maché</b>	12 – 16" (30 – 40 cm)	10 – 12" (15 – 20 cm)
<b>Magic</b>	6 – 8" (15 – 20 cm)	4 – 6" (10 – 15 cm)

### RANUNCULUS SCHEDULING IN WEEKS

	Maché	Magic
<b>Total crop time</b>	21 – 24	22 – 26
<b>'288' plug crop time</b>	8 – 10	8 – 10
<b>Transplant to finish crop time</b>		
<b>4" crop</b>	12 – 15	14 – 16
<b>6" crop</b>	13 – 16	N/A

Ranunculus is traditionally sown in August/September for January/February sales. Additional crops can be sown in September/October for March/April sales.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## TigerEye

**Minimum Germination Rate:** 85%

**Seed Product Form:** Raw, pelleted

### FLOWERING

**Time frame when plants are receptive to flower initiation:** 6 – 8 leaves present or about days 21 – 35.

**Flowering Type:** Obligate long-day plant (primary) – long days (greater than 13 hours) will initiate flowering.

**Specific Flowering Mechanism:** Maturity and long days trigger flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 10 – 14 days.

**Cover:** A light covering over the seed is recommended. Avoid media compaction.

**Media:** • pH: 6 – 6.2

• EC: <1

**Light:** Light is necessary for germination. Provide a light source of 10 – 100 foot candles if utilizing a chamber.

**Temperature:** 75° – 78°F (24° – 25°C) until radicle emergence.

**Moisture:** Provide wet (4+) level day 1 – 14. On day 15, alternate between wet (4) and moist (3); dry back must occur within 18 hours.

**Humidity:** 100% from day 1 – 14 or until seed coats are shed.

**Dehumidify:** After seed coats have been shed, lower humidity to 40%. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell; and to make the plant receptive to flower initiation.

**Media:** • pH: 6 – 6.2

• EC: 1 – 1.5

**Light:** 2,500 – 4,500 foot candles (25,000 – 45,000 lux or 8- 16 mols)

**Temperature:** 64 – 67°F (18° – 19.5°C) with -5 to -10°F (-3 to -5.5°C) DIF or morning drop.

**Moisture:** Alternate between wet (4) and moist (3); dry back must occur within 18 hours.

**Fertilizers:** 14-4-14 or 17-5-17 at 50 – 100 ppm nitrogen or add calcium nitrate or calcium chloride at 50 ppm once a week from March 15 – September 21.

**Growth Regulators:** If needed, spray B-Nine (daminozide) at 1,250 – 2,500 ppm or Sumagic (uniconazole).

**Fungicides:** Preventative fungicide should be applied between days 21 – 35 for foliar diseases, especially Botrytis.

### GROWING ON

**Transplant Ready:** 5 – 8 weeks from a '288' plug tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 6 – 6.2

• EC: 1.5 – 1.75

**Light:** Provide 3,500 – 5,500 foot candles (12 – 20 mols of light, or 35,000 – 55,000 lux).

**Temperature:** 64 – 67°F (18° – 19.5°C) with -5 to -10°F (-3 to -5.5°C) DIF or morning drop.

**Moisture:** Alternate between wet (4) and moist (3); dry back must occur within 18 hours.

**Humidity:** 40%.

**Fertilizers:** 14-4-14 or 17-5-17 at 50 – 100 ppm nitrogen or add calcium nitrate or calcium chloride at 50 ppm once a week from March 15 – September 21. A weekly supplement of magnesium sulfate (Epsom salts) at 16 oz/100 gallons will enhance the foliage color.

**Growth Regulators:** It is best to control growth through moisture, feed and temperature management. If needed, apply sprays of B-Nine (daminozide) at 2,500 – 5,000 ppm, or Bonzi (paclobutrazol) or Sumagic (uniconazole).

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to treat:** 1 – 2 weeks prior to finish or shipping

**Growth regulators:** B-Nine (daminozide) at 2,500 – 3,000 ppm

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen

**Common Diseases:** Botrytis, Pythium. To reduce disease pressure monitor moisture and humidity levels, and use preventative fungicide drenches and sprays.

**Common Pests:** Fungus Gnats, Shore Flies, White Fly.

PRODUCT USE	GARDEN SPECIFICATIONS
Containers, mass plantings, combinations	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>TigerEye</b>	16 – 24" (40 – 60 cm)	16 – 24" (40 – 60 cm)

### RUDBECKIA SCHEDULING IN WEEKS

	TigerEye
<b>Total crop time</b>	11 – 15
<b>'288' plug crop time</b>	5 – 8
<b>Transplant to finish crop time</b>	
<b>Packs</b>	3 – 4 (sold green)
<b>4" crop</b>	5 – 7
<b>6" crop</b>	6 – 8, depending on number of plugs transplanted

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Picante™, Fuego™, Salsa™

### SALVIA SPLENDENS

**Minimum Germination Rate:** 90%

**Seed Product Form:** Raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Salsa: days 18 – 21; Picante: days 21 – 24; 3 – 5 leaves are present.

**Flowering Type:** Salsa is a day-neutral plant. Picante is a facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** Daylength triggers flowering. Warm temperatures will enhance flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 4 – 5 days.

**Cover:** Seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** • pH: 6.0 – 6.2

• EC: 0.5

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch compared to seed germinated in the dark.

**Moisture:** Saturated (5) for days 0 – 4 or until radicle emergence. On days 5 – 14 reduce moisture to moist (3). Beginning day 15 reduce further to medium (2).

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 75° – 78°F (22° – 23°C) until radicle emergence. Reduce to 72° – 75°F (22° – 23°C) until cotyledon expansion.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

Avoid premature flowering in the plug stages. Plants will not size up properly after transplanted if budded in the plug tray. In troubleshooting plug culture, downward cupping of the leaves indicates that the media is too dry and/or EC levels are too high; or temperatures are too cool.

**Media:** • pH: 6.0 – 6.2

• EC: 0.75 – 1.2 Salvia is very sensitive to high salt levels and can be used as an indicator crop for high EC.

**Light:** Provide 2,500 – 3,000 (25,000 – 30,000 lux).

**Temperature:** 72° – 75°F (22° – 23°C). Gradually reduce to 65° – 68°F (18° – 20°C) as seedlings mature.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Fertilize established seedlings at 40 – 50 ppm nitrogen with calcium- and potassium nitrate-based fertilizers (14-2-14, 13-2-13). Ammonium concentrations >5 ppm can be toxic. Symptoms include a gray cast or browning of immature leaves. Interveinal chlorosis on mature leaves indicates a lack of magnesium.

**Growth Regulators:** If needed, apply B-Nine (daminozide) at 2,500 – 5,000 ppm to tone plants.

### GROWING ON

**Transplant Ready:** 5 – 6 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 6.2 – 6.5

• EC: 0.75 – 1.0 Salvias are sensitive to high salts and levels should be monitored to avoid leaf drop.

**Light:** Provide 3,000 – 3,500 foot candles (30,000 – 35,000 lux). Under low light conditions, supplemental lighting will reduce stretching.

**Temperature:** 55° – 60°F (13° – 16°C) nights; 70° – 75°F (21° – 24°C) days.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed as needed at 100 – 200 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14). A combination of low feed and cool temperatures may promote the yellowing of leaves.

**Growth Regulators:** Salvia is responsive to DIF treatments, B-Nine (daminozide), A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniconazol) or B-Nine/Cycozel (chlormequat chloride) tank mix.

**Common Diseases:** Alternaria Leaf Spot, Powdery Mildew, Rust and Corynespora Leaf Spot

**Common Pests:** Thrips, Aphids, Whitefly and Spider Mite

### PRODUCT USE

Packs, pots, containers, mass plantings

### GARDEN SPECIFICATIONS

**Light:** Partial to full sun  
**USDA Hardiness Zone:** 10  
**AHS Heat Zone:** 12 – 1

	Garden Height	Garden Width
<b>Picante</b>	14 – 16" (35 – 40 cm)	10 – 12" (25 – 30 cm)
<b>Fuego</b>	12 – 14" (25 – 30 cm)	10 – 12" (25 – 30 cm)
<b>Salsa</b>	8 – 10" (20 – 25 cm)	8 – 10" (20 – 25 cm)

### SALVIA SCHEDULING IN WEEKS

	Picante	Fuego	Salsa
<b>Total crop time</b>	10 – 11	9 – 10	9 – 10
<b>'288' plug crop time</b>	5 – 6	5 – 6	5 – 6
<b>Transplant to finish crop time</b>			
<b>Packs</b>	5 – 6	4 – 5	4 – 5
<b>4" crop</b>	6 – 7	5 – 6	6 – 7

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Atlantis™

### SCHIZANTHUS X WISETONENSIS

**Minimum Germination Rate:** 75%

**Seed Product Form:** Raw

### FLOWERING

**Flowering Mechanism:** Obligate long plant – days > 12 hours are necessary for flower initiation.

**Time frame when plants are receptive to flower initiation:** 1–2 weeks after transplanting allowing plants to bulk before initiation.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 7 – 14): From the time a seed is sown until radicle emergence takes place; usually with the root penetrating the media and some cotyledon development. Humidity in the air is 95 – 98% (humidification); media moisture 3.

**Cover:** Seeds may be covered lightly with a light layer of coarse vermiculite to maintain optimum moisture levels.

**Media:** pH: 5.8 – 6.2. EC: 0.25 – 0.5 Avoid media compaction to allow for root penetration.

**Light:** No light is needed for germination.

**Moisture:** Moist (3) important to keep soil moist but not wet (4).

**Humidity:** 100% until radical emerges then lower to 40%-70%.

**Temperature:** 62° – 65°F (17° – 19°C) 7-14 days.

**Fertilizers:** 14-4-14 or 17-5-17 at 50-70 ppm. Maintain EC of 0.25 – 0.50.

**Germination 2** (approximately day 7 – 14): From the time cotyledon is observed until it is fully expanded. The roots have expanded throughout the media. Dehumidify from 98% to 50% in the air. Media moisture needs to be moist (3) at this stage.

**Media:** pH: 5.8 – 6.2. EC: 0.25 – 0.50

**Light:** Keep plugs under short days to prevent premature flowering. 2,000 – 3,000 foot candles (20,000 – 30,000 lux); 6 – 10 mols of light.

**Moisture:** Moist (3) and alternate to medium (2.5) within 18 hours at radicle emergence (approximately day 8).

**Dehumidify:** Lower relative humidity to 40% (approximately day 14). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, continue to maintain temperatures of 62° – 65°F (17° – 19°C).

**Fertilizers:** 14-4-14 or 17-5-17 at 50 – 70 ppm nitrogen then can be increased to 70 – 100 ppm once true leaves appear as needed for an EC in the soil of 0.5 – 1.

**Fungicides:** Plants may become susceptible to Botrytis under humid conditions but no preventative fungicides are recommended.

**Plug Bulking/Flower Initiation:** The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media. Flower initiation is not recommended for Schizanthus until two weeks after transplant.

**Media:** pH: 5.8 – 6.2. EC: 1 – 1.2

**Light:** 3,500 – 5,500 foot candles (35,000 – 55,000 lux); 12 – 20 mols of light. Keep plants under short days to prevent premature flowering

**Temperature:** 62° – 65°F (17° – 19°C)

**Moisture:** Alternate between moisture levels moist (3) to medium (2.5). Allow the soil to approach medium (2.5), before re-saturating to moist (3). If media is allowed to dry back further than (2.5) may cause burning and foliage loss.

**Fertilizers:** 14-4-14 or 17-5-17 at 75 – 125 ppm nitrogen, as needed for an EC in the soil of 1 – 1.2.

**Growth Regulators:** If needed, spray B-Nine (daminozide) at 1,500 – 2,500 ppm.

**Fungicides:** None recommended; watch for Botrytis in humid conditions.

**Initiated Bulking:** Seedlings develop from juvenile to mature.

**Light:** Provide 4,750 – 7,500 foot candles (47,500 – 75,000 lux) or 17 – 28 mols of light continue to keep plugs under short days to prevent premature flowering.

**Temperature:** 62° – 65°F (17° – 19°C)

**Fertilizers:** 14-4-14 or 17-5-17 at 75 – 125 ppm nitrogen, as needed for an EC in the soil of 1 – 1.2.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish:** Optimize plant shoot and root growth, which is usually a 1:1 ratio.

**Media:** pH: 5.8 – 6.2. EC: 1.1 – 1.3

**Light:** Plants should be grown in full sunlight. If weather conditions are poor, additional lighting will improve quality of plants. Plants should be bulked in the finish container under short days 1 – 2 weeks and then day length can be extended to 14 hours per day until flowering begins.

**Temperature:** 60° – 63°F (16° – 17°C) days and 55° – 58°F (12.5° – 13.5°C) nights.

**Moisture:** Alternate between moisture levels moist (3) and medium (2.5). Allow media to approach level (2.5) before re-saturating to moist (3). Overwatering will create a larger but soft plant prone to Botrytis and soft rots. Underwatering will produce small plants with yellow lower leaves or leaf-tip burn.

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 125 – 150 ppm, as needed for an EC in the soil of 1.1 – 1.3. Underfeeding will cause irreversible lower leaf yellowing.

**Growth Regulators:** B-Nine (daminozide) 1,500 – 3,000ppm or A-Rest (ancymidol) at 1 – 2 ppm. Plant growth regulators are generally not needed when plants are grown under the recommended temperatures.

**Fungicides:** Sub-irrigation or drip watering will help prevent disease due to the dense foliage in the finished product.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** Not required if plants are grown at temperatures recommended.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Botrytis. Monitor moisture and humidity levels.

**Common Pests:** Thrips, Whitefly and Aphids. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> Unknown

	Garden Height	Garden Width
<b>Atlantis</b>	8 – 10" (20 – 25 cm)	8 – 10" (20 – 25 cm)

### SCHIZANTHUS SCHEDULING IN WEEKS

	Atlantis
<b>Total crop time</b>	12 – 14
<b>'128' plug crop time</b>	6 – 7
<b>'200' plug crop time</b>	5 – 6
<b>'288' plug crop time</b>	4 – 5
<b>Transplant to finish crop time</b>	
<b>4" crop</b>	7 – 9, depending on number of plugs transplanted
<b>5" crop</b>	8 – 10, depending on number of plugs transplanted

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Aromas™, Arrow™

### ANTIRRHINUM MAJUS

**Minimum Germination Rate:** Aromas 85%, Arrow 80%

**Seed Product Form:** Raw

### FLOWERING

**Flowering Mechanism:** Irradiance (primary); plants initiate on approximately day 17 – 30 with HID light for 16 – 18 hours OR total 12 – 20 mols (3,500 – 5,500 foot candles) for 4 – 6 weeks at 67°F (19.4°C). Bud/flower initiation at approximately 4 – 6 leaves.

**Flowering Type:** Facultative long-day plants (secondary); long days enhance flowering.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 5): Humidity in the air 100% (humidification) from the time the crop is sown until radicle emergence takes place; root initial has penetrated media; some cotyledon development. Expect radicle emergence in 3 – 4 days.

**Cover:** Not necessary due to seed size.

**Media:** • pH: 5.5 – 6.2  
• EC: 0.5 – 0.75

**Light:** Light is not required for germination. If utilizing a chamber, providing a light source of 25 – 100 foot candles (250 – 1,000 lux) will improve germination and reduce stretch compared to seed germinated in the dark.

**Moisture:** Saturated (5) for days 1 – 5 or until radicle emergence.

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Temperature:** 70 – 75°F (21° – 24°C) until radicle emergence. (Temperatures higher than 79° F (26°C) can decrease the speed of germination and reduce usable seedlings.) Once cotyledons are observed, reduce temperature to 65° – 68°F (16° – 18°C).

**Fertilizers:** Fertigation water should not be greater than an EC of 0.5.

**Germination 2** (approximately day 6 – 18): Change the humidity in the air (dehumidification) to 40%. The result is better root expansion; cotyledons fully expanded; roots are expanding throughout the growing substrate.

**Media:** • pH: 5.5 – 6.2  
• EC: 0.75 – 1.2

**Light:** 1,500 – 2,500 foot candles (15,000 – 25,000 lux); 4 – 8 mols of light.

**Moisture:** Dry back media to wet (4) and alternate to moist (3) within 18 hours beginning at radicle emergence (approximately day 6).

**Dehumidify:** Lower relative humidity to 40% when radicle emerges (approximately day 6). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 65° – 68°F (16° – 18°C).

**Fertilizers:** 14-4-14 at 50 ppm as needed for an EC in the soil of 0.75 – 1.2.

**Plug Bulking/Flower Initiation** (approximately day 19 – 31): Length of vegetative period – time necessary for roots to reach the edge of the plug, for shoots to fill out container, and for plants to become receptive to flower initiation. Before initiation starts, the plants should be a proper size, which includes optimum shoot development, large number of auxiliary shoots and good presentation from pot size to plant size.

**Media:** • pH: 5.5 – 6.2. High pH levels may promote iron deficiency in snapdragons resulting in chlorotic young shoot growth.  
• EC: 0.75 – 1.2. High EC levels may encourage shoot tip abortion.

**Light:** Provide 2,500 – 4,000 foot candles (25,000 – 40,000 lux). Do not exceed 4,000 foot candles (40,000 lux) or 8 – 14 mols of light.

**Temperature:** 64° – 67°F (17.5° – 19.5°C); -3 to -5F (-2 to -3C) DIF or morning drop. Gradually decrease to 62° – 65°F (17° – 18°C) as the seedlings mature.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Watering or fertilizing late in the day may cause tip abortion.

**Fertilizers:** 14-4-14 or 17-5-17 at 50 – 75 ppm, as needed for an EC in the soil of 0.75 – 1.2.

**Growth Regulators:** If needed, apply B-Nine (daminozide) at 2,500 – 5,000 ppm to tone plugs. Also responds to A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniclazonol) or B-Nine/Cycozel (chlormequat chloride) tank mix.

**Initiated Bulking** (approximately Day 32 – 44) – Plants are receptive to flowering.

**Light:** Provide 3,500 – 5,500 foot candles (35,000 – 55,000 lux) or 12 – 20 mols of light. To induce early flowering, use supplemental lighting at 300 – 450 foot candles (3,000 – 4,500 lux) for a 14 hour day.

**Temperature:** 64° – 67°F (17.5° – 19.5°C); -3 to -8F (-2 to -4.5C) DIF or morning drop.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish:** (approximately day 45 – 115)

**Media:** • pH: 5.5 – 6.2 pH levels greater than 6.2 may lead to iron deficiencies.  
• EC: 1.0 – 1.5

**Light:** Provide 3,500 – 5,000 foot candles (35,000 – 50,000) or 12 – 18 mols.

**Temperature:** 64° – 67°F (17.5° – 19.5°C); -3 to -10F (-2 to -6C) DIF or morning drop.

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 75 – 125 ppm, as needed for an EC in the soil of 1 – 1.5. At temperatures less than 55°F (13°C), the use of ammonium-based fertilizers may cause root rot problems.

**Growth Regulators:** If needed, apply 1 – 2 applications of B-Nine (daminozide) at 2,500 – 5,000 ppm. Also responds to DIF treatments, A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniclazonol) or B-Nine/Cycozel (chlormequat chloride) tank mix.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 3,000 ppm.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Botrytis Blight, Downy Mildew, Powdery Mildew, Pythium, Tomato Spotted Wilt Virus, and Impatiens Necrotic Spot Virus

**Common Pests:** Aphids, Thrips, and Spider Mite

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 9 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Aromas, Arrow</b>	24 – 30" (60 – 76 cm)	12 – 14" (30 – 35 cm)

### SNAPDRAGON SCHEDULING IN WEEKS

	Aromas, Arrow
<b>Total crop time</b>	15 – 18 for spring sales; 13 – 16 for fall sales
<b>'288' plug crop time</b>	6 – 7
<b>Transplant to finish crop time</b>	
<b>4" crop, spring</b>	9 – 11
<b>4" crop, fall</b>	7 – 9
<b>6" crop, spring</b>	10 – 12
<b>6" crop, fall</b>	8 – 10

The shortest crop times may be achieved when following recommended optimal culture. Deviations in environmental conditions will result in longer crop times.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



**DWARF SERIES: Bells™, Chimes™, Little Darling™, Montego™**  
**INTERMEDIATE SERIES: Coronette™, La Bella™, Liberty Classic™, Madame Butterfly™, Ribbon™**

#### ANTIRRHINUM MAJUS

**Minimum Germination Rate:** 80%

**Seed Product Form:** Raw; Montego raw, pelleted

#### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 16 – 20; 4 – 6 leaves are present.

**Flowering Type:** Facultative long-day plants – long days enhance flowering.

**Specific Flowering Mechanism:** High irradiance (15 – 20 mols) will trigger and enhance flowering.

#### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 4 days.

**Cover:** Seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** pH: 5.5 – 5.8. EC: <0.75

**Light:** Light is not required for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch compared to seed germinated in the dark.

**Moisture:** Saturated (5) for days 0 – 5 or until radicle emergence. On days 6 – 18 reduce moisture to moist (3). Beginning day 19 reduce further to medium (2).

**Humidity:** 100% until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 72° – 75°F (22° – 24°C) until radicle emergence. Higher temperatures can decrease the speed of germination. Reduce to 65° – 68°F (16° – 18°C) until cotyledon expansion.

**Fertilizers:** Fertigation water should not be greater than an EC of 0.5.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** pH: 5.5 – 5.8 High pH levels may promote iron deficiency in Snapdragons resulting in chlorotic young shoot growth. EC: 0.5 – <1 High EC levels may encourage shoot tip abortion.

**Light:** Provide 2,000 – 3,000 foot candles (20,000 – 30,000 lux). Do not exceed 3,000 foot candles (30,000 lux). To induce early flowering, use supplemental lighting at 300 – 450 foot candles (3,000 – 4,500 lux) for a 14-hour day. Days less than 12 hours will promote vegetative growth and delay flowering.

**Temperature:** 65° – 68°F (18° – 20°C). Gradually decrease to 62° – 65°F (17° – 18°C) as the seedlings mature.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Watering early in the day and providing good ventilation is important to avoid tip abortion under wet, cool and low light conditions. Shoot tip abortion can occur if tips are left wet overnight.

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** As needed, begin feeding established seedlings at 25 – 50 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14). Mature seedlings can be fed at 100 ppm nitrogen. If additional shoot growth is needed, alternate between calcium nitrate and ammonium phosphate-based fertilizers. Chlorosis of lower leaves may indicate ammonium levels are too high.

**Growth Regulators:** If needed, apply B-Nine (daminozide) at 2,500 – 5,000 ppm to tone plugs. Also responds to A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniconazole) or B-Nine/Cycocel (chlormequat chloride) tank mix.

#### GROWING ON

**Transplant Ready:** 6 – 7 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** pH: 5.5 – 5.8. Low pH may allow sodium to become toxic. High pH may lead to iron deficiencies. EC: 1 – 1.5 Snapdragons are salt sensitive. Leach occasionally to reduce EC levels.

**Light:** Snapdragons are long-day plants. Provide high light levels. Under low light conditions supplemental lighting will aid flowering.

**Temperature:** 50° – 55°F (10° – 14°C) nights; 60° – 70°F (16° – 22°C) days.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed at 150 – 200 ppm nitrogen with calcium nitrate (13-2-13 or 14-4-14). Under cool weather conditions, avoid ammonium-based fertilizers which may encourage root rot problems.

**Growth Regulators:** If needed, apply 1 – 2 applications of B-Nine (daminozide) at 2,500 – 5,000 ppm. Also responds to DIF treatments, A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniconazole) or B-Nine/Cycocel (chlormequat chloride) tank mix.

**Common Diseases:** Botrytis Blight, Downy Mildew, Powdery Mildew, Pythium, Rust, Tomato Spotted Wilt Virus, and Impatiens Necrotic Spot Virus

**Common Pests:** Aphids, Thrips, and Spider Mite

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 9 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Madame Butterfly</b>	24 – 30" (60 – 75 cm)	14 – 16" (30 – 35 cm)
<b>Coronette</b>	20 – 24" (50 – 60 cm)	12 – 14" (30 – 35 cm)
<b>La Bella, Liberty Classic, Ribbon</b>	18 – 22" (45 – 55 cm)	12 – 14" (30 – 35 cm)
<b>Little Darling</b>	10 – 12" (25 – 30 cm)	8 – 10" (20 – 25 cm)
<b>Bells</b>	8 – 10" (20 – 25 cm)	6 – 8" (15 – 20 cm)
<b>Chimes</b>	6 – 8" (15 – 20 cm)	6 – 8" (15 – 20 cm)
<b>Montego</b>	6 – 8" (15 – 20 cm)	8 – 10" (20 – 25 cm)

#### SNAPDRAGON SCHEDULING IN WEEKS

	Intermediate Types	Dwarf Types
<b>Total crop time</b>	16 – 18 for spring sales; 12 – 14 weeks for fall sales	9 – 12
<b>'288' plug crop time</b>	6 – 7	6 – 7
<b>Transplant to finish crop time</b>		
<b>Packs</b>	N/A	4 – 5
<b>4" crop</b>	10 – 12	5 – 6
<b>6" crop</b>	12 – 13	N/A

Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.



## Opus III/IV™, Overture II™

### ANTIRRHINUM MAJUS / CUT FLOWER

Cut flower Snapdragons are extremely daylength sensitive. Variety selection is critical to success. The proper Snapdragon grouping must be planted in the appropriate time slot to have a high-quality crop. Overture (Group II) is typically produced to flower under short, cool days. Opus (Group III/IV) is generally produced to flower under long, warm days.

**Minimum Germination Rate:** 85%

**Seed Product Form:** Raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** 5 – 10 pairs of leaves.

**Flowering Type:** Opus is a facultative long-day plant – long days enhance flowering. Overture is a facultative short-day plant – short days enhance flowering.

**Specific Flowering Mechanism:** Daylength, light intensity and temperature trigger flowering in cut flower Snapdragons.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 4 days.

**Cover:** Seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** • pH: 5.5 – 5.8  
• EC: <0.75

**Light:** Light is not required for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch compared to seed germinated in the dark.

**Moisture:** Saturated (5) for days 0 – 5 or until radicle emergence. On days 6 – 18 reduce moisture to moist (3). Beginning day 19 reduce further to medium (2).

**Humidity:** 100% until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 72° – 75°F (22° – 24°C) until radicle emergence. Higher temperatures can decrease the speed of germination. Reduce to 65° – 68°F (16° – 18°C) until cotyledon expansion.

**Fertilizers:** Fertigation water should not be greater than 0.5.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.5 – 5.8. High pH levels may promote iron deficiency in Snapdragons resulting in chlorotic young shoot growth.  
• EC: 0.5 – <1. High EC levels may encourage shoot tip abortion.

**Light:** Provide 2,000 – 3,000 foot candles (20,000 – 30,000 lux). Do not exceed 3,000 foot candles (30,000 lux).

**Temperature:** 65° – 68°F (18° – 20°C). Gradually decrease to 62° – 65°F (17° – 18°C) as the seedlings mature.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** As needed, begin feeding established seedlings at 25 – 50 ppm nitrogen with a calcium-based fertilizer (13-2-13- or 14-4-14). Mature seedlings can be fed at 100 ppm nitrogen. If additional shoot growth is needed, alternate between calcium nitrate and ammonium phosphate-based (17-5-17) fertilizers. Chlorosis of lower leaves may indicate ammonium levels are too high.

### GROWING ON

Cut flower Snapdragons are typically transplanted directly into the ground. Raised beds are preferred. Provide support to the growing stems to produce high-quality stems.

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray. Transplant plugs before seedlings become root bound. Delayed flowering and reduced quality will occur if plugs are held too long prior to transplant.

**Spacing:** In high light conditions, transplant plugs on a spacing of 10 – 12 plants per square foot. Under low light conditions, decrease spacing to 8 plants per square foot.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** Amend soils as needed to provide adequate aeration to the roots, yet retain enough water to provide a steady supply of moisture without staying saturated.

- pH: 5.5 – 5.8. Low pH may allow sodium to become toxic. High pH may lead to iron deficiencies.
- EC: 1 – 1.5 Snapdragons are salt sensitive. If necessary, leach beds occasionally to reduce EC levels.

**Light:** The two biggest factors influencing flower initiation are daylength and light quality. High light levels are necessary to initiate optimum flowering. Initiation generally occurs when plants have developed 5 – 10 pairs of leaves. Overcast weather during this time frame may affect the outcome of the crop. If necessary, provide supplemental lighting of 350 – 400 foot candles (3,500 – 4,500 lux) to ensure adequate light levels. Altering natural day length will impact flowering and stem length.

**Temperature:** Temperature directly affects the rate of growth and quality of cut flower Snapdragons. The winter blooming Overture (Group II), prefers night temperatures of 50° – 55°F (10° – 14°C) and cool days. The summer blooming Opus (Group III/IV), prefers slightly higher night temperatures of 55° – 60°F (13° – 16°C) with cool days.

**Moisture:** Alternate between moisture levels moist (3) and medium (2). Allow media to approach level (2) before re-saturating to level (3).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed at 100 – 300 ppm nitrogen with calcium nitrate and/or potassium nitrate fertilizers. When the buds begin to show color, irrigate with clear water only. Avoid fertilizers high in ammonium under cool conditions. Under high light and warm temperatures, an ammonium feed may be beneficial. Excessive side shoots may be indicative of high fertility levels or excessive moisture.

**Common Diseases:** Botrytis Blight, Downy Mildew, Powdery Mildew, Pythium, Rust, Tomato Spotted Wilt Virus, and Impatiens Necrotic Spot Virus

**Common Pests:** Aphids, Thrips, and Spider Mite

### PRODUCT USE

Commercial cut flower production

Vase life: 6 – 7 days

### SNAPDRAGON SCHEDULING IN WEEKS

	Overture II	Opus III/IV
<b>'288' plug crop time</b>	4 – 5	4 – 5
<b>Transplant to finish crop time</b>		
<b>Cut flower</b>	Use Overture for winter flowering: 8 – 13, depending upon conditions	Use Opus for summer flowering: 6 – 10, depending upon conditions

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Constellation™

### HELIANTHUS ANNUUS

**Minimum Germination Rate:** 80%

**Seed Product Form:** Raw

### FLOWERING

**Flowering Mechanism:** Short days; plants initiate on approximately days 21 – 28, 4 – 6 leaves present and the daylength is less than 12 hours.

**Flowering Type:** Facultative short-day plant.

**Specific Flowering Mechanism:** Flower buds will initiate when the daylength is less than 12 hours. Plants will grow approximately 24" tall at this daylength. If the daylength is greater than 14 hours, plants will grow up to 36" tall.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 6): From the time a seed is sown until radicle emergence takes place, usually with the root penetrating the media and some cotyledon development. If desired, Helianthus Constellation seeds can be sown into the final container. Humidity in the air is 95 – 98% (humidification); media moisture 4+ – 5. Expect radicle emergence in 5 – 6 days.

**Cover:** Cover seeds with a thin layer of medium-sized vermiculite to maintain moisture levels.

**Media:** pH: 5.5 – 5.8. EC: 0.75 – 1. High EC discourages rooting into the media and could decrease final count of usable seedlings.

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Moisture:** Saturated (5) for day 1 – 5, on day 5 reduce to wet (4). Beginning day 9, reduce moisture further to moist (3).

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 68° – 72°F (20 – 22°C).

**Germination 2** (approximately Day 6 – 10): From the time cotyledon is observed until it is fully expanded. The roots have expanded throughout the media. Dehumidify from 100% to 50% moisture in the air. Media moisture during the wet cycle is usually 4 – 5, and 2 – 3 during the dry cycle; this wet-dry cycle should take place within 12 – 24 hours for most plants.

**Media:** pH: 5.5 – 5.8. EC: 1 – 1.5

**Light:** Supplemental lighting at 350 – 450 foot candles (3,500 – 4,500 lux) during a 10 – 12 hour day will enhance plant growth.

**Temperature:** 68° – 72°F (20 – 22°C).

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). Do not allow seedlings to wilt.

**Humidity:** 40 – 70%

**Dehumidify:** Lower relative humidity to 40% (approximately day 6 – 8). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Alternate between calcium-based fertilizers (13-2-13 or 14-4-14) and potassium nitrate (15-5-15) at 50 – 75 ppm nitrogen. Phosphorus should not exceed 10 ppm.

**Growth Regulators:** Helianthus Constellation is naturally a compact plant and should not require PGR applications. If needed in the plug stages, a 1,500 – 2,500 B-Nine application may be supplied as a spray.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis, and/or Rust.

**Plug Bulking/Flower Initiation** (approximately day 21 – 28): The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media. Induction and initiation may occur if daylength is less than 12 hours.

**Media:** pH: 5.5 – 5.8. EC: 1 – 1.5

**Light:** Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 65° – 68°F (18° – 20°C). If needed, the temperature may be gradually reduced to 62° – 65°F (16° – 18°C) to hold plugs.

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). Do not allow plants to wilt.

**Humidity:** 40 – 70%

**Fertilizers:** Alternate between calcium-based fertilizers (13-2-13 or 14-4-14) and potassium nitrate (15-5-15) at 75 – 100 ppm nitrogen.

**Growth Regulators:** If needed, spray B-Nine at 1,500 – 2,500 ppm.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis, Rust and/or Botrytis.

**Initiated Bulking** (approximately day 28 – 35): Seedlings develop from juvenile to mature, usually determined by the number of leaves present or daylength. Seedlings are receptive to initiation and flower bud development.

**Light:** Provide 3,500 – 4,500 foot candles (35,000 - 45,000 lux) or 12 – 16 mols of light.

**Temperature:** 62° – 68°F (17° – 20°C)

**Fertilizer:** Alternate between calcium-based fertilizers (13-2-13 or 14-4-14) and potassium nitrate (15-5-15) at 100 – 150 ppm nitrogen. Under high light conditions a 20-10-20 fertilizer can be used; leach with fresh water every third watering.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis, Rust and/or Botrytis.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish** (approximately day 35 - 98): Optimize plant shoot and root growth, which is usually a 1:1 ratio. Flower buds are usually present and developing.

**Media:** pH: 5.5 – 5.8. EC: 1.2 – 1.5; high salts may result in root loss.

**Light:** Provide 3,500 – 4,500 foot candles (15 – 20 total mols or 35,000 – 45,000 lux) to enhance shoot and root growth. Less than 12 hours daylength will result in shorter plants. Greater than 14 hours daylength will delay flowering and result in taller plants.

**Temperature:** 70° – 75°F (21° – 24°C) days; 65° – 68°F (18° - 20°C) nights.

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). Excessive drying of the media moisture level will concentrate salts around the root system and burn the root hairs. Symptoms of excessive drying include lower leaves turning yellow, and dropping.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration under cool, low light conditions.

**Humidity:** 40%

**Fertilizers:** Constant liquid feed at 150 – 200 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14). Under high light conditions, a 17-5-17 fertilizer can be used. Leach with fresh water every third watering.

**Growth Regulators:** If needed, spray B-Nine at 1,500 – 3,500 ppm, or drench Bonzi at 1 – 2 ppm.

**Fungicides:** Preventative fungicide may be applied for Pythium, Rhizoctonia and Thielaviopsis, Rust and/or Botrytis.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to treat:** 1 – 2 weeks prior to finish or shipping.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Pythium, Rhizoctonia, Thielaviopsis, Rust, Botrytis. Monitor moisture and humidity levels and use preventative fungicide drenches.

**Common Pests:** Fungus Gnats, Shore Flies, White Fly, Spider Mites, Beetles, and Thrips. Use pesticides according to label directions.

*continued on next page*



## Constellation™ (continued)

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Part sun to full sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Constellation</b>	24 – 36" (60 – 90 cm)	12 – 14" (30 – 35 cm)

### SUNFLOWER SCHEDULING IN WEEKS

	Constellation
<b>Total crop time</b>	8 – 13
<b>'128' plug crop time</b>	3 – 4
<b>'200' plug crop time</b>	3
<b>'288' plug crop time</b>	3
<b>Transplant to finish crop time from a '200' plug</b>	
<b>4" crop</b>	5 – 6
<b>6" crop</b>	8 – 9
<b>8" crop</b>	9 – 10, depending on number of plugs transplanted

The shortest crops times may be achieved when following recommended optimal culture. Deviation in environmental conditions will result in longer crop times.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Duchess™

### TORENIA FOURNIERI

**Minimum Germination Rate:** 90%

**Seed Product Form:** Pelleted

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 25 – 30 days; 6 – 8 leaves present.

**Flowering Type:** Facultative long-day plant (minor) – long days enhance flowering.

**Specific Flowering Mechanism:** Irradiance (12 – 18 mols) and temperature trigger flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 4 – 6 days.

**Cover:** Do not cover the seed.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 0.75

**Light:** Light is necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch.

**Temperature:** 75°F (22°C) until radicle emergence. Reduce to 65° – 68°F (18° – 20°C).

**Moisture:** Saturated (5) for days 0 – 6 or until radicle emergence. On day 7 reduce moisture to moist (3). Prolonged saturated media will reduce the number of transplantable seedlings.

**Humidity:** 100% until radicle emergence then reduce to 40 – 70%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Fertigation water should not be greater than 0.5.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 1

**Light:** Maximum 3,000 foot candles (30,000 lux). Avoid direct sunlight.

**Temperature:** 65° – 68°F (18° – 20°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Avoid drying plugs to wilting.

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** After cotyledon emergence, fertilize weekly at 50 – 75 ppm nitrogen with a calcium-based fertilizer (14-2-14 or 14-4-14). A little phosphorus is beneficial for improved rooting and flowering. Increase rate to 75 – 100 ppm nitrogen as seedlings mature.

**Growth Regulators:** If desired, B-Nine (daminozide) can be applied to mature seedlings to tone the flat prior to transplant. Also responds to A-rest (ancymidol).

### GROWING ON

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8

• EC: 1.0 – 1.5

**Light:** To avoid heat stress, provide a light shade during the summer months. Low light conditions may cause stretching of stems and delay flowering. Supplemental light may be beneficial during winter/early spring production.

**Temperature:** 60° – 65°F (16° – 18°C) nights; 65° – 70°F (18° – 21°C) days. Night temperatures below 60°F (16°C) may cause leaf curl and leaf discoloration ranging from yellow to red.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** 150 – 200 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14).

**Growth Regulators:** Due to its compact nature, growth regulation should not be necessary. Torenia does respond to Bonzi (paclobutrazol).

**Pinching:** No pinching is necessary due to the natural branching habit of Duchess.

**Common Diseases:** Botrytis, Pythium Root Rot

**Common Pests:** Aphids, Thrips

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings	<b>Light:</b> Filtered sun to full sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 9 – 1

	Garden Height	Garden Width
<b>Duchess</b>	6 – 8" (15 – 20 cm)	6 – 8" (15 – 20 cm)

### TORENIA SCHEDULING IN WEEKS

	Duchess
<b>Total crop time</b>	11 – 13
<b>'288' plug crop time</b>	4 – 5
<b>Transplant to finish crop time</b>	
<b>Packs</b>	7 – 8
<b>4" crop</b>	8 – 9

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Obsession™, Tuscany®

### VERBENA X HYBRIDA

**Minimum Germination Rate:** 85%

**Seed Product Form:** Raw, GoldSmart™ Primed

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 18 – 24; 4 – 6 leaves present.

**Flowering Type:** Facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** Maturity of plant and high light will trigger flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 4 – 7 days.

**Cover:** Cover seeds with a thin layer of medium sized vermiculite to maintain moisture levels.

**Media:** • pH: 5.8 – 6.2  
• EC: <1

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination and reduce stretch compared to seed germinated in the dark.

**Temperature:** 75° – 76°F (24° – 24.5°C) day and night from day 1 – 7; when cotyledons appear reduce temperature to 68°F (20°C).

**Moisture:** Water in plug trays before seeding to moisture level moist (3+), and maintain at (3+) for days 1 – 7 or until radicle emergence. For days 8 – 15, water trays to moisture level wet (4), and allow trays to approach level (3) before resaturating. Beginning day 16, begin alternating between moisture level wet (4), and level medium (2).

**Humidity:** 100% from day 1 – 7 or until seed coats are shed.

**Dehumidify:** On day 8 or after seed coats have shed, reduce to 40%. Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Maintain EC at <1. Fertigation water should not be greater than an EC of 0.5.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.8 – 6.2  
• EC: 1.2 – 1.5

**Light:** Provide 3,500 – 4,500 foot candles (12 – 16 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance shoot and root growth.

**Temperature:** 67° – 68°F (20°C) with a -3 to -5°F (-1.5 to -3°C) DIF or morning drop from day 16 – 44.

**Moisture:** Alternate between moisture levels wet (4), and moist (3). Allow media to approach level moist (3), before re-saturating to level wet (4).

**Fertilizers:** 14-4-14 pr 17-5-17 at 60 – 80 ppm nitrogen to maintain an EC of 1.2 – 1.5; 6 – 8 ppm phosphorus.

**Growth Regulators:** If needed, spray B-Nine (daminozide) at 1,250 – 2,500 ppm. In warmer conditions Bonzi (paclobutrazol) or A-Rest (ancymidol) may be applied

### GROWING ON

**Transplant Ready:** 8 – 10 weeks from a '288' plug tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.8 – 6.2  
• EC: 1.5 – 2.0

**Light:** Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower development. Long days may enhance growth.

**Temperature:** 70°F (21°C) night temperature and 67°F (19°C) day temperature for 3 days after transplanting. Then 68° – 70°F (20° – 21°C) at night, 64° – 67° (18° – 19°C) in the day with a -5 to -10°F (-2° to -3°C) negative DIF from 5 a.m. to 9 a.m.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4), and moist (3). Allow media to approach level (3) before re-saturating to level (4).

**Humidity:** 40%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration for better disease control.

**Fertilizers:** Under high light conditions, apply an ammonium-based feed (17-5-17) at 100 – 150 ppm nitrogen. Under low light conditions, apply a calcium-based feed (14-4-14) at 100 – 150 ppm nitrogen.

**Growth Regulators:** If needed, apply either 1 – 2 applications of B-Nine (daminozide) at 2,500 – 5,000 ppm, A-Rest (ancymidol) at 2 – 5 ppm or Bonzi (paclobutrazol). Also responds to negative DIF treatments of 5 – 10°F (2° – 3°C) for height control.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 3,000 ppm.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Pythium, Rhizoctonia, Powdery Mildew. Monitor moisture levels and utilize preventative fungicide drenches.

**Common Pests:** Fungus gnats, Shore Flies, Aphids, Thrips. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings, beds, hanging baskets	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Tuscany</b>	8 – 10" (20 – 25 cm)	10 – 12" (25 – 30 cm)
<b>Obsession</b>	6 – 8" (15 – 20 cm)	10 – 12" (25 – 30 cm)

### VERBENA SCHEDULING IN WEEKS

	Obsession	Tuscany
<b>Total crop time</b>	10 – 12	12 – 14
<b>'288' plug crop time</b>	6 – 7	6 – 7
<b>Transplant to finish crop time</b>		
<b>Packs</b>	5 – 6	6 – 8
<b>4" crop</b>	6 – 8	7 – 9
<b>6" crop</b>	8 – 9	9 – 10
<b>10" hanging basket</b>	8 – 10	8 – 11

Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.



# Cora<sup>®</sup>, SunStorm<sup>®</sup>, SunDress<sup>™</sup>, SunGlow<sup>™</sup>

## CATHARANTHUS ROSEUS

**Minimum Germination Rate:** 85%

**Seed Product Form:** Raw

### FLOWERING

**Flowering Mechanism:** Irradiance (primary); plants initiate on approximately day 20 with HID light for 16-18 hours OR total 15 – 24 mols (4,250-6,500 foot candles) for 3 – 4 weeks at 75°F (24°C). Bud/flower development occurs day 36 – 70.

**Flowering Type:** Day-neutral plant – high irradiance, temperatures higher than 75°F (24°C) will enhance flowering.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 7): Humidity in the air 100% (humidification) from the time the crop is sown until radicle emergence takes place; root initial has penetrated media; some cotyledon development. Expect radicle emergence in 7 – 8 days.

**Cover:** Seeds may be covered with a medium layer of coarse vermiculite to maintain dark conditions, optimum moisture levels and so roots will penetrate growing media.

**Media:** pH: 5.5 – 5.8; this recommended range will reduce the incidence of Thielaviopsis. Monitor pH frequently because Vinca will naturally raise the soil pH by as much as 0.5 – 1 unit. EC: <0.5 – 0.75. Avoid media compaction to allow for root penetration.

**Light:** Dark conditions are required for germination.

**Moisture:** Saturated (5), from day 1 – 7 or until radicle emergence (approximately day 8). If you are unable to dehumidify on day 8, decrease the moisture level to wet (4+).

**Humidity:** 100% from day 1 – 7 or until seed coats are shed.

**Temperature:** 76° – 78°F (24° – 25°C) until day 7.

**Fertilizers:** Maintain EC of 0.5 – 0.75.

**Germination 2** (approximately Day 8 – 16): Change the humidity in the air (dehumidification) to 40%. The result is better root expansion; cotyledons fully expanded; roots are expanding throughout the growing substrate.

**Media:** pH: 5.5 – 5.8. EC: 1 – 1.25

**Light:** 2,000 – 3,000 foot candles (20,000 – 30,000 lux); 6 – 10 mols of light.

**Moisture:** Dry back media to wet (4) and alternation to moist (3) within 18 hours at radicle emergence (approximately day 8).

**Dehumidify:** Lower relative humidity to 40% (approximately day 8). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 75° – 78°F (24° – 25.6°C).

**Fertilizers:** 14-4-14 or 17-5-17 at 60 – 100 ppm nitrogen as needed for an EC in the soil of 1 – 1.25.

**Fungicides:** Preventative fungicide may be applied for Thielaviopsis and Rhizoctonia between day 7 and 10.

**Plug Bulking/Flower Initiation** (approximately day 17 – 24): Length of vegetative period – time necessary for roots to reach the edge of the plug, for shoots to fill out container, and for plants to become receptive to flower initiation. Before initiation starts, the plants should be a proper size, which includes optimum shoot development, large number of auxiliary shoots and good presentation from pot size to plant size.

**Media:** pH: 5.5 – 5.8. EC: 1.25 – 1.5

**Light:** 3,500 – 5,000 foot candles (35,000 – 50,000 lux); 12 – 18 mols of light.

**Temperature:** 75° – 78°F (24° – 25.6°C)

**Moisture:** Alternate between moisture level wet (4) to medium (2). Allow the soil to approach medium (2), before re-saturating to wet (4). If media is allowed to dry back further than (2), roots damage may occur resulting in a lack of iron uptake. Watering or fertilizing late in the day may increase the susceptibility to airborne disease.

**Fertilizers:** 14-4-14 or 17-5-17 at 75 – 125 ppm nitrogen, as needed for an EC in the soil of 1.25 – 1.5.

**Growth Regulators:** SunStorm requires little to no growth regulators since it is genetically compact. If needed, spray B-Nine (daminozide) at 1,500 – 2,500 ppm.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

**Fungicides:** Preventative fungicide may be applied for Thielaviopsis, Rhizoctonia, Pythium, and Phytophthora.

**Initiated Bulking** (approximately day 25 – 35): Plants are receptive to flowering.

**Light:** Provide 4,750 – 6,000 foot candles (47,500 – 60,000 lux) or 17 – 22 mols of light.

**Temperature:** 75° – 78°F (24° – 25.6°C)

**Fungicides:** Preventative fungicide may be applied for Thielaviopsis, Rhizoctonia, Pythium, and Phytophthora.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish:** Approximately day 36 – 70.

**Media:** pH: 5.5 – 5.8. EC: 1.7 – 2.0

**Light:** Provide 5,000 – 7,500 foot candles (50,000 – 75,000) or 18 – 28 mols.

**Temperature:** 75° – 78°F (24° – 25.5°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to wet (4).

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 100 – 150 ppm, as needed for an EC in the soil of 1.7 – 2.

**Growth Regulators:** SunStorm is a genetically compact so growth regulators are normally not required. B-Nine (daminozide) at 2,500 – 5,000 ppm or A-Rest (ancymidol) at 2 – 4 ppm can be used for the other Vinca.

**Fungicides:** Preventative fungicide may be applied for Rhizopus, Thielaviopsis, Rhizoctonia, Pythium, and Phytophthora.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 3,000 ppm.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Thielaviopsis, Rhizoctonia, Pythium. Monitor moisture and humidity levels and use preventative fungicide drenches.

**Common Pests:** Fungus Gnats, Shore Flies and Thrips. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Jumbo packs, pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Cora</b>	14 – 16" (35 – 40 cm)	22 – 25" (55 – 62 cm)
<b>SunStorm</b>	8 – 10" (20 – 25 cm)	10 – 12" (25 – 30 cm)
<b>SunDress</b>	8 – 10" (20 – 25 cm)	12 – 14" (30 – 35 cm)
<b>SunGlow</b>	10 – 12" (25 – 30 cm)	12 – 14" (30 – 35 cm)

### VINCA SCHEDULING IN WEEKS

	Cora	SunStorm	SunDress	SunGlow
<b>Total crop time</b>	11 – 18	10-14	12-15	11-14
<b>'288' plug crop time</b>	5 – 7	5 – 7	5 – 7	5 – 7
<b>'200' plug crop time</b>	6 – 7	6 – 7	6 – 7	6 – 7
<b>Transplant to finish crop time</b>				
<b>Jumbo packs</b>	5 – 8	4 – 6	N/A	4-6
<b>4" crop</b>	5 – 9	5 – 8	5 – 9	5 – 8
<b>6" crop</b>	6 – 10	6 – 8	7 – 10	5 – 8

\*Depending on the number of plugs per container.

The shortest crops times may be achieved when following recommended optimal culture. Deviation in environmental conditions will result in longer crop times.



## Cora<sup>®</sup> Cascade<sup>™</sup>, SunShower<sup>™</sup>

### CATHARANTHUS ROSEUS

**Minimum Germination Rate:** 85%

**Seed Product Form:** Raw

### FLOWERING

**Flowering mechanism:** Irradiance (primary); plants initiate on approximately day 20 with HID light for 16 – 18 hours OR total 15 – 24 mols (4,250-6,500 foot candles) for 3 – 4 weeks at 75°F (24°C). Bud/flower development will occur between days 36 – 70.

**Flowering Type:** Day-neutral plant – high irradiance, temperatures higher than 75°F (24°C) will enhance flowering.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 7): Humidity in the air 100% (humidification) from the time the crop is sown until radicle emergence takes place; root initial has penetrated media; some cotyledon development. Expect radicle emergence in 7 – 8 days.

**Cover:** Seeds may be covered with a medium layer of coarse vermiculite to maintain dark conditions, optimum moisture levels and so roots will penetrate growing media.

**Media:** pH: 5.5 – 5.8; this recommended range will reduce the incidence of Thielaviopsis. Monitor pH frequently because vinca will naturally raise the soil pH by as much as 0.5 – 1 unit. EC: <0.5 – 1. Avoid media compaction to allow for root penetration.

**Light:** Dark conditions are required for germination.

**Moisture:** Saturated (5), from day 1 – 7 or until radicle emergence (approximately day 8). If you are unable to dehumidify on day 8, decrease the starting moisture level from saturated (5) to wet (4+).

**Humidity:** 100% from day 1 – 7 or until seed coats are shed.

**Temperature:** 76° – 78°F (24° – 25°C) until day 7.

**Fertilizers:** Maintain EC of 0.5 – 1.

**Germination 2** (approximately day 8 – 16): Change the humidity in the air (dehumidification) to 40%. The result is better root expansion; cotyledons fully expanded; roots are expanding throughout the growing substrate.

**Media:** pH: 5.5 – 5.8. EC: 1 – 1.25

**Light:** 2,000 – 3,000 foot candles (20,000 – 30,000 lux); 6 – 10 mols of light.

**Moisture:** Dry back media to wet (4) and alternation to moist (3) within 18 hours at radicle emergence (approximately day 8).

**Dehumidify:** Lower relative humidity to 40% (approximately day 8). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 75° – 78°F (24° – 25.6°C).

**Fertilizers:** 14-4-14 or 17-5-17 at 60 – 100 ppm nitrogen as needed for an EC in the soil of 1 – 1.25.

**Fungicides:** Preventative fungicide may be applied for Thielaviopsis and Rhizoctonia between day 7 and 10.

**Plug Bulking/Flower Initiation** (approximately day 17 – 24): Length of vegetative period – time necessary for roots to reach the edge of the plug, for shoots to fill out container, and for plants to become receptive to flower initiation. Before initiation starts, the plants should be a proper size, which includes optimum shoot development, large number of auxiliary shoots and good presentation from pot size to plant size.

**Media:** pH: 5.5 – 5.8. EC: 1.25 – 1.75

**Light:** 3,500 – 5,500 foot candles (35,000 – 55,000 lux); 12 – 20 mols of light.

**Temperature:** 75° – 78°F (24° – 25.6°C)

**Moisture:** Alternate between moisture level wet (4) to medium (2). Allow the soil to approach medium (2), before re-saturating to wet (4). If media is allowed to dry back further than (2), root damage may occur resulting in a lack of iron uptake. Watering or fertilizing late in the day may increase the susceptibility to airborne disease.

**Fertilizers:** 14-4-14 or 17-5-17 at 75 – 125 ppm nitrogen, as needed for an EC in the soil of 1.25 – 1.75.

**Growth Regulators:** If needed, spray B-Nine (daminozide) at 1,500 – 2,500 ppm.

**Fungicides:** Preventative fungicide may be applied for Thielaviopsis, Rhizoctonia, Pythium, and Phytophthora.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

**Initiated Bulking** (approximately day 25 – 35): Plants are receptive to flowering.

**Light:** Provide 4,750 – 7,500 foot candles (47,500 – 75,000 lux) or 17 – 28 mols of light.

**Temperature:** 75° – 78°F (24° – 25.6°C)

**Fertilizers:** 14-4-14 or 17-5-17 at 75 – 150 ppm nitrogen, as needed for an EC in the soil of 1.25 – 1.75.

**Fungicides:** Preventative fungicide may be applied for Thielaviopsis, Rhizoctonia, Pythium, and Phytophthora.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant to Finish:** approximately day 36 – 84.

**Media:** pH: 5.5 – 5.8. EC: 1.7 – 2.

**Light:** Provide 5,000 – 7,500 foot candles (50,000 – 75,000) or 18 – 28 mols.

**Temperature:** 75° – 78°F (24° – 25.5°C).

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to wet (4).

**Humidity:** 40%

**Fertilizers:** 14-4-14 or 17-5-17 at 100 – 175 ppm, as needed for an EC in the soil of 1.7 – 2.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 5,000 ppm or A-Rest (ancymidol) at 2 – 4 ppm.

**Fungicides:** Preventative fungicide may be applied for Rhizopus, Thielaviopsis, Rhizoctonia, Pythium, and Phytophthora.

### TECHNIQUES TO ENHANCE POST HARVEST QUALITY

**When to Treat:** 1 – 2 weeks prior to finish or shipping.

**Growth Regulators:** B-Nine (daminozide) at 2,500 – 3,000 ppm.

**Fertilizer:** Potassium nitrate drench at 150 ppm nitrogen.

**Common Diseases:** Thielaviopsis, Rhizoctonia, Pythium. Monitor moisture and humidity levels and use preventative fungicide drenches.

**Common Pests:** Fungus Gnats, Shore Flies and Thrips. Use pesticides according to label directions.

PRODUCT USE	GARDEN SPECIFICATIONS
Pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 11 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Cora Cascade</b>	6 – 8" (15 – 20 cm)	32 – 36" (81 – 91 cm)
<b>SunShower</b>	6 – 8" (15 – 20 cm)	18 – 24" (45 – 60 cm)

### VINCA TRAILING SCHEDULING IN WEEKS

	Cora Cascade	SunShower
<b>Total crop time</b>	12 – 18	12 – 18
<b>'128' Plug crop time</b>	7 – 8	7 – 8
<b>'200' Plug crop time</b>	6 – 7	6 – 7
<b>'288' Plug crop time</b>	5 – 7	5 – 7
<b>*Transplant to finish crop time</b>		
<b>6" crop</b>	8 – 9	8 – 9
<b>8" crop</b>	9 – 10	9 – 10
<b>10" hanging basket</b>	10 – 11	10 – 11

\*Depending on number of plugs transplanted

The shortest crops times may be achieved when following recommended optimal culture. Deviation in environmental conditions will result in longer crop times.



## Endurio<sup>®</sup>, Penny<sup>™</sup>, Rocky<sup>™</sup>

### VIOLA CORNUTA

**Minimum Germination Rate:** Penny 85%; Endurio, Rocky 90%

**Seed Product Form:** Raw, GoldSmart<sup>™</sup> Primed

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 16 – 24; 2 – 3 sets of true leaves.

**Flowering Type:** Penny is a facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** Daylength and irradiance triggers flowering. Cool night temperatures enhance flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 3 – 4 days.

**Cover:** Seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** pH: 5.5 – 5.8 Lower pH levels will discourage Thielaviopsis outbreaks and boron deficiencies which may cause tip abortion and stunted growth. EC: <0.75

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination dramatically compared to seed germinated in the dark.

**Temperature:** 68° – 70°F (20° – 21°C) until radicle emergence. Reduce to 65° – 68°F (18° – 20°C) until cotyledon expansion.

**Moisture:** Saturated (5) on day 1. On days 2 – 3 reduce moisture to wet (4) until radicle emergence. On day 7, reduce further to moist (3). Non-uniform germination may result if media conditions are too dry.

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Fertigation water should not be greater than an EC of 0.5.

**Plug Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell AND to make the plant receptive to flower initiation.

**Media:** pH: 5.5 – 5.8. EC: <1 Violas are sensitive to high salts, avoid EC levels exceeding 1.5.

**Light:** Provide 2,000 – 3,000 foot candles (20,000 – 30,000 lux) maximum. Violas should not be given night interruption as premature flowering may occur.

**Temperature:** 65°F (18°C) nights; 65° – 68°F (18° – 20°C) days. Cool nights will prevent seedling stretch. After several sets of true leaves have appeared, drop night temperatures to 59°F (15°C) to initiate flowering.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and moist (3). Allow media to approach level (3) before re-saturating to level (4). Alternating moisture levels encourages root development. Do not allow seedlings to wilt. Continuously saturated media will limit oxygen availability, discourages optimal root development and promotes seedling stretch.

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed established seedlings at 75 ppm nitrogen with a calcium-based fertilizer (14-4-14). As seedling matures, increase rate to 100 ppm nitrogen. An ammonium concentration >5 ppm will cause seedling stretch. Upward cupping of leaves may indicate calcium deficiency.

**Growth Regulators:** If necessary, apply B-Nine (daminozide) at 2,500 ppm to tone the finished plug tray.

### GROWING ON

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*

**Media:** pH: 5.5 – 5.8 At pH levels >6.5, Thielaviopsis may develop as black lesions on the roots. Symptoms also include yellowing of lower leaves and die back of the plant. Stressed plants under high temperatures are most likely to be affected. EC: 1.0 Viola roots are sensitive to high salts.

**Light:** Provide full sun.

**Temperature:** During the cool season, a night temperature of 59°F (15°C) will promote early flowering. Temperatures below 59°F (15°C) will promote a hardier plant, but will increase crop time and delay flowering. Keep days below 68°F (20°C) or as cool as possible during warm weather conditions.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Saturated media for extended periods will induce stretching. When growing under warm temperatures and high light conditions, do not allow the plants to wilt.

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed every 2 – 3 waterings at 100 – 150 ppm nitrogen with a calcium based fertilizer (13-2-13). If desired, an application of ammonium nitrate (17-5-17) will help expand leaves. During cool weather production, ammonium-based feeds may encourage root rot problems. High nitrogen concentrations may promote stretching.

**Nutrition:** Malformed, puckered and upward cupped leaves indicate calcium deficiencies. To prevent this, fertilize with calcium nitrate or add calcium sulfate to the growing media before transplant. Boron deficiencies can be distinguished by tip abortion, upper leaf stunting, puckering and thickening of leaves, along with shortened internodes and/or a gnarled mass of lateral shoots. Violas tend to be more sensitive to boron deficiencies than pansies. Boron deficiency is more prevalent during warm weather with frequent watering. pH levels <6 will ensure boron is more readily available to the plant. A one-time application of Solubor will help overcome these problems. NOTE: An overdose of Bonzi (paclobutrazol) may also produce symptoms similar to boron or calcium deficiencies.

**Growth Regulators:** Violas respond to DIF treatments, B-Nine (daminozide) and A-Rest (ancymidol). NOTE: Malformed leaves and leathery growth may occur if B-Nine is applied at 5000+ ppm when temperatures exceed 90°F (32°C).

**Common Diseases:** Alternaria Leaf Spot, Downy Mildew, Thielaviopsis Root Rot, Cercospora Leaf Spot

**Common Pests:** Aphids

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 4 <b>AHS Heat Zone:</b> 9 – 1

	Garden Height	Garden Width
<b>Endurio</b>	4 – 6" (10 – 15 cm)	8 – 12" (20 – 30 cm)
<b>Penny, Rocky</b>	4 – 6" (10 – 15 cm)	4 – 6" (10 – 15 cm)

### VIOLA SCHEDULING IN WEEKS

	Endurio, Penny, Rocky
<b>Total crop time</b>	9 – 10 for fall sales; 11 – 13 for spring sales
<b>'288' plug crop time</b>	4 – 5
<b>Transplant to finish crop time</b>	Production timing will vary depending on whether the crop is grown under warm or cool conditions. Crop time for spring sales is longer due to cooler temperatures during the winter production months.
<b>Packs</b>	4 – 5
<b>4" crop</b>	5 – 6
<b>6" crop</b>	6 – 7



## Patiola®

### VIOLA CORNUTA

**Minimum Germination Rate:** 90%

**Seed Product Form:** Raw

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 16 – 24; 2 – 3 sets of true leaves.

**Flowering Type:** Patiola is a facultative long-day plant – long days enhance flowering.

**Specific Flowering Mechanism:** Daylength and irradiance triggers flowering. Cool night temperatures enhance flowering.

### PLUG CULTURE

The timing approximations are based on optimal culture recommendations below:

**Germination 1** (approximately day 1 – 4): From the time a seed is sown until radicle emergence takes place; usually with the root penetrating the media and some cotyledon development. Humidity in the air is 95 – 98% (humidification); media moisture 4+ – 5. Expect radicle emergence in 3 – 4 days.

**Cover:** Seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** pH: 5.5 – 5.8; this recommended range will reduce the incidence of Thielaviopsis outbreaks and boron deficiencies which may cause tip abortion and stunted growth. EC: <0.75. Avoid media compaction to allow for root penetration.

**Light:** Light is not necessary for germination. If utilizing a chamber, providing a light source of 10 – 100 foot candles (100 – 1,000 lux) will improve germination dramatically compared to seed germinated in the dark.

**Moisture:** Saturated (5) on day 1. On days 2 – 3 reduce moisture to wet (4) until radicle emergence. On day 7, reduce further to moist (3). Non-uniform germination may result if media conditions are too dry.

**Humidity:** 100% from day 1 – 4 or until seed coats are shed then reduce to 40%.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** 65° – 68°F (18 – 20°C) until radicle emergence. Then reduce gradually to 62° – 65°F (17° – 18°C) as seedlings mature.

**Fertilizers:** Maintain EC of <0.75. Fertigation water should not be greater than an EC of 0.5.

**Germination 2** (approximately day 5 – 14): Change the humidity in the air (dehumidification) to 40%. The result is better root expansion; cotyledons fully expanded; roots are expanding throughout the growing substrate.

**Media:** pH: 5.5 – 5.8. EC: 0.5 – 0.75

**Light:** 2,000 – 2,500 foot candles (20,000 – 25,000 lux); 6 – 8 mols of light.

**Moisture:** Dry back media to wet (4) and alternate to moist (3) within 18 hours at radicle emergence (approximately day 6).

**Dehumidify:** Lower relative humidity to 40% (approximately day 5). Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Temperature:** Once cotyledons are observed, reduce temperature to 64° – 67°F (17.5° – 19.5°C); -2 to -3°F (-1.5 to -2°C) DIF or morning drop.

**Fertilizers:** 14-4-14 or 17-5-17 at 60 – 75 ppm nitrogen as needed for an EC in the soil of 0.5 – 0.75. Maintain a boron concentration of 0.5 ppm in the soil.

**Growth Regulators:** B-Nine spray at 2,500 ppm if stem stretch is observed

**Fungicides:** Preventative fungicide may be applied for Thielaviopsis and Rhizoctonia between day 7 and 10.

**Plug Bulking/Flower Initiation** (approximately day 15 – 21): The time it takes for the shoots to proportionately fill the plug cell and for roots to develop throughout the media. Induction and initiation may occur; if buds are present, they should be few in number and small in size.

**Media:** pH: 5.5 – 5.8. EC: 0.5 – 1.

**Light:** 2,500 – 3,500 foot candles (25,000 – 35,000 lux); 8 – 12 mols of light.

**Temperature:** 65°F (18°C) nights; 65° – 68°F (18° – 20°C) days. Cool nights will prevent seedling stretch. After several sets of true leaves have appeared, drop night temperatures to 59°F (15°C) to initiate flowering.

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4).

**Humidity:** 40 – 60%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration under cool, low light conditions.

**Fertilizers:** Feed established seedlings with a calcium-based fertilizer (14-4-14) at 50 – 150 ppm nitrogen. Use the lower rates on younger seedlings. An ammonium concentration >5 ppm nitrogen will cause seedling stretch.

**Growth Regulators:** Violas can be treated when the first true leaves are fully developed. Apply B-Nine (daminozide) at 2,500 – 5,000 ppm. A-Rest (ancymidol) can also be used. Violas also respond to negative DIF treatments, -5 to -10°F (-3 to -6°C) DIF or morning drop.

**Fungicides:** May be applied for the prevention of Thielaviopsis.

**Initiated Bulking** (approximately day 22 – 34): Seedlings develop from juvenile to mature, usually determined by the number of leaves present (cultivar specific). Seedlings are receptive to initiation and flower bud development.

**Light:** Provide 4,250 – 5,500 foot candles (42,500 – 55,000 lux) or 15 – 20 mols of light.

**Temperature:** 64° – 67°F (17.5° – 19.5°C)

**Fertilizer:** 14-4-14 or 17-5-17 at 100 – 125 ppm, 8 – 12 ppm phosphorus. Maintain a boron concentration of 0.5 ppm in the soil.

**Growth Regulators:** B-Nine spray at 2,500 – 7,500 ppm; A-Rest 2 – 3 ppm.

**Fungicides:** Fungicides may be applied for the prevention of Thielaviopsis.

### GROWING ON

The timing approximations are based on optimal culture recommendations below:

**Transplant Ready:** 4 – 5 weeks from sow in a '288' tray.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** pH: 5.5 – 5.8 At pH levels >6.5, Thielaviopsis may develop as black lesions on the roots. Symptoms also include yellowing of lower leaves and die back of the plant. Stressed plants under high temperatures are most likely to be affected. EC: 1.0 Viola roots are sensitive to high salts.

**Light:** Provide full sun.

**Temperature:** During the cool season, a night temperature of 59°F (15°C) will promote earlier flowering. Temperatures below 59°F (15°C) will promote a more cold-hardy plant, but will increase crop time and delay flowering. Keep days below 68°F (20°C) or as cool as possible during warm weather conditions.

**Average Daily Temperature (ADT):** 67°F (19°C)

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Saturated media for extended periods will induce stretching. When growing under warm temperatures and high light conditions, do not allow the plants to wilt.

**Humidity:** 40 – 70%

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Feed every 2 – 3 watering at 100 – 150 ppm nitrogen with a calcium-based fertilizer (13-2-13). If desired, an application of ammonium nitrate (17-5-17) will help expand leaves. During cool weather production, ammonium-based feeds may encourage root rot problems. High nitrogen concentrations may promote stretching.

**Nutrition:** Malformed, puckered and upward cupped leaves indicate calcium deficiencies. To prevent this, fertilize with calcium nitrate or add calcium sulfate to the growing media before transplant. Boron deficiencies can be distinguished by tip abortion, upper leaf stunting, puckering and thickening of leaves, along with shortened internodes and/or a gnarled mass of lateral shoots. Violas tend to be more sensitive to boron deficiencies than pansies. Boron deficiency is more prevalent during warm weather with frequent watering. pH levels <6 will ensure boron is more readily available to the plant. A one-time application of Solubor will help overcome these problems. NOTE: An overdose of Bonzi (paclobutrazol) may also produce symptoms similar to boron or calcium deficiencies.

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## Patiola®

**Growth Regulators:** Violas respond to DIF treatments, B-Nine (daminozide) and A-Rest (ancymidol). NOTE: Malformed leaves and leathery growth may occur if B-Nine is applied at 5,000+ ppm when temperatures exceed 90°F (32°C).

**Common Diseases:** Alternaria Leaf Spot, Downy Mildew, Thielaviopsis Root Rot, Cercospora Leaf Spot

**Common Pests:** Aphids

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 8 <b>AHS Heat Zone:</b> 9 – 1

	Garden Height	Garden Width
<b>Patiola</b>	4 – 6" (10 – 15 cm)	4 – 6" (10 – 15 cm)

### VIOLA SCHEDULING IN WEEKS

	Patiola
<b>Total crop time</b>	9 – 10 fall sales; 11 – 13 spring sales
<b>'288' plug crop time</b>	4 – 5
<b>Transplant to finish crop time</b>	Timing will vary for production depending on whether the crop is grown under warm or cool conditions. Crop time for spring sales is longer due to cooler temperatures during the winter months in which it is grown.
<b>Packs</b>	4 – 5
<b>4" crop</b>	5 – 6
<b>6" crop</b>	6 – 7

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



## Magellan™, Short Stuff™, Swizzle™, Uproar™, Zowie!™

### ZINNIA ELEGANS

**Minimum Germination Rate:** 85%

**Seed Product Form:** Raw, coated

### FLOWERING

**Time frame when plants are receptive to flower initiation:** Days 18 – 24 days; 6 – 8 leaves.

**Flowering Type:** Zinnias are facultative short-day plants – short days enhance flowering.

**Specific Flowering Mechanism:** Short days needed for bud initiation; long days enhance flowering development. Irradiance overall enhances flowering.

### PLUG CULTURE

**Germination:** Optimum conditions for seedling development that begins the day the crop is sown until cotyledon expansion. Expect radicle emergence in 1 day.

**Cover:** Seeds may be covered with a thin layer of coarse vermiculite to maintain moisture levels.

**Media:** • pH: 5.5 – 5.8

• EC: <0.5 Zinnias are very sensitive to high salts.

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

**Moisture:** Saturated (5) for days 1 – 3. Beginning day 4, reduce to level moist (3). On day 10, reduce further to medium (2).

**Humidity:** 100% until radicle emergence then reduce to 40%.

**Temperature:** 70° – 75°F (21° – 24°C) until radicle emergence. Reduce to 65° – 68°F (18° – 20°C) until cotyledon expansion.

**Plug Bulking:** Optimum conditions during the vegetative period, beginning at cotyledon expansion, needed for the root to reach the edge of the plug cell. Stressful conditions may promote premature flowering in the plug trays. Budded seedlings may not size up properly in the finish container.

**Media:** • pH: 5.5 – 5.8

• EC: 0.5 – 0.75

**Light:** Lighting may trigger premature flowering in the plug. Provide 3,000 – 3,500 foot candles (30,000 – 35,000 lux)

**Temperature:** 65° – 68°F (18° – 20°C) after radicle emergence. As seedling matures, reduce temperatures to 62° – 65°F (17° – 18°C).

**Moisture:** Alternate between moisture levels wet (4) and medium (2). Allow media to approach level (2) before re-saturating to level (4). Do not overwater or let plants wilt.

**Humidity:** Zinnias prefer low humidity.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** If desired fertilize established seedlings at 25 – 35 ppm nitrogen with a calcium-based fertilizer (13-2-13).

**Growth Regulators:** Zinnias will respond to B-Nine (daminozide) at 2,500 ppm.

### GROWING ON

Good air circulation and water management are essential to produce healthy zinnias.

**Transplant Ready:** 2 – 3 weeks from sow in a '288' tray. Transplant as soon as root system is established. Root-bound plugs do not transplant well. Zinnias can also be sown directly into the finish container.

**Finish Bulking/Flower Initiation:** Optimum conditions during the vegetative period, beginning at transplant, needed for the root to reach the edge of the container AND to make the plant receptive to flower initiation.

**Media:** • pH: 5.5 – 5.8

• EC: 1

**Light:** Low light conditions will promote stretching of Zinnias. Crops finished under short days tend to exhibit a greater number of single blooms. Long days will correct this situation. Provide 3,500 – 4,500 foot candles (12 – 15 total mols or 35,000 – 45,000 lux) to hasten flower induction. Supplemental lighting under low light conditions at 350 – 450 foot candles (35,000 – 45,000 lux) will enhance flower development.

**Temperature:** 60° – 65°F (15° – 18°C) nights; 70° – 85°F (21° – 29°C) days.

**Moisture:** Alternate between moisture levels medium (3) and dry (1). Allow media to approach level (1) before re-saturating to level (3). Water early in the day to allow the foliage to dry thoroughly before night fall. Rapid drying of the foliage will discourage disease outbreaks.

**Humidity:** Zinnias prefer low humidity.

**Dehumidify:** Provide horizontal airflow to aid in drying down the media through evapotranspiration, allowing better penetration of oxygen to the roots.

**Fertilizers:** Fertilize weekly at 200 ppm nitrogen with a calcium-based fertilizer (13-2-13 or 14-4-14).

**Growth Regulators:** Pack production of Short Stuff may require one application of B-Nine (daminozide) at 5,000 ppm. Other Zinnias may need additional applications. Also responds to DIF treatments, A-Rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniconazole) or B-Nine/Cycocel (chlormequat chloride) tank mix.

**Common Diseases:** Powdery Mildew, Botrytis Blight, Bacterial Leaf Spot, Alternaria Leaf Spot

**Common Pests:** Aphids, Whitefly, Thrips

PRODUCT USE	GARDEN SPECIFICATIONS
Packs, pots, gallons, containers, mass plantings	<b>Light:</b> Full sun <b>USDA Hardiness Zone:</b> 10 <b>AHS Heat Zone:</b> 12 – 1

	Garden Height	Garden Width
<b>Short Stuff</b>	8 – 10" (20 – 25 cm)	10 – 12" (25 – 30 cm)
<b>Swizzle</b>	10 – 12" (25 – 30 cm)	10 – 12" (25 – 30 cm)
<b>Magellan</b>	12 – 14" (30 – 35 cm)	10 – 12" (25 – 30 cm)
<b>Uproar</b>	28 – 36" (70 – 90 cm)	24 – 27" (60 – 68 cm)
<b>Zowie!</b>	24 – 30" (60 – 76 cm)	24 – 27" (60 – 68 cm)

### ZINNIA SCHEDULING IN WEEKS

	Magellan, Short Stuff, Swizzle	Uproar, Zowie!
<b>Total crop time</b>	8 – 9	8 – 11
<b>'288' Plug crop time</b>	1 – 2	2 – 3
<b>*Transplant to finish crop time</b>		
<b>Packs</b>	6 – 7	6 – 7
<b>4" crop</b>	7 – 8	7 – 8
<b>6" crop</b>	7 – 8	7 – 8

Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.

# Annuals: Guidelines and Schedules

SERIES	SEED FORM	MINIMUM GERM.	CROP TIME IN WEEKS	CONTAINER SIZE	GARDEN HEIGHT
Ageratum Fields™	Pelleted, Raw	90%	12–14	Packs, 4" - 6"	14–16"
Ageratum Tycoon™	Pelleted, Raw	85%	10–12	Packs, 4" - 6"	6–8"
Aquilegia Origami™	Raw	85%	20–24	Jumbos – 6"	14-16"
Begonia semperflorens Bada Bing®	Pelleted, Raw	90%	11–13	Packs, 4" - 6", Hanging Baskets	8–10"
Begonia semperflorens Bada Boom®	Pelleted, Raw	90%	11–13	Packs, 4" - 6", Hanging Baskets	8–10"
Begonia semperflorens Bayou™	Pelleted	85%	12–14	4" - 6"	14–16"
Begonia semperflorens Eureka™	Pelleted, Raw	85%	13–15	Packs, 4" - 6", Hanging Baskets	9–12"
Begonia tuberosa Go–Go™	Pelleted	85%	15–18	4–6", Hanging Baskets	8 - 10"
Begonia hybrida Braveheart®	Pelleted, Raw	85%	12–14	4" - 6", Hanging Baskets	14–16"
Begonia Varsity™	Pelleted, Raw	85%	12–14	Packs, 4" - 6", Hanging Baskets	8–10"
Begonia Volumia™	Pelleted, Raw	90%	12–14	Packs, 4" - 6", Hanging Baskets	12–14"
Campanula Isabella™	Pelleted, Raw	85%	17–24	4–6"	8-10"
Cineraria Jester®	Pelleted, Raw	90%	16–18	4–6"	8–10"
Cineraria Venezia™	Raw	85%	14–16	4–6"	7–9"
Cleome Sparkler™	GoldSmart™ Primed	75%	13–15	6" and larger	3.5–4'
Cyclamen intermediate Canto™	Raw	85%	25-27	4"	10–12"
Cyclamen intermediate Laser™	Raw	85%	26–28	4-5"	10–12"
Cyclamen intermediate Sterling™	Raw	85%	25–29	4-5"	10–12"
Cyclamen mini Midori™	Raw	85%	25–27	2.5 - 4.5"	6–8"
Cyclamen mini Miracle™	Raw	85%	24–26	2.5 - 4.5"	8-10"
Cyclamen mini Silverado™	Raw	85%	24–26	2.5 - 4.5"	6-8"
Cyclamen mini SilverHeart™	Raw	85%	24–26	3.5-5"	8-10"
Cyclamen standard Rainier™	Raw	85%	31–35	5-8"	14-16"
Cyclamen standard Sierra/ Sierra Synchro™	Raw	85%	28–32	4–6.5"	12-14"
Cyclamen standard Winter Ice™	Raw	85%	28–32	5-8"	12-14"
Cyclamen standard Concerto™	Raw	85%	28-32	4–6.5"	12-14"
Dahlia Hello!™	Raw	80%	9–12	4" and larger	7–9"
Dahlia Fresco™	Raw, Film Coated	70%	9–10	4" and larger	10–12"
Dahlia Harlequin™	Raw, Film Coated	70%	8–9	4" and larger	12–14"
Dianthus chinensis Barbarini®	Pelleted, Raw	85%	15–18	Packs, 4", 6", gallon	8–10"
Dianthus chinensis Charms™	Pelleted, Raw	85%	15–18	Packs, 4", 6", gallon	8–10"
Dianthus chinensis Super Parfait™	Pelleted, Raw	85%	15–18	Packs, 4", 6", gallon	6–8"
Dianthus interspecific Dulce™	Pelleted, Raw	85%	15–18	Packs, 4", 6", gallon	10–12"
Dianthus interspecific Fandango™	Pelleted, Raw	85%	16–19	4", 6", gallon	16–18"
Dianthus x barbatus Diabunda™	Pelleted, Raw	90%	9–11	Packs, 4", 6" & gallon	8-10"
Dianthus interspecific Elation™	Pelleted, Raw	85%	9–11	Packs, 4", 6" & gallon	6–8"

# Annuals: Guidelines and Schedules

SERIES	SEED FORM	MINIMUM GERM.	CROP TIME IN WEEKS	CONTAINER SIZE	GARDEN HEIGHT
Digitalis Camelot™	Pelleted	85%	20–24	6", Gallon	3.5–4'
Eustoma cut Cinderella™ and Twinkle™	Pelleted, Raw	85%	22–26	N/A	N/A
Eustoma Lizzy™	Pelleted, Raw	85%	22–26	Packs, 4–6"	10–12"
Gaillardia Plume™	Raw	70%	12–15	4 - 8"	12–14"
Gazania Big Kiss™	Raw	90%	13–15	4–6"	10–12"
Gazania Kiss™	Raw	90%	13–15	4–6"	8–10"
Gazania Gazoo™	Raw	80%	12–14	4–6"	10–12"
Geranium (Ivy) Tornado™	Coated	80%	12–16	4-8", Hanging Basket	8-10"
Geranium BullsEye™	Coated	90%	13–15	4–6"	13–15"
Geranium Elite™	Coated	90%	13–14	Packs, 4–6"	10–12"
Geranium Maverick™	Coated	90%	12–15	4–6"	14–16"
Geranium Multibloom™	Coated	90%	11–12	Packs, 4"	10–12"
Geranium Orbit/Orbit Synchro™	Coated	90%	13–14	4–6"	12–14"
Geranium Pinto™	Coated	90%	12–14	4–6"	14–16"
Geranium Ringo 2000™	Coated	90%	11–13	Packs, 4"	12–14"
Gerbera Jaguar™	Raw	90%	Winter/Spring: 17–19, Summer: 16–18	4 -6", Hanging Basket	8–10"
Heliotrope Blue Wonder™	Raw	65%	12–14	4–6"	12–15"
Impatiens Accent™	Raw	95%	10–11	Packs, 4- 6", Hanging Basket	10–12"
Impatiens Mosaic™	Raw	90%	10–11	Packs, 4- 6", Hanging Basket	12–14"
Impatiens Victorian™	Raw	85%	10–11	Packs, 4- 6", Hanging Basket	10–12"
Impatiens Xtreme™	Raw	95%	9–10	Packs, 4- 6", Hanging Basket	8–10"
Impatiens Blitz 3000™	Raw	90%	11–12	Packs, 4- 6", Hanging Basket	12–14"
Impatiens Jambalaya®	Raw	95%	10–11	Packs, 4- 6", Hanging Basket	8–10"
Impatiens Shimmer®	Raw	95%	10–11	Packs, 4- 6", Hanging Basket	10–12"
Laurentia Starshine™	Raw, MultiPellets	80%	17–20	4", Hanging Basket	8–12"
Marigold Antigua™	Detailed, Coated	85%	10–12	Packs, 4"	10–12"
Marigold Inca II™	Detailed, Coated	85%	12–13	Packs, 4"	12–14"
Marigold Moonsong™	Detailed, Coated	85%	10–12	Packs, 4"	12-15"
Marigold Moonstruck®	Detailed, Coated	85%	12–13	Packs, 4"	12–14"
Marigold Perfection™	Detailed, Coated	85%	13–14	Packs, 4"	14–16"
Marigold Lunacy™	Detailed, Coated	85%	12–13	Packs, 4"	10–12"
Melampodium Medallion™	Raw	75%	8–10	6"- 8"	20–25"
Nicotiana Saratoga™	Pelleted, Raw	85%	9–11	Packs, 4–6"	10–12"
Ornamental Pepper Explosive™ Blast	Raw	85%	17–20	Jumbo, 4- 6"	5-6"
Ornamental Pepper Explosive™ Ember	Raw	85%	17–20	Jumbo, 4- 6"	10-12"

# Annuals: Guidelines and Schedules

SERIES	SEED FORM	MINIMUM GERM.	CROP TIME IN WEEKS	CONTAINER SIZE	GARDEN HEIGHT
Ornamental Pepper Explosive™ Ignite	Raw	85%	17–20	Jumbo, 4- 6"	3-5"
Osteospermum Asti™	Raw	85%	14–18	4- 6"	17–20"
Pansy Karma™	Raw, GoldSmart™ Primed	90%	10–12 fall, 12–14 spring	Packs, 4"	6–8"
Pansy Mammoth™	Raw, GoldSmart™ Primed	90%	10–12 fall, 12–14 spring	Packs, 4"	6–8"
Pansy Mariposa™	Raw, GoldSmart™ Primed	85%	10–12 fall, 12–14 spring	Packs, 4"	6–8"
Pansy Colossus™	Raw, GoldSmart™ Primed	90%	11–12 fall, 13–14 spring	Packs, 4"	4–5"
Pansy Delta™	Raw, GoldSmart™ Primed	90%	10–12 fall, 11–13 spring	Packs, 4"	4–6"
Pansy Sky™	Raw, GoldSmart™ Primed	90%	11–13	Packs, 4"	5–6"
Penstemon barbatus Pinacolada™	Raw	75%	14–18	4- 8"	8–10"
Pentas Starla™	Pelleted, Raw	85%	15–18	Packs, 4-6"	14–18"
Petunia grandiflora Frost™	Pelleted, Raw	85%	9–11	Packs, 4"	12–14"
Petunia grandiflora Storm™	Pelleted, Raw	90%	9–11	Packs, 4"	12–14"
Petunia grandiflora Ultra™	Pelleted, Raw	90%	9–11	Packs, 4"	12–14"
Petunia milliflora Picobella™	Pelleted, Raw	90%	8–11	Packs, 4"	8–10"
Petunia multiflora PrimeTime™	Pelleted, Raw	85%	9–11	Packs, 4"	10–12"
Petunia trailing Ramblin'™	Pelleted, Raw	85%	10–12	4-6", Hanging Basket	10–14"
Petunia grandiflora Bravo™	Pelleted, Raw	85%	8–11	Packs, 4"	10–12"
Petunia multiflora Hurrah™	Pelleted, Raw	85%	8–11	Packs, 4"	8–10"
Petunia spreading Plush™	Pelleted, Raw	85%	9–11	4-6", Hanging Basket	10–14"
Platycodon Miss Tilly™	Raw	90%	14–18	4"	6–8"
Primula acaulis Orion®	Raw, GoldSmart™ Primed	80%	21–23	4"	5–6"
Primula acaulis Primera™	Raw, GoldSmart™ Primed	80%	20–22	4"	5–6"
Primula obconica Libre™	Raw	80%	16–20	4-6"	8–10"
Primula obconica Grace™	Raw	70%	16–20	4–6"	8–10"
Primula obconica Embrace™	Raw	80%	16–20	4–6"	8–10"
Ranunculus Maché™	Pelleted, Raw	80%	21–24	4–6"	12–16"
Ranunculus Magic™	Pelleted, Raw	80%	22–26	4"	6–8"
Rudbeckia TigerEye	Pelleted, Raw	85%	11–15	Packs, 4-6"	16"–24"
Salvia Picante™	Raw	90%	10–11	Packs, 4"	14–16"
Salvia Salsa™	Raw	90%	9–10	Packs, 4"	8–10"
Salvia Fuego™	Raw	90%	9–10	Packs, 4"	12–14"
Schizanthus Atlantis™	Raw	75%	12–14	4-5"	8–10"

# Annuals: Guidelines and Schedules

SERIES	SEED FORM	MINIMUM GERM.	CROP TIME IN WEEKS	CONTAINER SIZE	GARDEN HEIGHT
Snapdragon cut Opus III/IV™	Raw	85%	10–14	N/A	N/A
Snapdragon cut Overture II™	Raw	85%	12–17	N/A	N/A
Snapdragon dwarf Bells™	Raw	80%	9–12	Packs, 4"	8–10"
Snapdragon dwarf Chimes™	Raw	80%	9–12	Packs, 4"	6–8"
Snapdragon dwarf Little Darling™	Raw	80%	9–12	Packs, 4"	10–12"
Snapdragon inter. Aromas™	Raw	85%	15–18 spring, 13–16 fall	4- 6"	24–30"
Snapdragon inter. La Bella™	Raw	80%	16–18 spring, 12–14 fall	4- 6"	18–22"
Snapdragon inter. Liberty Classic™	Raw	80%	16–18 spring, 12–14 fall	4- 6"	18–22"
Snapdragon inter. Madame Butterfly™	Raw	80%	16–18 spring, 12–14 fall	4- 6"	24–30"
Snapdragon inter. Ribbon™	Raw	80%	16–18 spring, 12–14 fall	4- 6"	18–22"
Snapdragon inter. Arrow™	Raw	80%	15–18 spring, 13–16 fall	4- 6"	24–30"
Snapdragon dwarf Montego™	Pelleted, Raw	80%	9–12	Packs, 4"	6–8"
Snapdragon inter. Coronette™	Raw	80%	16–18 spring, 12–14 fall	4- 6"	20–24 "
Sunflower (Helianthus) Constellation™	Raw	80%	8–13	4- 8"	24–36"
Torenia Duchess™	Pelleted	90%	11–13	Packs, 4"	6–8"
Verbena Tuscany®	Raw, GoldSmart™ Primed	85%	12–14	Packs, 4-6", Hanging Basket	8–10"
Verbena Obsession™	Raw, GoldSmart™ Primed	85%	10–12	Packs, 4-6", Hanging Basket	6–8"
Vinca Cora®	Raw	85%	11–18	Jumbo, 4-6"	14–16"
Vinca Trailing Cora® Cascade™	Raw	85%	12–18	6- 8", Hanging Basket	6–8"
Vinca SunDress™	Raw	85%	12–15	4- 6"	8–10"
Vinca SunGlow™	Raw	85%	11–14	Jumbo, 4-6"	10–12"
Vinca SunStorm®	Raw	85%	10–14	Jumbo, 4-6"	8–10"
Vinca Trailing SunShower™	Raw	85%	12–18	6- 8", Hanging Basket	6–8"
Viola Penny™	Raw, GoldSmart™ Primed	85%	9–10 fall, 11–13 spring	Packs, 4- 6"	4–6"
Viola Endurio®	Raw, GoldSmart™ Primed	90%	9–10 fall, 11–13 spring	Packs, 4- 6"	4–6"
Viola Patiola®	Raw	90%	9–10 fall, 11–13 spring	Packs, 4- 6"	4–6"
Viola Rocky™	Raw, GoldSmart™ Primed	90%	9–10 fall, 11–13 spring	Packs, 4- 6"	4–6"
Zinnia dwarf Short Stuff™	Coated, Raw	85%	8–9	Packs, 4- 6"	8–10"
Zinnia Magellan™	Coated, Raw	85%	8–9	4" and larger	12–14"
Zinnia Swizzle™	Coated, Raw	85%	8–9	4" and larger	10–12"
Zinnia Uproar™	Coated, Raw	85%	8–11	4" and larger	28–36"
Zinnia Zowie™	Coated, Raw	85%	8–11	4" and larger	24–30"

# GLOSSARY

## SEED FORMS

**Coated Seed:** Seed has a coating applied to assist in mechanical handling or germination performance.

**Detailed Seed:** Seed has been refined by removing the seed “tails” to assist in mechanical handling.

**GoldSmart™ Primed Seed:** A primed product that improves uniformity and speed of emergence during germination.

**Pelleted Seed:** Small seed which has had a built-up coating applied to assist in mechanical handling or germination performance.

**Raw Seed:** Seed is in its natural state after being harvested and cleaned.

## LIGHT RESPONSES

**Facultative:** Flowering is hastened by the identified photoperiod.

**Obligate:** Plants must be exposed to its identified photoperiod to flower at all.

**Irradiance:** Amount of light intensity a plant receives (represented as mols of light per day).

**Facultative Irradiance Response:** Extra lighting reduces the leaf number below the first flower, i.e. flowering occurs earlier developmentally.

**Irradiance Indifferent Response:** Extra lighting has no effect on the leaf number below the first flower, i.e. extra lighting does not hasten flowering developmentally

**Long-day Plant:** Plants require a night length shorter than a specific number of hours for flower induction to occur. Day extension or night breaks can help induce flowering.

**Short-day Plant:** Plants require a night length longer than a specific number of hours for flower induction to occur.

**Day-neutral Plant:** Flower induction is unaffected by daylength. Plants will flower under either short or long days.

## MOISTURE MANAGEMENT LEVELS

The moisture number recommendation represents the driest point the growing substrate should obtain for each particular crop. Plants should only be given enough water so that they can dry back down to the original number recommendation with a 12 – 24 hour time period. If growers are not saturating the growing substrate, make sure the EC of the fertigation water is less than 1.2.

**Saturated (5):** Water is easily observed. Press finger on cell. Water moves out freely from top and bottom.

**Wet (4):** Water is not easily observed. When media is lightly touched, there is very little movement from top to bottom.

**Moist (3):** Media is black but not glistening. To the touch, there is water, but virtually no water movement.

**Medium (2):** The media has changed color from a dark black to a medium brown. There is no water movement.

**Dry (1):** The media has changed color to a very light brown.

## HARDINESS ZONES

**AHS:** American Horticultural Society

**USDA:** United States Department of Agriculture

For further information visit [www.ahs.org](http://www.ahs.org) or [www.usda.gov](http://www.usda.gov).

# PROTECT YOUR SEED

The method in which seed is stored is every bit as important as the techniques utilized in germination. Without proper storage, seed quality can diminish rapidly depending upon the species. Temperature and humidity are the primary factors influencing seed quality. In general, the higher the temperature and humidity in the storage environment, the more the moisture content of the seeds will increase over time. High moisture content will deteriorate or “age” the seed prematurely.

A dedicated space with the ability to control temperature and humidity is essential for preserving seed quality. An insulated closet or small refrigerator works quite nicely. For most species, a storage temperature of 40°F (5°C) with a relative humidity of 25 – 30% will keep seed moisture content in the optimum range. Cyclamen seed requires a higher storage humidity of 50% and should have its own dedicated storage space.

Goldsmith Seeds delivers seed in moisture-proof packets at the correct moisture content. It is best to purchase seed in quantities appropriate for a single sowing. However, if seed is left-over, reseal the packet quickly to prevent a change in seed moisture content.

**TIP:** Do not open packets immediately after removal from the storage environment. Allow the packet to acclimate to the warmer temperatures in the sowing area. This will avoid condensation forming on the “cold” seed when it is exposed to greenhouse conditions.

*Note: These suggestions are only guidelines and may have to be altered to meet individual grower's needs. Check all chemical labels to verify registration for use in your region.*



syngenta flowers

P.O. Box 1349 • Gilroy, CA 95021-1349

Tel: 408-847-7333 • Toll Free: 800-549-0158 • Fax: 408-848-5429

[www.goldsmithseeds.com](http://www.goldsmithseeds.com)

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P.O. Box 1349 • Gilroy, CA 95021-1349  
Tel: 408-847-7333 • Toll Free: 800-549-0158 • Fax: 408-848-5429  
[www.goldsmithseeds.com](http://www.goldsmithseeds.com)

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