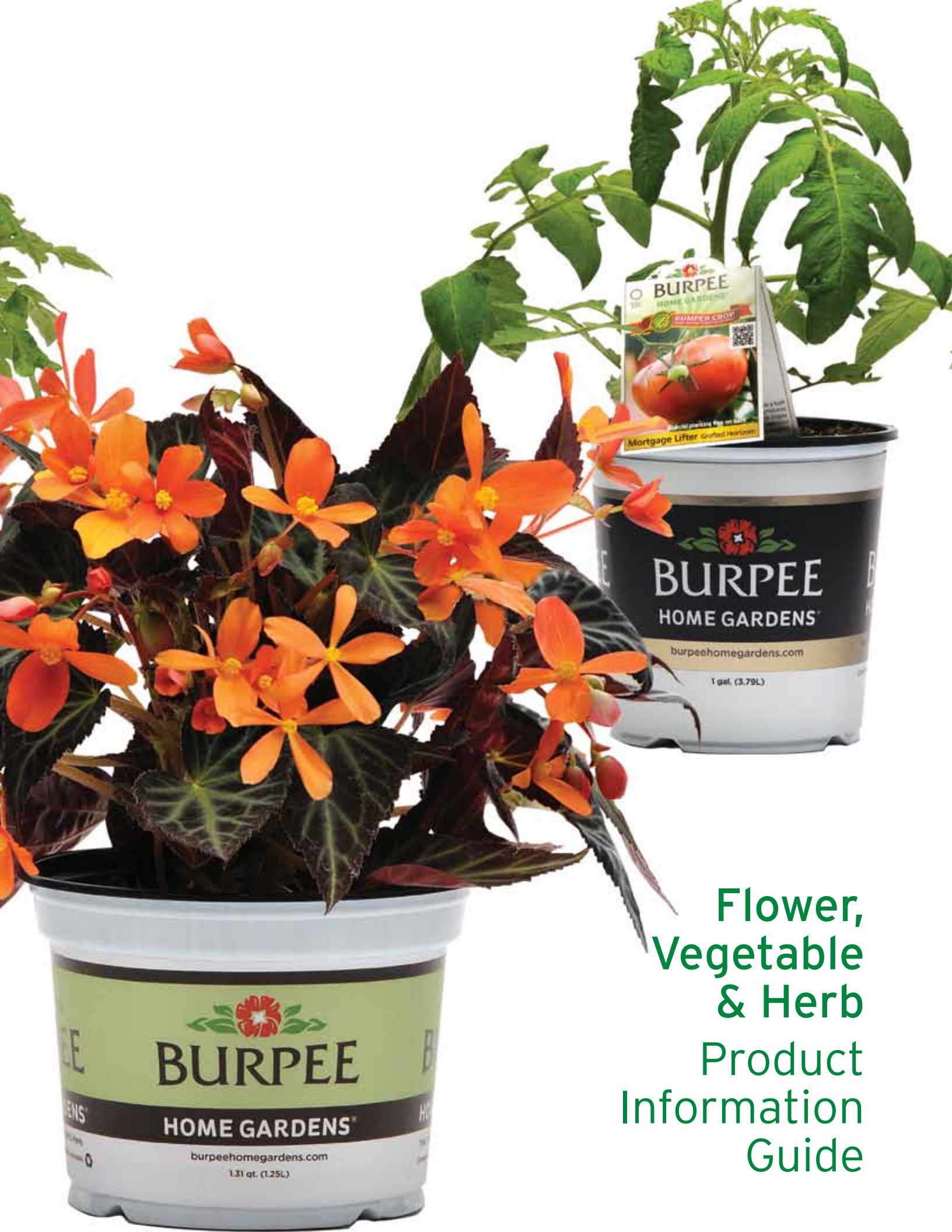


Flower, Vegetable & Herb

Product Information Guide

Table of Contents

2013 Burpee Home Gardens® Flower Listing

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

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

BACOPA
Abunda™ Giant White (V)

BEGONIA
Dragon Wing® Pink (S)
Dragon Wing Red (S)
Gryphon (S)
NEW Sparks Will Fly (V)
NEW Whopper Red Bronze Leaf (S)
NEW Whopper Rose Bronze Leaf (S)
NEW Whopper Red Green Leaf (S)
NEW Whopper Rose Green Leaf (S)
NEW Yang Red (S)
NEW Yang White (S)
NEW Yin Red (S)
NEW Yin Rose (S)
NEW Yin White (S)

BIDENS
Sun Kiss (V)

CALIBRACHOA
NEW Isabells Dark Purple (V)
Isabells Deep Blue (V)
Isabells Hot Pink (V)
NEW Isabells Hot Pink Star (V)
Isabells Orange (V)
Isabells Pink Vein (V)
NEW Isabells Purple Star (V)
Isabells Red Improved (V)
Isabells Rose Star (V)
Isabells Terracotta (V)
Isabells Yellow (V)

CAREX
Amazon Mist (S)
Red Rooster (S)

COLEUS
NEW Chocolate Covered Cherry (S)
Emotions Inspired (S)
Emotions Passionate (S)
Emotions Sophisticated (S)
Henna (V)
NEW Honey Crisp (V)
Indian Summer (V)
Redhead (V)
Sultana (V)
NEW Vino (V)
Wasabi (V)

COREOPSIS
Early Sunrise (S)

DIANTHUS
Bouquet™ Purple (S)
Bouquet Rose Magic (S)
Floral Lace Cherry (S)
Floral Lace Picotee (S)
Floral Lace Violet (S)

DICHONDRA
Silver Falls (S)

EUPHORBIA
Breathless® Blush (V)
Breathless White (V)

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

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

IMPATIENS
Center Stage (V)
Enlighten Bright Red (S)
Enlighten Cranberry Burst (S)
Enlighten Gypsy Rose (S)
Enlighten Neon Punch (S)
Enlighten Red Wash (S)
Enlighten Rosy Starburst (S)
Enlighten Sunset Beach (S)
Enlighten Twilight Night (S)
Enlighten White Nights (S)
NEW Enlighten Flutter Appleblossom (S)
NEW Enlighten Flutter Bright Purple (S)
NEW Enlighten Flutter Orange Flash (S)
NEW Enlighten Flutter Red (S)
NEW Enlighten Flutter Red Flash (S)
Fanfare® Bright Coral (V)
Fanfare Fuchsia (V)
NEW Patchwork™ Cosmic Burgundy (V)
NEW Patchwork Cosmic Orange (V)
Patchwork Lavender (V)
Patchwork Peach Prism (V)
Patchwork Pink Shades (V)

DOUBLE IMPATIENS
Fiesta™ Apple Blossom (V)
Fiesta Purple (V)
Fiesta Salsa Red (V)
Fiesta Sparkler Cherry (V)
Fiesta Sparker Hot Pink (V)
Fiesta White (V)

NEW GUINEA IMPATIENS
Celebrette Frost (V)
Celebrette Grape Crush (V)
Celebrette Orange Crush (V)
Celebrette Red (V)

IPOMOEA (SWEET POTATO VINE)
Blackie (V)
Marguerite (V)

JUNCUS
Blue Dart (S)
Twisted Dart (S)

LANTANA
Lucky™ Pure Gold (V)
Lucky Red Flame (V)
Lucky Sunrise Rose (V)

LOBELIA
NEW Hot Springs™ Dark Blue (V)
NEW Hot Springs Lavender Pink (V)
NEW Hot Springs Sky Blue (V)
NEW Hot Springs White (V)

AFRICAN MARIGOLD
Taishan® Orange (S)
Taishan Yellow (S)
Vanilla (S)

FRENCH MARIGOLD
Durango® Bolero (S)
Durango Orange (S)
Durango Yellow (S)

OSTEOSPERMUM (SPRING DAISY)
Voltage™ Yellow (V)

ORNAMENTAL PEPPER
Black Pearl (S)
Purple Flash (S)

PETUNIA
Black Velvet (V)
NEW Blue A Fuse (V)
Paparazzi™ Fashion Cherry (S)
Paparazzi Glamour Pink (S)
Paparazzi Glitz Yellow (S)
Paparazzi Midnight Blue (S)
Paparazzi Palladium Purple (S)
Paparazzi Rodeo Rose (S)
Paparazzi White Diamonds (S)
Paparazzi Flash Cherry (S)
Paparazzi Flash Midnight (S)
Paparazzi Flash Plum (S)
Paparazzi Flash Raspberry (S)
Paparazzi Flash Red (S)
Paparazzi Flash Violet (S)
Paparazzi Flash White (S)
Paparazzi Flash Yellow (S)
Phantom (V)
Pinstripe (V)
Pop Rocks Coral (S)
Pop Rocks Lavender (S)
Pop Rocks White (S)
Pop Rocks Yellow (S)
Suncatcher™ Burgundy (V)
Suncatcher Midnight Blue (V)
Suncatcher Pink Lemonade (V)
Suncatcher Red (V)
NEW Suncatcher Vintage Rose (V)
Suncatcher Yellow (V)

RUDBECKIA
Tiger Eye (S)

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

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

VERBENA
Aztec® Blue Velvet (V)
Aztec Burgundy (V)
Aztec Red Velvet (V)
Aztec White (V)
NEW Aztec Wink Burgundy (V)
NEW Aztec Wink Violet (V)
Quartz XP Red With Eye (S)
Quartz XP White (S)
Quartz XP Merlot Mix (S)

VINCA
Garden Apricot (S)
Garden Dark Red (S)
Garden Pink (S)
Garden Polka Dot (S)
Garden White (S)

ZINNIA
Bridesmaid (S)
Champagne Toast (S)
Double Zahara™ Cherry (S)
Double Zahara Fire (S)
UpTown Orange Blossom (S)
UpTown Pink Champagne (S)
UpTown Sunstreak (S)
UpTown White Wall (S)
White Wedding (S)

PROGRAM DROPS FOR 2013

BEGONIA
Nightlife Red
Nightlife Rose
Nightlife White

2013 Burpee Home Gardens® Vegetable & Herb Listing

NEW BUMPER CROP™ GRAFTED TOMATOES
Big Rainbow
Black Krim
Brandywine Pink
Brandywine Red
Mortgage Lifter
San Marzano

BOOST COLLECTION
CUCUMBER
'Gold Standard'
PEPPER
'Sweet Heat'
SALAD MIX
Healing Hands
TOMATO
'Cherry Punch'
NEW Mighty Sweet
'Power Pops'
'Solar Power'
NEW Tasti-Lee®

ARTICHOKE
Imperial Star
ARUGULA
Myway
BUSH BEAN
Blue Lake Bush
NEW Gold 'N Green Mix II
POLE BEAN
Blue Lake Pole
BROCCOLI
Packman
NEW Raab Zamboni
BRUSSELS SPROUTS
Franklin
Royal Marvel
CABBAGE
Big Flat Head
Fast Vantage
Pacifica
CAULIFLOWER
Amazing
Cheddar
Romanesco Veronica
Snow Crown
CELERY
Tango
COLLARDS
Georgia
CUCUMBER
Burpee Hybrid II
Burpless No. 26
Bush Champion
Homemade Pickles
NEW 'Patio Snacker'
Pickalot Hybrid
EGGPLANT
Burpee Hybrid
Pot Black
Purple Blaze
White Star Hybrid
FENNEL
Orion
KOHLRABI
Quickstar

LETTUCE & GREENS
Alfresco Mix (multi-species, multi-pellet)
Burpee Bibb
Buttercrunch
City Garden Mix (multispecies, multi-pellet)
Global Gourmet Mix (multi-species, multi-pellet)
Gourmet Blend
Heatwave Blend
Little Caesar
MELON
Ambrosia
Doral
NEW Sugar Cube
Twice As Nice
MUSTARD
Florida Broadleaf
OKRA
Clemson Spineless
ONION
Parade Bunching
Red Zeppelin
White Sweet Spanish
Yellow Sweet Spanish
PAK CHOI
Toy Choy
PEA
RSVPea
PEPPER – SWEET BELL
Baron
NEW Better Belle II
Big Bertha
Cajun Belle
NEW 'Cute Stuff Gold'
NEW 'Cute Stuff Red'
Great Stuff Hybrid
Pinot Noir
PEPPER – SWEET
Bananarama
Big Daddy Hybrid
Costa Rican Sweet Hybrid
Flavorburst Hybrid
PEPPER – HOT
NEW Big Guy
Burning Bush
Hot Lemon
Hungarian Yellow Wax
Jalapeño Gigante
Ristra Cayenne Hybrid
Tabasco
Zavory
PUMPKIN
Casper
Harvest Moon
Howden
Jack-Be-Little
SPINACH
Baby's Leaf Hybrid
Bloomsdale
SUMMER SQUASH
Burpee Golden (Zucchini)
Burpee Hybrid (Zucchini)
Limelight (Zucchini)
Lunar
Pic-N-Pic Hybrid
NEW Smooth Pickin' (Zucchini)
WINTER SQUASH
Burpee's Bush Table Queen
Burpee's Butterbush

STRAWBERRY
NEW All Star (Bareroot)
Berri Basket® White
Berries Galore® Pink, Rose and White
SWISS CHARD
Bright Lights
TOMATO – BEEFSTEAK
Big Beef
Brandy Boy Hybrid
Supersteak Hybrid
TOMATO – SLICER
Better Boy
NEW Big Daddy
Big Pink
Burpee's Big Boy®
Bush Champion II
Bush Early Girl
Celebrity
Champion II
Delicious
Early Girl
Fourth Of July
Jet Star
Lemon Boy
Orange Wellington
Phoenix
Steak Sandwich Hybrid
SuperTasty Hybrid
Sweet Seedless Hybrid
Tye Dye
TOMATO – PASTE & SALADETTE
Big Mama Hybrid
Fresh Salsa Hybrid
TOMATO – HEIRLOOM
NEW Black Prince
NEW Brandywine Pink
NEW Brandywine Red
Cherokee Purple
Delicious
NEW Jubilee
MEW Mortgage Lifter
NEW Old German
Pineapple
NEW Rutgers
Yellow Pear
TOMATO – SMALL-FRUITED
NEW Black Cherry
Black Pearl Hybrid
Napa Grape Hybrid
Red Grape
Sungold
Sweet 100
Tomatoberry Garden
Tumbler
WATERMELON
Crimson Sweet
Sugar Baby
HERBS
Boxwood Basil
Cardinal Basil
Nufar Basil
Red Rubin Basil
Siam Queen Basil
Sweet Dani Lemon Basil
Sweet Italian Large Leaf Basil
Sweet Mammoth Basil
Catnip
Garlic Chives
Onion Chives
Santo Cilantro
Dill
Fernleaf Dill
Ellagance Ice, Purple and Sky Lavender
Greek Oregano
Oregano
Italian Dark Single Parsley
Triple Curled Parsley
Peppermint
Rosemary
Sage
Spearmint
Summer Savory
Sweet Leaf Stevia
Sweet Marjoram
Summer Thyme

PREMIUM "TO GO" GARDENS
PATIO-READY VEGGIE PLANTERS
CUCUMBER
Bush Champion
NEW 'Patio Snacker'
EGGPLANT
Burpee Hybrid
PEPPER
Baron
NEW Better Belle II
BOOST 'Sweet Heat'
Flavorburst Hybrid
Jalapeño Gigante
NEW BUMPER CROP GRAFTED TOMATOES
Big Rainbow
Black Krim
Brandywine Pink
Brandywine Red
Mortgage Lifter
San Marzano
TOMATO
Bush Champion II
Bush Early Girl
Celebrity
Fourth of July
Fresh Salsa Hybrid
Phoenix
Tumbler
COLORFUL MIXED SALAD BOWLS
Alfresco Mix
BOOST Healing Hands
City Garden Mix
Global Gourmet Mix
Gourmet Blend
Heatwave Blend
CREATIVE HERB COMBOS
Tuscan Trio (Parsley, basil and oregano)
Good Grillin' (Parsley, rosemary and chives)
Kitchen Favorites (Dill, parsley, oregano and basil)

PROGRAM DROPS FOR 2013
BUSH BEAN
Gold 'N Green Mix
BROCCOLI
Flash Hybrid
Raab
CUCUMBER
Sweet Burpless Hybrid
PEPPER
Better Belle
Big Early
Sweet Spot X3R
TOMATO
Bush Early Girl II
Old Time Tasty

Burpee Home Gardens® Flower Variety Culture Chart

Crop		Seed Germination Media Temperature *	Rooting Hormone Before Sticking Cutting	Cover/ Light Seed	Sow to Transplant (Days)
FLOWERS					
ALYSSUM	**Clear Crystal (S)**	70-72°F (21-22°C)		L	21-28
ANGELONIA (SUMMER SNAP)	**Archangel (V)**		No		
	Serena (S)	72-76°F (22-24°C)		L	35-42
BACOPA	**Abunda (V)**		No		
BEGONIA	**Dragon Wing (S)**	72-75°F (22-24°C)		C. Lt.	49-56
	Gryphon (S)	72-78°F (22-25°C)		L	56-63
	Sparks Will Fly (V)		Optional		
	Whopper (S)	72-75°F (22-24°C)		C. Lt.	49-56
	Yin/Yang (S)	75-78°F (24-25°C)		L	49-56
BIDENS	**Sun Kiss (V)**		No		
CALIBRACHOA	**Isabells (V)**		No		
CAREX	**Amazon Mist (S)**	64-72°F (18-22°C)		C	42-49
	Red Rooster (S)	64-72°F (18-22°C)		C	42-49
COLEUS	**Chocolate Covered Cherry (S)**	72-75°F (22-24°C)		C	32-42
	Emotions (S)	72-75°F (22-24°C)		C	32-42
	Henna (V)		No		14-21
	Honey Crisp (V)		No		14-21
	Indian Summer (V)		No		14-21
	Redhead (V)		No		14-21
	Sultana (V)		No		14-21
	Vino (V)		No		14-21
	Wasabi (V)		No		14-21
COREOPSIS	**Early Sunrise (S)**	68-72°F (20-22°C)		C. Lt.	35
DIANTHUS	**Bouquet (S)**	64-68°F (18-20°C)		C	28-35
	Floral Lace (S)	64-68°F (18-20°C)		C	28-35
DICHONDRA	**Silver Falls (S)**	72-76°F (22-24°C)		C. Lt.	35
EUPHORBIA	**Breathless (V)**		Yes		
GERANIUM	**Fantasia (V)**		Optional		
GERBERA	**Revolution (S)**	64-68°F (18-20°C)		C. Lt.	42-49
IMPATIENS	**Center Stage (V)**		No		
	Enlighten (S)	72-76°F (22-24°C)		L	28-35
	Enlighten Flutter (S)	72-76°F (22-24°C)		L	28-35
	Fanfare (V)		No		
	Patchwork (V)		No		
DOUBLE IMPATIENS	**Fiesta (V)**		No		
NEW GUINEA IMPATIENS	**Celebrette (V)**		No		
IPOMOEA	**Blackie (V)**		No		
	Marguerite (V)		No		
JUNCUS	**Blue Dart (S)**	71-76°F (21-24°C)		L	42-49
	Twisted Dart (S)	71-76°F (21-24°C)		L	42-49
LANTANA	**Lucky (V)**		Optional		

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

***** Root vegetative cuttings at 68 to 72°F (20 to 22°C) media temperature.

Note: This chart includes general culture guidelines. Please refer to the GrowerFacts on the following pages for detailed growing information.

Stick Cutting to Transplant (Days)	Growing On Temperature (Night)	Total Crop Time for 4-in. (10-cm) Pots (Weeks)	306 Pack	4-in. (10-cm) Pot	6-in. (15-cm) Pot	Hanging Basket
	55-60°F (13-15°C)	8-10	X			
21-28	60-70°F (15-21°C)	8-12		X	X	
	64-66°F (18-19°C)	14-16	X	X		
21	56-61°F (13-16°C)	8-10		X		X
	60-65°F (15-18°C)	14-17		X	X	X
	62-67°F (17-19°C)	13-15			X	
28-35	55-60°F (13-15°C)	5-7		X	X	X
	60-65°F (15-18°C)	14-17		X	X	
	60-65°F (15-18°C)	12-15	X	X		
28-49	53-61°F (12-16°C)	8-13		X		
21-28	50-58°F (10-14°C)	9-13		X	X	X
	58-62°F (14-17°C)	15-18		X	X	
	58-62°F (14-17°C)	15-18		X	X	
	62-65°F (17-18°C)	9-11		X	X	
	62-65°F (17-18°C)	9-11		X	X	
	59-70°F (15-21°C)	9-10		X	X	
	59-70°F (15-21°C)	9-10		X	X	
	59-70°F (15-21°C)	9-10		X	X	
	59-70°F (15-21°C)	9-10		X	X	
	59-70°F (15-21°C)	9-10		X	X	
	59-70°F (15-21°C)	9-10		X	X	
	59-70°F (15-21°C)	9-10		X	X	
	55-60°F (13-15°C)	14-18		X	X	
	50-60°F (10-15°C)	12-14		X	X	
	50-60°F (10-15°C)	9-11	X			
	62-65°F (17-18°C)	12-13		X		
21-28	59-67°F (15-19°C)	8-11		X	X	
21-28	62-67°F (17-19°C)	11-13		X	X	X
	62-66°F (17-19°C)	14-17		X	X	
28	66-71°F (19-21°C)	10-12		X		X
	62-65°F (17-18°C)	8-10	X	X		
	62-65°F (17-18°C)	8-10	X	X		
21	56-61°F (13-16°C)	9-12		X	X	
21	56-61°F (13-16°C)	9-12		X	X	X
21	56-61°F (13-16°C)	9-12		X		
21-28	59-64°F (15-18°C)	10-13		X		
21	59-64°F (15-18°C)	10-12		X	X	
21	59-64°F (15-18°C)	10-12		X	X	
	59-64°F (15-18°C)	13-15		X		
	59-64°F (15-18°C)	13-15		X		
24-28	62-67°F (17-19°C)	10-12		X		

Burpee Home Gardens® Flower Variety Culture Chart

Crop		Seed Germination Media Temperature *	Rooting Hormone Before Sticking Cutting	Cover/ Light Seed	Sow to Transplant (Days)
FLOWERS					
LOBELIA	**Hot Springs (V)**		Optional		
AFRICAN MARIGOLD	**Taishan (S)**	68-72°F (20-22°C)		C	21
	Vanilla (S)	68-72°F (20-22°C)		C	21
FRENCH MARIGOLD	**Durango (S)**	70-72°F (21-22°C)		C	21
OSTEOSPERMUM	**Voltage Yellow (V)**		Yes		
ORNAMENTAL PEPPER	**Black Pearl (S)**	72-76°F (22-24°C)		C	35-49
	Purple Flash (S)	72-76°F (22-24°C)		C	35-49
PETUNIA	**Black Velvet (V)**		No		
	Blue A Fuse (V)		No		
	Paparazzi (S)	72-76°F (22-24°C)		L	28-35
	Paparazzi Flash (S)	72-76°F (22-24°C)		L	28-35
	Phantom (V)		No		
	Pinstripe (V)		No		
	Pop Rocks (S)	72-76°F (22-24°C)		L	28-35
	Suncatcher (V)		No		
RUDBECKIA	**Tiger Eye (S)**	75-78°F (24-25°C)		L	21-35
SALVIA	**Mystic Spires Blue (V)**		No		21-42
	Vista (S)	70-75°F (21-24°C)		C	28-35
SNAPDRAGON	**Snapshot (S)**	64-68°F (18-20°C)		C. Lt.	35-42
VERBENA	**Aztec (V)**		No		
	Quartz (S)	72-75°F (22-24°C)		L	28
VINCA	**Garden (S)**	75-78°F (24-25°C)		L	35
ZINNIA	**Bridesmaid (S)**	68-73°F (20-23°C)		C	21
	Champagne Toast (S)	68-73°F (20-23°C)		C	21
	Double Zahara (S)	68-73°F (20-23°C)		C	21
	Uptown (S)	68-73°F (20-23°C)		C	21
	White Wedding (S)	68-73°F (20-23°C)		C	21

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

***** Root vegetative cuttings at 68 to 72°F (20 to 22°C) media temperature.

(S) = seed (v) = vegetative

Note: This chart includes general culture guidelines. Please refer to the GrowerFacts on the following pages for detailed growing information.

Stick Cutting to Transplant (Days)	Growing On Temperature (Night)	Total Crop Time for 4-in. (10-cm) Pots (Weeks)	306 Pack	4-in. (10-cm) Pot	6-in. (15-cm) Pot	Hanging Basket
24-28	56-64°F (13-18°C)	10-13		X	X	
	59-65°F (15-18°C)	7-10	X	X		
	59-65°F (15-18°C)	7-10	X	X		
	60-62°F (15-17°C)	8-9	X	X		
21-28	44-55°F (7-13°C)	11-15		X	X	
	65-70°F (18-21°C)	13-15		X		
	65-70°F (18-21°C)	13-15		X		
21-28	53-61°F(12-16°C)	8-11		X	X	
21-28	53-61°F(12-16°C)	8-11		X	X	X
	55-65°F (13-18°C)	11-13		X		
	55-65°F (13-18°C)	11-13	X	X		
21-28	53-61°F (12-16°C)	8-11		X	X	
21-28	53-61°F (12-16°C)	8-11		X	X	
	57-65°F (14-18°C)	9-12	X	X		
21-28	53-61°F (12-16°C)	9-12		X	X	X
	65-68°F (18-20°C)	11-15			X	
	62-67°F (17-19°C)	7-10			X	
	64-68°F (18-20°C)	8-10	X			
	45-55°F (7-13°C)	11-12	X			
21-28	62-64°F (17-18°C)	9-11		X	X	X
	60°F (15°C)	10-12	X			
	65-68°F (18-20°C)	9-10	X	X	X	
	59-64°F (15-18°C)	11-12		X	X	
	59-64°F (15-18°C)	11-12		X	X	
	59-64°F (15-18°C)	11-12	X	X		
	59-64°F (15-18°C)	11-12		X		
	59-64°F (15-18°C)	11-12		X	X	

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

ALYSSUM (SEED)

Lobularia maritime

Clear Crystal®

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

PLUG PRODUCTION

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

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

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

Stage 1 - Germination takes approximately 3 to 4 days.
Germination temperature: 70 to 72°F (21 to 22°C)
Light: Light is beneficial during germination.
Relative humidity: Maintain 95 to 97% relative humidity until cotyledons emerge. Avoid excess humidity later in the plug production, as this will create conditions favorable for disease incidence.

Stage 2
Temperature: 65 to 75°F (18 to 24°C) days; 60 to 65°F (15 to 18°C) nights
Light: Can be up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.
Media Moisture: Keep the media medium (level 3) to medium wet (level 4).
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous.

Stage 3
Temperature: 65 to 75°F (18 to 24°C) days; 55 to 60°F (13 to 15°C) nights
Media Moisture: Keep the media medium wet (level 3) during Stages 3 and 4.
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Stage 4
Temperature: 60 to 70°F (15 to 21°C) days; 55 to 60°F (13 to 15°C) nights
Light: Light levels can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained.
Fertilizer: Same as Stage 3.

Plant Growth Regulators
PGRs are generally not required.

GROWING ON TO FINISH

Container Size
Grow in 306 pack.

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

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

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

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

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

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

Crop Scheduling
Sow to transplant: Approximately 4 weeks
Transplant to flower: 4 to 6 weeks seasonally
Total crop time (sow to flower): 8 to 10 weeks seasonally

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

ANGELONIA (SEED)

Angelonia angustifolia

Serena®

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

PLUG PRODUCTION

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

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

Stage 1 – Germination takes 4 to 5 days.
Soil temperature: 71 to 76°F (22 to 24°C)
Light: 10 f.c. (100 Lux) or higher. Light is required for germination. Seeds will not germinate in the dark.
Moisture: Keep soil moist but not saturated (level 4) during Stage 1 for optimal germination.
Humidity: Maintain 95% relative humidity (RH) until radicle emergence.

Stage 2
Soil temperature: 68 to 73°F (20 to 23°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm) from nitrate-form fertilizers with low phosphorous.

Stage 3
Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow the media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture level at wet-dry cycle (moisture level 4 to 2). Do not allow the seedlings to wilt as they do not recover very well.
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm).
Growth Regulators: Growth regulators are generally not needed in plug stage. If necessary, B-Nine (daminozide) 5,000 ppm spray can be used.

Stage 4
Soil temperature: 65 to 67°F (18 to 19°C)
Light: Up to 5,000 f.c. (53,800 Lux) if optimal temperature can be maintained.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

GROWING ON TO FINISH

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

Temperature
- Night: 65 to 67°F (18 to 19°C)
- Day: 65 to 76°F (18 to 24°C)
- Daily average temperatures below 65°F (18°C) will slow down the crop growth rate dramatically.

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

Irrigation
Avoid both excessive watering and drought.

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

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

For growers in warmer climates:
A Bonzi (paclobutrazol) drench at 5 to 10 ppm (1.3 to 2.5 ml/l, 0.4% formulation) can be used 2 weeks after transplant instead of the B-Nine/Cycocel tank mix.

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

Crop Scheduling
Sow to transplant (406 to 128-cell plug tray): 5 to 6 weeks
Transplant from 406 to 288-tray to saleable finished container:

Container Size	Plants Per Pot	Weeks From Transplant	Total Weeks
306 pack	1	8 to 9	13 to 15
4 to 4.5-in. (10 to 11-cm) Pot	1	9 to 10	13 to 15

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

Common Problems
Insects: No serious problems
Diseases: No serious problems

ANGELONIA (VEGETATIVE)

Angelonia angustifolia

Archangel™

PROPAGATION

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

GROWING ON TO FINISH

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

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

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

ARCHANGEL ANGELONIA continued

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

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

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

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

Controlling Growth
- Height can be controlled, in part, by maintaining moderate fertility, allowing the media to dry slightly between waterings, providing maximum light and spacing plants in advance of crowding and stretch.
- Under conditions conducive to rapid vegetative growth, chemical plant growth regulators may be needed.
- A Cycocel (700 to 1,000 ppm) and B-Nine (1,500 to 2,000 ppm) tank mix applied 1 to 2 times is effective.
- The first application should be 7 to 10 days after the first pinch.
- Likewise, a tank mix of A-Rest (6 to 12 ppm) and B-Nine (1,000 to 1,500 ppm) applied 1 to 2 times can be used to control growth.
- Cultural practices should be emphasized to avoid use of PGRs on Archangel Angelonia compact varieties.
- In general, more frequent applications of any growth regulator at a lower concentration will produce the best results.
- Florel causes leaf tip burn when applied to Archangel Angelonia.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

Common Problems

Problems	Causes
Plant/ stem collapse	Wet media for an extended period of time *(Pythium, Rhizoctonia, Botrytis)*
Excessive vegetative growth	Low light conditions Over-fertilization under low light conditions Overwatering under low light conditions
Poor branching	Low fertilization, especially nitrogen Low light conditions
Stretched plants	Low light conditions Crowding before spacing Late transplanting Excessive phosphorous

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4 to 4.5-in. (10 to 11-cm) Pot 1 PP*	6-in. (15-cm) Pot 3 PP*
Unrooted cuttings	9 to 11	13 to 16
Rooted cuttings	5 to 8	10 to 12

*PP: Plants per pot

BACOPA (VEGETATIVE)

Sutera cordata

Abunda™ Giant White

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

GROWING ON TO FINISH

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

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

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

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

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

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

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

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

Problems	Causes
Plant collapse	Wet media for an extended period *(Pythium)* *Rhizoctonia* due to planting too deep
Delayed flowering	Low light levels Excessive Florel application
Excessive vegetative growth	High ammonia concentration in the soil Over-fertilization under low light conditions Low light and overwatering; wet media
Poor branching	Low fertilization; lack of nitrogen
Stretched plants	Low light
Chlorosis	Iron deficiency High pH Nitrogen deficiency

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*
Unrooted cuttings	10 to 13
Rooted cuttings	5 to 7

*PP: Plants per pot

BEGONIA (SEED)

Begonia x hybrida

Dragon Wing®
Whopper

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

GERMINATION

Germination takes 7 to 10 days.

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

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

Moisture
Keep media saturated through germination.

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

Humidity
Maintain relative humidity at approximately 95% or higher.

Light
Light is beneficial but not required for germination.

PLUG PRODUCTION

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

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

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

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

Plant Growth Regulators
Growth regulators are not required to produce Dragon Wing and Whopper plugs.

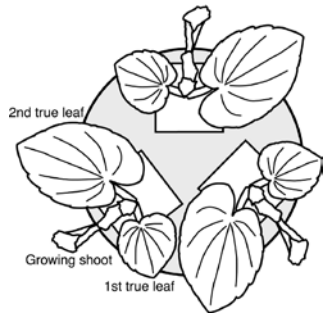
GROWING ON TO FINISH

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

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

Container Size	Bench Spacing	Plants Per Pot/Basket
4 to 4.5-in (10 to 11-cm) Pot	Pot-tight	1
6-in. (15-cm) Pot	8 in. (20 cm)	2 to 3

Transplanting
Due to directional stem arching, it is very important to position Dragon Wing and Whopper plugs properly when placing more than 1 plug into baskets and containers for finishing.



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

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

DRAGON WING & WHOPPER BEGONIA continued

Light
- Grow on in a high-light environment – 3,000 to 7,000 f.c. (30,000 to 70,000 Lux).
- Daylength and light quality can have a dramatic effect on plant habit; daylength can also affect flowering time.
- Dragon Wing and Whopper begonias will flower under natural daylength year-round, making them a good choice for year-round production in warmer climates.
- They flower 1 to 3 weeks faster under short days.
- Short days (8 to 10 hours) cause plants to grow nearly horizontal.
- Natural or HID long days give intermediate, arching growth.
- Long days provided by incandescent lighting cause more upright growth, which is beneficial for plant shipment (tighter spacing on shelves with less breakage).

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

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

Plant Growth Regulators
- 4-in. (10-cm) pots: A spray of 3 ppm (0.75ml/l) Bonzi can be applied weekly for 3 applications to keep plants compact. Start the first application 2 weeks after transplanting.
- 6-in. (15-cm) pots: A spray of 5 ppm (1.25 ml/l) Bonzi 2 weeks after transplant has been found to be effective in trials in Elburn, IL. An additional 1 or 2 sprays of 5 ppm (1.25 ml/l) Bonzi every other week after the first application results in earlier flowering, shorter internodes, darker foliage and more uniform branches.
- NOTE: In-house trials are recommended to determine the best rates for your location. Always follow current manufacturer label instructions.

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

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

BEGONIA (SEED)

Begonia x hybrida

Gryphon

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

PLUG PRODUCTION

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

Plug Tray Size
- Sow 1 pelleted seed per cell in 288 or larger plug tray.
- Water thoroughly at sowing to completely dissolve the pellet.
- Do not cover the pellet at sowing.

Stage 1 – Germination takes approximately 10 to 12 days.
Germination temperature: 72 to 78°F (22 to 25°C). Prefers warmer temperature but can also germinate well at 72°F (22°C).
Light: Light is required.
Media Moisture: Keep the media moisture (level 5) during germination. Gryphon is very sensitive to drying out during early stages of germination.
Relative Humidity: Maintain 95 to 97% relative humidity until cotyledons emerge. A saturated media and high relative humidity is critical to germinate successfully.

Stage 2
Temperature: Optimum 71 to 76°F (21 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Media Moisture: Keep the media very wet (level 5) to medium wet (level 4) during stage 2. Keep soil moisture high and maintain uniform media moisture. Do not stress plugs.
Fertilizer: Begin fertilization at 5 days out of the germination chamber. Start with 50 to 75 ppm N from ammonia-form fertilizer, 2 to 3 times per week increase slowly to 100 ppm. Maintain a media pH of 5.8 to 6.2.

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

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

Growth Regulators
Not needed.

GROWING ON TO FINISH

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

Temperature
Night: 62 to 67°F (17 to 19°C)
Day: 65 to 75°F (18 to 24°C)

Light
Light level from 3,000 to 7,000 f.c. (32,400 to 75,600 lux).

Photoperiod
Gryphon is a foliage plant, but plant could flower when grown under a daylength of 11 hours or shorter. Under daylength longer than 11 hours, flowering will be significantly delayed or plants will never flower.

Irrigation
Avoid both excessive watering and drought.

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

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

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

Pinching
No pinching is required.

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

Container Size	Plants Per Pot	Weeks From Transplant
6-in. (15-cm) Pot	1 to 3	5 to 6

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

BEGONIA (VEGETATIVE)

Begonia x hybrida

Sparks Will Fly

A Burpee Home Gardens® Exclusive.

PROPAGATION

- The day cuttings arrive, stick them in a disinfected propagation area.
- Use a slightly moistened, well-drained, aerated rooting media with a pH of 5.8 to 6.2 and EC of 1.0 to 1.5. Use paper or other preformed pots.
- When sticking, avoid direct contact between foliage and soil. Bottom heat is recommended. Media temperature of 72°F (22°C) and air temperature of 68 to 74°F (20 to 23°C) with 70 to 80 percent humidity will ensure quick and uniform rooting.
- Temperatures can be lowered after cuttings are well-rooted, but never let them fall below 58°F (14°C).
- Water cuttings slightly after sticking. Mist 1 to 3 days, avoiding saturating media. Keep cuttings somewhat dry and let wilt slightly between mists. Avoid run-off, which will leach nutrients and may cause fungal problems. If possible, mist by hand only and cover cuttings with cheesecloth.
- Roots should be visible after 9 to 11 days. Total rooting time is 21 to 29 days.
- Water in the morning; excess water will leach nutrients and raise the pH, resulting in nutrition deficiencies.
- Shade cuttings for the first week at 1,500 to 2,000 f.c. (15,000 to 20,000 Lux), which reduces transpiration. Well-established cuttings can tolerate light levels of 2,500 to 3,500 f.c. (25,000 to 35,000 Lux).
- As cuttings root, fertilize at 150 to 200 ppm N using a well-balanced fertilizer, including minor elements. Fertilize in the morning to avoid high salt levels.
- Preventively drench after sticking to reduce *Pythium* risk. Preventive sprays combined with venting and proper water management help control *Botrytis*. Pests shouldn't be a problem in a weed-free rooting area. Excessive pesticide use during rooting may result in slow, irregular rooting.
- Using PGRs during rooting will result in a more compact cutting. Spray B-Nine at 1,000 to 1,500 ppm or Cycocel at 250 to 350 ppm before cuttings stretch. Depending on variety and time of year, a second application may be necessary. Florel is not recommended.
- Pinch liner at third node but before fifth node develops.
- Extend daylength to at least 14 hours using HID lights, if possible.

GROWING ON TO FINISH

Media
- A pH of 5.8 to 6.2 is optimum.
- Sparks Will Fly begonia prefers a well-drained soil.

Temperature
Night: 55 to 60°F (13 to 16°C)
Day: 65 to 75°F (18 to 24°C)
Crop can be finished cooler in final weeks of production; maintain temps above 55°F (13°C).

Light
- Sparks Will Fly begonia should be grown under moderate light levels; 3,000 to 4,000 f.c. (30,000 to 40,000 Lux) is the ideal range.
- Plants may scorch under high light and high temperatures. Longer days promote flowering.
- Schedule crops to finish under long days (more than 13 hours).
- Crops produced under short days (less than 12 hours) will result in small plants and poor flowering.

Watering
- The media should be allowed to dry between waterings.
- Water stress can be used for growth control, however, periods of sustained wilting should be avoided.
- Excess water will result in unwanted stretch and disease.

Fertilizer
- Use a constant liquid feed program of 200 to 300 ppm.
- Sparks Will Fly begonia will benefit from more fertilizer early in production to build a strong plant.
- Regular leaching with clear water will help to reduce buildup of excess salts in media.

Pinching
- It is not recommended to pinch Sparks Will Fly begonias.

Controlling Growth
- Maintain recommended temperatures and light levels to avoid stretch.
- Excessive moisture in media will encourage unwanted stretch.
- Water management is an excellent tool in producing high-quality Sparks Will Fly begonias.
- Chemical plant growth regulators are generally not needed. Sparks Will Fly begonia is responsive to B-Nine and B-Nine/Cycocel tank mix for finished production in smaller containers. Begin applications 7 days after transplant.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

Common Problems
Insects: Whitefly, spider mites

Problems	Causes
Plant collapse	Stem canker *(Botrytis)* Plants grown in saturated soil for extended period of time *(Pythium)*
Poor branching, thin plants	Low fertilization during early stages of growth Low light Production under short days (less than 12 hours)

Crop Schedule & Uses
(Crop Schedule in Weeks)

Container Size	Rooted cuttings
4-in. (10-cm) Pot 1 PP*	5 to 7
6 to 8-in. (15 to 20-cm) Pots 1 to 2 PP*	6 to 8
10 to 12-in. (25 to 30-cm) Pots 2 to 3 PP*	8 to 11

*PP: Plants per pot or basket

BEGONIA (SEED)

Begonia x hybrida

Yang

Yin

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

GERMINATION

- Germination takes 7 to 10 days.
- Do not cover seed. Water thoroughly at sowing to completely dissolve the pellet.
- Recommended plug sizes are 512 to 288-cell.

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

Humidity
Maintain relative humidity at 95%.

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

Light
Light is beneficial, but not required.

PLUG PRODUCTION

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

Temperature
- Maintain soil temperature at 70 to 75°F (21 to 24°C) after true leaves develop.
- Plugs can be held at 62 to 65°F (17 to 18°C) from maturity until transplant.

Light
After germination, maintain light levels between 1,000 and 2,500 f.c. (10,000 to 30,000 Lux). As seedlings mature, light levels can be increased up to 5,000 f.c. (54,000 Lux).

Moisture
Yin and Yang are very sensitive to drying out during early stages of germination. Keep soil moisture high until the first true leaf develops, then reduce moisture levels.

Fertilizer
The high soluble salts in fertilizers tend to affect Nightlife; however, it will also grow slowly if not fertilized. Frequent light fertilization is best. Use 20-10-20 about 50 ppm at Day 8 and at Day 11. Then use every other day until Stage 3. After true leaves emerge, alternate with 15-0-15 until transplant. Always rinse foliage after feeding.

Plant Growth Regulators
None are required during the plug stage.

GROWING ON TO FINISH

Container Size
306 pack: 1 plant per cell
4 to 4.5-in. (10 to 12-cm) pot: 1 plant per pot

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

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

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

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

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

Plant Growth Regulators
Note: Yin and Yang are very responsive to Bonzi and Sumagic. **Avoid overspray from neighboring plants.**

Pinching
No pinching is required.

Crop Scheduling
Sow to transplant (512 or 288-cell plug tray): 7 to 8 weeks
Transplant to finish: 5 to 7 weeks

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

Common Problems
Insects: Fungus gnats, shore flies
Diseases: No major problems when using good cultural and IPM practices.

BIDENS (VEGETATIVE)

Bidens ferulifolia

Sun Kiss

PROPAGATION

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

GROWING ON TO FINISH

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

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

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

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

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

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

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

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

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

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*
Unrooted cuttings	7 to 10
Rooted cuttings	4 to 6

*PP: Plants per pot

CALIBRACHOA
(VEGETATIVE)

Calibrachoa hybrid

Isabells
A Burpee Home Gardens® Exclusive.

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

GROWING ON TO FINISH

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

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

Light
- Keep light intensities at 5,000 to 8,000 f.c. (50,000 to 80,000 Lux).
- Low light levels cause stem stretch and poor flowering.
- Flowering is best under long days of Spring and Summer. Generally, flowering will begin in mid to late Spring and will be heaviest in late May to September. Crop times will be increased under short daylength. An Autumn crop is possible if the crop is started early enough to allow for flower initiation before days shorten significantly.
- For fastest flowering during short daylength, maintain night temperatures at 59 to 61°F (15 to 16°C) and use lighting to provide a daylength greater than 12 to 13 hrs. Night-break lighting can be used.

Watering
- Plants are susceptible to *Botrytis.* Avoid high humidity and wet foliage.
- Calibrachoa are susceptible to root diseases if over-watered. Allow the media to dry slightly between watering, but avoid any wilt.
- Provide plants with adequate horizontal air flow at all times.

Fertilizer
- Calibrachoa require heavy fertilization.
- Use constant feed with a balanced fertilizer at 225 to 300 ppm N with a full complement of minor elements. Additional iron as needed.
- Use clear water with every third watering if high soluble salt problems occur.

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

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

Controlling Growth
- Use high light and cool temperatures to control growth.
- Isabells Calibrachoa respond well to DIF in production.

ISABELLS CALIBRACHOA continued

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

Common Problems
Insects: Aphids, thrips, whitefly, leafminers and fungus gnats
Diseases: *Botrytis, Rhizoctonia, Phytophthora, Pythium, Theilaviopsis*

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 1 to 3 PP*
Unrooted cuttings	9 to 13	10 to 15
Rooted cuttings	6 to 9	7 to 11

*PP: Plants per pot

CAREX (SEED)

Amazon Mist
Carex comans

Red Rooster
Carex buchananii

Approximate seed count: 3,685 S./oz. (130 S./g)

PLUG PRODUCTION

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

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

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

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

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

Humidity
Maintain 95 to 100% relative humidity during germination.

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

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

Plant Growth Regulators
Not required.

GROWING ON TO FINISH

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

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

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

Irrigation
Maintain even moisture. Avoid excessive wetness.

Fertilizer
- After transplant, fertilize the crop with a balanced fertilizer supplying 150 to 200 ppm N.
- Maintain the media EC at 1.0 to 1.5 mmhos/cm and pH at 5.8 to 6.5.

Plant Growth Regulators
Not necessary.

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

COLEUS (SEED)

Solenostemon scutellarioides

Chocolate Covered Cherry Emotions

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

PLUG PRODUCTION

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

Sowing
Sow seed in 288 or larger plug trays. Cover lightly with vermiculite.

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

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

Stage 2
Soil temperature: 72 to 75°F (21 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm) from nitrate-form fertilizers with low phosphorous. Alternate feed with clear water. Feed between 2 to 3 clear irrigations. Irrigate early in the day so foliage is dry by nightfall to prevent diseases. Keep soil pH at 5.5 to 6.2 and EC less than 1.0 mS/cm.

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

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

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

GROWING ON TO FINISH

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

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

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

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

Irrigation
Avoid both excessive watering and drought.

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

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

Pinching
Not necessary.

Spacing
Space plants when foliage is touching.

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

Common Problems
Insects: Aphids, mealy bugs, whiteflies
Diseases: *Alternaria, Botrytis, Verticillium*
Other: Excessive internode elongation under low light

COLEUS (VEGETATIVE)

Solenostemon hybrid

Henna
Honey Crisp
Indian Summer
Redhead
Sultana
Vino
Wasabi

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

GROWING ON TO FINISH

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

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

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

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

VEGETATIVE COLEUS continued

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

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

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

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

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 1 to 2 PP*
Unrooted cuttings	8 to 10	9 to 11
Rooted cuttings	5 to 7	6 to 8

*PP: Plants per pot

COREOPSIS (SEED)

Coreopsis grandiflora

Early Sunrise

Approximate seed count: 10,700 S./oz. (375 S./g)

PLUG PRODUCTION

Plug Tray Size
Early Sunrise Coreopsis plugs are best produced in 392-cell plug trays. The average plug production time is 5 weeks.

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

Sowing
Cover the seed with a light layer of coarse grade vermiculite. This helps in keeping the seed moist during germination. Light is required for germination. Allow 4 to 6 days for germination.

Temperature
Germination: 68 to 72°F (20 to 22°C)
After germination: Plugs can be grown in the greenhouse at 70 to 75°F (21 to 24°C) days and 60 to 65°F (15 to 18°C) nights until transplant.

Light
Stage 1: Light is required for germination.
After germination: 2,500 to 3,000 f.c. (25,000 to 30,000 Lux)
Seedling maturity: Up to 5,000 f.c. (50,000 Lux)

Humidity
Maintain 95 to 97% relative humidity during germination.

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

Fertilizer
When cotyledons fully expand, start fertilizing with 50 ppm N twice a week. As the true leaves develop, increase the fertilizer rate to 100 ppm N. Maintain the plug media EC at 0.75 to 1.0 mmhos/cm and pH at 5.8 to 6.2.

Plant Growth Regulators
Not required.

GROWING ON TO FINISH

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

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

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

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

Irrigation
Maintain even moisture. Avoid excessive wetness.

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

Plant Growth Regulators
- Growth regulators can be applied for container production.
- Foliar sprays of B-Nine at 5,000 ppm applied twice after transplant work well. First application can be done 2 weeks after transplant followed by a second application 2 weeks later.

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

Common Problems
Insects: Whiteflies, thrips, and aphids

DIANTHUS (SEED)

Dianthus barbatus interspecific

Bouquet™

Approximate seed count: 8,575 S./oz. (300 S./g)

PLUG PRODUCTION

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

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

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

Light
Light is required for germination.

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

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

GROWING ON TO FINISH

Container Size
Suitable for production in 4-in. (10-cm) pots or in 6-in. (15-cm.) pots, 3 plugs per pot.

Temperature
- Night: 50 to 60°F (10 to 15 °C)
- Day: 60 to 72°F (15 to 22°C)

Fertilization
After plants are established, apply a calcium-based fertilizer or 15-5-15 at 100 ppm, 1 to 2 times per week. Dianthus require adequate calcium in their fertilization program.

Growth Regulators
Since Bouquet Dianthus are very responsive to growth regulators, growers should experiment with concentrations and application timing. For example, an application of Bonzi spray at 20 ppm can be applied 2 weeks after transplanting into a 4-in. (10-cm) or larger pot. For 6-in. (15-cm) pots, another application of Bonzi spray at 20 ppm may be required 2 weeks later.

Crop Scheduling (sow to flower)
Late Spring/Summer: 12 to 13 weeks
Late Summer/Winter: 14 to 18 weeks

CULTURAL TIP

Use a powdery mildew preventative program.

DIANTHUS (SEED)

Dianthus chinensis X barbatus

Floral Lace

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

GERMINATION

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

PLUG PRODUCTION

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

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

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

Light
Light is required for germination.

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

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

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

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

GROWING ON TO FINISH

Container Size
306 packs

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

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

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

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

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

DICHONDRA (SEED)

Dichondra argentea

Silver Falls

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

PLUG PRODUCTION

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.3 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

Sowing
Cover the seed lightly with coarse vermiculite.

Temperature
Germination: 72 to 76ºF (22 to 24ºC)
Cotyledon stage: 65 to 72ºF (18 to 22ºC)
True leaves: 65 to 70ºF (18 to 21ºC)
Hold plugs: 62 to 65ºF (16 to 18ºC)

Light
Stage 1: Not required.
After germination: 1,000 to 2,500 f.c. (10,000 to 30,000 Lux).
Seedling maturity: Up to 5,000 f.c. (54,000 Lux) if temperature can be controlled.

Humidity
Maintain 95% relative humidity until cotyledons emerge.

Soil Moisture
Keep soil moisture high until radicle emergence, then reduce moisture levels after the radicle penetrates the medium. Plug development is faster with drier plug culture. Do not allow the seedlings to wilt.

Fertilizer
At radicle emergence, apply 50 to 75 ppm N from 15-0-15. As cotyledons expand, increase to 100 to 150 ppm N.

Growth Regulators
Spray B-Nine at 2,500 ppm 1 week before transplant to promote branches.

GROWING ON TO FINISH

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

Temperature
- Night: 62 to 65ºF (16 to 18ºC)
- Day: 65 to 75ºF (18 to 24ºC)

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

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

Fertilizer
Feed weekly with 200 ppm N in complete fertilizer.

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

Pinching
Pinching is not needed.

Crop Scheduling
Sow to transplant (288-cell plug tray): 6 to 7 weeks
Transplant to saleable 4-in. (10-cm) pot: 7 to 8 weeks

Container Size	Plants Per Pot	Weeks From Transplant
4 to 4.5-in. (10 to 11-cm) Pot	1	6 to 7

If producing liners (72-tray), allow 7 to 8 weeks from sow to transplant, and reduce post-transplant crop time by 2 weeks.

Common Problems
Insects: No serious problems
Diseases: No serious problems

EUPHORBIA (VEGETATIVE)

Euphorbia hypericifolia

Breathless®

PROPAGATION

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

GROWING ON TO FINISH

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

Temperature
- Night: 59 to 67º (15 to 19ºC)
- Day: 65 to 76ºF (18 to 24ºC)

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

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

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

Pinching
- If no pinch was performed in propagation, Breathless Euphorbia should be pinched at transplant to encourage basal branching. Additional pinching is optional.
- A 4-in. (10-cm) crop can be produced without a pinch in finish production provided it received a pinch in propagation or at transplant.
- Plants in 10-in. (25-cm) or larger pots may require a shearing to shape.

Controlling Growth
- Maintain recommended temperatures and light levels to avoid stretch.
- Excessive moisture in media will encourage unwanted stretch. Water management is an excellent tool to use to produce high-quality Breathless Euphorbia.
- Chemical plant growth regulators are generally not needed.
- Use a B-Nine (spray) 2,500 ppm, Cycocel (spray) 750 ppm tank mix 7 to 10 days after transplant.
- **Do not use Florel.**
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

Common Problems
Insects: Whitefly, spider mites

Problems	Causes
Plant collapse	Stem canker *(Botrytis)* Plants grown in saturated media for extended periods of time *(Pythium)*
Poor branching and thin plants	Low fertilization during early stages of growth; low light
Yellowing foliage	Euphorbia can be cold sensitive if not acclimated and lower leaves may yellow especially when there is excessive moisture at low temperatures. Yellowing will also occur when treated with Florel.

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 2 to 3 PP*
Unrooted cuttings	8 to 11	9 to 13
Rooted cuttings	6 to 7	6 to 9

*PP: Plants per pot

GERANIUM
(VEGETATIVE)

Pelargonium x hortorum

Fantasia®

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

GROWING ON TO FINISH

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

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

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

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

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

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

FANTASIA GERANIUM continued

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

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

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

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

Problems	Causes
Plant collapse	*Botrytis, Pythium, Rhizoctonia* Saturated soil for extended periods of time *(Pythium)*
Excess vegetative growth, few flowers	Excessive ammonia in fertilizer Over-fertilization under low light conditions Low light levels and overwatering; wet media
Foliage necrosis	Drying out between waterings Low pH High salts
Cupped foliage	Low pH
Poor branching, thin plants	Low fertilization in early stages of crop Low light levels

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 1 to 2 PP*
Unrooted cuttings	12 to 13	13 to 14
Callused cuttings for direct sticking	10 to 11	11 to 12
Rooted cuttings	8 to 9	9 to 10

*PP: Plants per pot

GERBERA (SEED)

Gerbera jamesonii

Revolution™

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

PLUG PRODUCTION

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

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

Stage 1 – Germination takes 4 to 7 days.
Soil temperature: 64 to 68°F (18 to 20°C
Light: Light is optional.
Moisture: Keep soil saturated (level 5) during Stage 1 for optimal germination.
Humidity: Maintain 95% relative humidity until radicle emergence.

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

Stage 3
Soil temperature: 68 to 70°F (20 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: It is critical to allow the media to dry until the surface become light brown (level 2) before watering. Keep the moisture level at wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm) from nitrate-form fertilizers (17-5-17 , 14-0-14, 15-5-15).
Growth Regulators: None

Stage 4
Soil temperature: 68 to 70°F (21 to 21°C)
Light: Up to 5,000 f.c. (53,800 Lux) if optimal temperature can be maintained.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

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

GROWING ON TO FINISH

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

Container size
4 to 6-in. (10 to 15-cm) pots

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

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

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

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

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

Growth Regulators
Generally, growth regulators are not needed. To reduce stretching when growing pot tight, B-Nine (daminozide) can be applied at 1,000 to 1,500ppm 2 to 3 times with an interval of 5 to 7 days. Do not apply when flower buds are the size of a pea or bigger to prevent decrease of flower size.

Pinching
None.

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

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

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

Common Problems
Insect: White flies, thrips
Disease: Downy mildew, Crown rot, *Botrytis,* Fusarium

IMPATIENS (VEGETATIVE)

Impatiens walleriana

Center Stage

A Burpee Home Gardens® Exclusive.

Patchwork

Fiesta® (Double Impatiens)

PROPAGATION

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

GROWING ON TO FINISH

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

Temperature – Patchwork, Fiesta
- Night: 56 to 61°F (13 to 16°C)
- Day: 68 to 76°F (20 to 24°C)

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

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

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

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

Pinching

Do not require pinching because they are naturally branching.

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

Common Problems

Insects: Thrips, aphids, fungus gnats
Diseases: *Botrytis* (gray mold), *Pythium, Rhizoctonia*

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

Problems	Causes
Plant collapse	Stem canker *(Botrytis)* Plants grown in saturated soil for extended period of time *(Pythium)*
Excessive vegetative growth, lack of flowers	Excessive nitrogen in fertilizer Excessive phosphorous Over-fertilization under low light conditions Low light and overwatering; wet media Excess or late Florel application
Foliage necrosis, leaf spot	Drying out between waterings Excess minor nutrient levels in media
Poor branching, thin plants	Low fertilization in early stages of crop

Center Stage Impatiens Crop Schedule & Uses

(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 1 to 2 PP*
Unrooted cuttings	10 to 12	12 to 14
Rooted cuttings	7 to 10	9 to 12

*PP: Plants per pot

Patchwork and Fiesta Impatiens Crop Schedule & Uses

(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 1 to 2 PP*
Unrooted cuttings	9 to 12	10 to 12
Rooted cuttings	6 to 9	7 to 9

*PP: Plants per pot

IMPATIENS (SEED)

Impatiens walleriana

Enlighten

A Burpee Home Gardens® Exclusive.

Enlighten Flutter

A Burpee Home Gardens® Exclusive.

GERMINATION

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

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (3 to 5 days)

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

Stage 2 – Stem and cotyledon emergence (10 days)

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

Stage 3 – Growth and development of true leaves (14 to 21 days)

- Allow the soil to dry out thoroughly between irrigations, but avoid severe wilting to promote root growth and control shoot growth.
- Soil temperature should be between 68 to 72°F (20 to 22°C).
- Maintain soil pH 6.0 to 6.2 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Use DIF (temperature differential) whenever possible to control plant height – especially the first 2 hours after sunrise. A-Rest, B-Nine, Bonzi or Sumagic can also be used.

Stage 4 – Plants ready for transplanting or shipping (7 days)

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

GROWING ON TO FINISH

Temperature

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

Light

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

Media

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

Fertilization

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

Controlling Height

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

Common Problems

Insects: Aphids, thrips
Diseases: *Pythium, Rhizoctonia, Botrytis,* TSWV/INSV (Impatiens Necrotic Spot Virus)
Other: Boron deficiency, high media pH
The most important disease and insect problem associated with impatiens is Impatiens Necrotic Spot Virus (INSV), which is transmitted by thrips. Control of thrips is necessary to avoid INSV.

SPREADING IMPATIENS (VEGETATIVE)

Impatiens hybrida

Fanfare®

PROPAGATION

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

GROWING ON TO FINISH

Media

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

Temperature

- Night: 59 to 64°F (15 to 18°C)
- Day: 68 to 79°F (20 to 26°C)
- Night temperatures above 70°F (21°C) will delay flowering dramatically and reduce plant quality.

Light

- Fanfare Spreading Impatiens are daylength-neutral and will flower year-round.
- Plants grow best under moderate light intensity. The ideal range would be 4,000 to 9,000 f.c. (40,000 to 90,000 Lux).
- Plants will stretch at light intensities below 3,000 f.c. (30,000 Lux).
- Reduce light intensity when temperatures are high to prevent flower and leaf burning.
- HID lighting can be used to reduce crop time in areas with naturally low light levels.

FANFARE SPREADING IMPATIENS
continued

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

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

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

Controlling Growth
- Grow plants with adequate light and space.
- Avoid high ammonium and phosphorus fertilizers, and do not overwater.
- Fanfare Spreading Impatiens will generally flower and be saleable well before any plant growth regulators are needed.
- Bonzi (5 to 15 ppm) applied as a spray 1 to 2 times can be used to control growth of Fanfare Spreading Impatiens.
- Mature plants which are approaching shipping can be drenched with Bonzi (0.25 to 0.50 ppm) to significantly slow vegetative growth while allowing flowering to continue.
- These recommendations for plant growth regulators should be used only as general guidelines. Growers must trial all chemicals under their particular conditions.

Common Problems
Insects: Thrips, spider mites, aphids
Diseases: Impatiens Necrotic Spot Virus (INSV), *Botrytis* (gray mold)

Problems	Causes
Plant collapse	Stem canker *(Botrytis)* Plants grown in saturated soil for extended period of time *(Pythium)*
Excessive vegetative growth, lack of flowers	Excessive nitrogen in fertilizer Excessive phosphorous Over-fertilization under low light conditions Low light and overwatering; wet media Excess or late Florel application
Foliage necrosis, leaf spot	Drying out between waterings Excess minor nutrient levels in media
Poor branching, thin plants	Low fertilization in early stages of crop

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 1 to 2 PP*
Unrooted cuttings	9 to 11	11 to 13
Rooted cuttings	6 to 8	8 to 10

*PP: Plants per pot

NEW GUINEA IMPATIENS (VEGETATIVE)

Impatiens hawkerii

Celebrette

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

GROWING ON TO FINISH

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

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

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

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

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

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

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

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

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

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 1 to 2 PP*
Unrooted cuttings	9 to 11	10 to 12
Rooted cuttings	6 to 8	7 to 9

*PP: Plants per pot

IPOMOEA (VEGETATIVE)

Ipomoea batatas

Blackie
Marguerite

PROPAGATION
- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 72°F (20 to 22°C) until roots are visible.
- Should be propagated under moderately high light as possible while avoiding unnecessary stress on the cuttings.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop. Avoid phosphorous and ammoniacal nitrogen during the rooting process to reduce stretch and unwanted vegetative growth.
- As the rooted cuttings develop, high light, appropriate water stress and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs) If necessary use B-Nine at 2,500 ppm .
- Pinching is not required but to improve branching and habit, plants can be pinched 5 to 7 days before transplanting.
- Ipomoea rooted cuttings should be ready for transplanting 24 to 28 days after sticking and should be transplanted as soon as possible.

GROWING ON TO FINISH

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

Light
- Keep light intensities above 3,000 to 5,000 f.c. while maintaining moderate temperatures.
- Ipomoea are grown for their foliage, and the flowers are small and inconspicuous. Therefore photoperiod is irrelevant, but flowering occurs earlier under short day conditions.
- Low light levels promote stem stretch at intensities below 1,500 f.c.
- Foliage color is reduced as intensity decreases.

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

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

BLACKIE & MARGUERITE IPOMOEA
continued

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

Pinching
- Once liners are established, pinch plants.
- Pinch plants above the fifth to sixth leaves, about 1 to 1.5 inches above the soil.

Controlling Height
- Height can be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Ipomoea also responds well to the use of B-Nine (2,500 ppm).
- Apply growth regulators once plants reach side of container.

Common Problems
Diseases: *Botrytis, Rhizoctonia, Pythium*
Insects: Aphids, Mealy bugs, Whitefly

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 1 to 2 PP*
Unrooted cuttings	10 to 12	11 to 13
Rooted cuttings	7 to 9	8 to 10

*PP: Plants per pot

JUNCUS (SEED)

Blue Dart
Juncus tenuis

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

Twisted Dart
Juncus tenuis – Juncus effusus spiralis

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

PLUG PRODUCTION

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

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

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

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

Stage 3
Temperature: 68 to 70°F (20 to 21°C).
Light: Can be up to 2,500 f.c. (26,900 Lux)
Media Moisture: Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Stage 4
Temperature: 65 to 67°F (18 to 19°C).
Light: Can be up to 5,000 f.c. (54,000 Lux)
Media Moisture: Maintain wet/dry cycle. Do not allow the seedlings to wilt.
Fertilizer: Keep the fertilizer rate to 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Growth Regulators
Not needed.

GROWING ON TO FINISH

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

Temperature
- Night: 59 to 64°F (15 to 18°C)
- Day: 62 to 73°F (17 to 23°C)
- Plants can be grown under temperatures as low as 50°F (10°C) but the crop time will increase significantly.

Light
As high as possible while maintaining moderate temperature.

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

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

Growth Regulators
Not needed.

Pinching
Pinching is not needed.

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

Crop Scheduling
Sow to transplant (288/264-cell plug tray):
Blue Dart: 6 to 7 weeks
Twisted Dart: 7 to 8 weeks
Add one more week when using 128 or 72-cell plug tray, but reduce post-transplant crop times by 1 week for Blue Dart.

Transplant to saleable size (from 288 cell):

Container Size	Plants Per Pot/ Basket	Weeks From Transplant	Total Weeks
4-in. (10-cm) Pot, Blue Dart	1	7 to 8	13 to 15
4-in. (10-cm) Pot, Twisted Dart	1	7 to 8	14 to 16
6-in. (15-cm) Pot, Blue Dart	3	7 to 8	13 to 15
6-in. (15-cm) Pot, Twisted Dart	3	7 to 8	14 to 16

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

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

LANTANA (VEGETATIVE)

Lantana camara

Lucky™

PROPAGATION

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

GROWING ON TO FINISH

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

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

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

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

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

Pinching
- Lucky Lantana should be pinched 7 to 10 days after transplanting. When pinched, plants should be actively growing with roots at or near the edge of the pot. Depending on pot size and local conditions, Lucky Lantana should be pinched 1 to 3 times.
- Florel promotes branching and improves the habit of Lantana. No Florel should be applied within 8 weeks of sale. A range of 300 to 400 ppm, applied 1 to 3 times should be used as a guideline. Florel must be applied to plants that are under no stress (water, temperature, etc.).

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

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

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 to 2 PP*
Unrooted cuttings	9 to 10
Rooted cuttings	6 to 7

*PP: Plants per pot

LOBELIA (VEGETATIVE)

Lobelia hybrida

Hot Springs™

PROPAGATION

- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- A rooting hormone can be applied to promote early, uniform rooting.
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- To encourage branching and reduce stem stretch, Hot Springs Lobelia should be propagated under as high a light as possible while avoiding unnecessary stress on the cuttings.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop. Avoid phosphorous and ammoniacal nitrogen during the rooting process to reduce stretch and unwanted vegetative growth.
- As the rooted cuttings develop, high light, appropriate water stress and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- Hot Springs Lobelia can be pinched 18 to 24 days after sticking, when roots are well developed, to promote early branching and improve habit.
- Hot Springs Lobelia rooted cuttings should be ready for transplanting 24 to 28 days after sticking and should be transplanted as soon as possible. Rooted cuttings should not be held, as Hot Springs Lobelia will be actively growing and plants will begin to stretch very quickly.

GROWING ON TO FINISH

Media

- Use a media with good aeration, drainage and water-holding capacity.
- A pH of 5.6 to 6.2 with a moderate starter charge is optimal.

Temperature

- Nights: 56 to 64°F (13 to 18°C)
- Days: 71 to 79°F (21 to 26°C)

Light

- Plants grow best at 5,000 to 8,000 f.c. (50,000 to 80,000 Lux).
- Flowering of Hot Springs Lobelia is almost independent of daylength. This variety will flower well early Spring through Fall.

Water

- Keep media moderately moist.
- Avoid water stress, as it will cause leaf edge burn.

Fertilizer

- Hot Springs Lobelia has a moderate fertilizer requirement.
- Maintain constant fertilization at 175 to 250 ppm N.
- Excessive phosphorous and ammoniacal nitrogen will promote unwanted vegetative growth. Both should be provided in very limited quantities.
- If new growth is chlorotic, add chelated iron to the feed.
- Slow-release fertilizer can be incorporated at a moderate rate to supplement a liquid program.

Pinching

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

Controlling Growth

Hot Springs Lobelia does not require growth regulators.

Common Problems

Insects: Spider mites, thrips.
Diseases: *Botrytis, Pythium*

Problems	Causes
Plant collapse	Stem canker *(Botrytis)* Plants grown in saturated soil for extended period of time *(Pythium)*
Excess vegetative growth, lack of flowers	Excessive nitrogen balance in fertilizer Over-fertilization under low light conditions
Foliage necrosis, leaf spot	Low light and overwatering; wet media Drying out between waterings High soluble salts level
Poor branching, thin plants	Low fertilization in early stages of crop Inadequate pinching or shearing

Crop Schedule & Uses

(Crop Schedule in Weeks)

	Unrooted cuttings	Rooted cuttings
4-in. (10-cm) Pot 1 PP*	10 to 13	7 to 9
6-in. (15-cm) Pot 2 PP*	12 to 14	9 to 11
10 to 12-in. (25 to 30-cm) Pot 4 to 5 PP*	13 to 15	10 to 12

*PP: Plants per pot or basket

AFRICAN MARIGOLD (SEED)

Tagetes erecta

Taishan®

Vanilla

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

PLUG PRODUCTION

Media

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

Plug Tray Size

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

Sowing

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

Stage 1 – Germination takes approximately 2 to 3 days.
Germination temperature: 68 to 72°F (20 to 22°C)
Light: Light is not required for germination.
Moisture: Keep soil wet (level 4) during Stage 1.
Humidity: Maintain 95 to 97% relative humidity (RH) until radicle emergence.

Stage 2
Temperature: 70 to 75°F (21 to 24°C) days; 60 to 65°F (15 to 18°C) nights
Light: Can be up to 2,500 f.c. (26,900 Lux) during Stage 2.
Moisture: Keep the media medium (level 3) to medium wet (level 4).
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm) with a nitrate-form fertilizer with low phosphorous.

Stage 3
Temperature: 70 to 75°F (21 to 24°C) days; 60 to 65°F (15 to 18°C) nights
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Keep the media medium wet (level 3) during Stage 3.
Fertilizer: Increase the fertilizer rate to level 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Stage 4
Temperature: 65 to 70°F (18 to 21°C) days; 60 to 65°F (15 to 18°C) nights
Light: Light levels can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.
Growth Regulators: Generally not required during plug production. Do not hold the plugs too long – transplant them on time.

GROWING ON TO FINISH

Container Size
306 packs: 1 plant per cell
4-in. (10-cm) pots: 1 plant per pot

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

Temperature
- Night: 59 to 65°F (15 to 18°C)
- Day: 63 to 70°F (17 to 21°C)
- Can be grown at moderate temperatures, minimum temperature 54°F (12°C).

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

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

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

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

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

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

Common Problems
Insects: Monitor for Aphids early in production, and for Thrips and Mites during flowering.

FRENCH MARIGOLD
(SEED)

Tagetes patula

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

PLUG PRODUCTION

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

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

Sowing
Cover the seed with coarse vermiculite. Allow 3 to 4 days for germination.

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

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

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

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

Fertilizer
Stage 2 and 3: Apply 50 to 75 ppm N, maintaining an EC of 1.0.
Stage 4: Apply 100 to 150 ppm N, maintaining an EC of 1.0 to 1.5.

Growth Regulators
Not required.

GROWING ON TO FINISH

Container Size
Durango Marigolds are well-suited to 306 packs and 4-in. (10-cm) pots.

Media
Use a well-drained, disease-free, soilless medium with a pH of 6.2 to 6.5 and a medium initial nutrient charge.

Temperature
- Night: 60 to 62°F (15 to 17°C)
- Day: 65 to 68°F (18 to 20°C)

Light
Keep light levels from moderate to high.

Irrigation
Maintain even moisture. Do not allow plants to wilt.

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

Growth Regulators
To tone the plants for best appearance, we recommend applying B-Nine at 2,500 ppm, 1 week after transplant for cell packs or 2 weeks after transplant for 6-in. (15-cm) pots.

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

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

OSTEOSPERMUM
(VEGETATIVE)

Osteospermum hybrid

Voltage™ Yellow

PROPAGATION

- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) for up to 14 days.
- Once roots begin to form, reduce temperature to 64 to 68°F (18 to 20°C) to avoid unnecessary stretch.
- A rooting hormone can be applied to promote early, uniform rooting.
- Mist may need to be applied for up to 24 hours per day for 3 to 5 days, depending on local conditions. Frequency and run time should be reduced during the dark period, but unrooted cuttings must not be allowed to wilt.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 ppm N as roots develop.
- Once roots are visible, the media should be kept moderately wet but never saturated. This will help prevent iron deficiency and the associated chlorotic foliage which can develop.
- Voltage Yellow Osteospermum should not be pinched but flower buds can be removed if needed.
- Voltage Yellow Osteospermum rooted cuttings should be ready for transplanting 28 to 32 days after sticking.

GROWING ON TO FINISH

Media

- Use media with good aeration, drainage and water-holding capacity.
- Like most Osteospermum, Voltage Yellow prefers a medium that will dry regularly between waterings.
- A pH of 5.8 to 6.2 is optimum.

Temperature

- After transplanting, allow plants to become established for 7 to 14 days, depending on pot size, at a night temperature of 59 to 64°F (15 to 18°C). Once plants are well-established and rooted in, begin growing at recommended cool temperature.
- Night: 44 to 55°F (7 to 13°C).
- Day: 59 to 75°F (15 to 24°C); avoid temperatures above 80°F (26°C).

Transplanting

Rooted cuttings should be transplanted at or slightly above the soil line of the final container. This will greatly reduce problems with various root and stem rots. In some situations a preventative fungicidal soil drench may be appropriate.

Light

Voltage Yellow Osteospermum will perform best under moderate to high light levels of 5,000 to 9,000 f.c. (50,000 to 90,000 Lux).

Watering

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

Fertilizer

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

Pinching

A pinch is optional; however, disbudding may be necessary for better branching.

Controlling Growth

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

Common Problems

Insects: Thrips, whitefly, aphids, fungus gnats
Diseases: *Botrytis* (gray mold), *Thielaviopsis, Pythium, Rhizoctonia*, powdery mildew

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 1 to 2 PP*
Unrooted cuttings	11 to 15	11 to 15
Rooted cuttings	8 to 11	8 to 11

*PP: Plants per pot

ORNAMENTAL PEPPER (SEED)

Capsicum annuum

Black Pearl
Purple Flash

Approximate seed count: 6,850 S./oz. (240 S./g)

PLUG PRODUCTION

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

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

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

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

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

GROWING ON TO FINISH

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

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

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

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

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

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

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

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

PETUNIA (SEED)

Petunia x hybrida

Paparazzi™ (grandiflora)

A Burpee Home Gardens® Exclusive.

Paparazzi™ Flash (multiflora)

A Burpee Home Gardens® Exclusive.

Pop Rocks (spreading)

A Burpee Home Gardens® Exclusive.

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

PLUG PRODUCTION

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

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

Stage 1 – Germination takes approximately 4 days.
Soil temperature: 72 to 76°F (22 to 24°C)
Light: Lighting is optional for all varieties.
Moisture: Keep soil very wet (level 5) during Stage 1 for optimal germination.
Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Stage 2
Soil temperature: 68 to 75°F (20 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3
Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).
Growth Regulators: Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.

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

Stage 4
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

GROWING ON TO FINISH

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

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

Temperature
- Night: 57 to 65°F (14 to 18°C)
- Day: 61 to 75°F (16 to 24°C)
- Petunias can tolerate temperatures as low as 35°F (2°C); however, keep in mind that crop timing (time to flower) is related to daily average temperature when grown under proper daylength. Plants will take longer to flower when grown in cooler conditions.

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

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

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

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

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

Total Crop Time:

Container Size	Number of Plants	Spring	Summer
4 & 6-in. (10 & 15-cm) Pot	1	7 to 8	13 to 15

Common Problems
No major problems will occur if good cultural and IPM practices are used.

PETUNIA (VEGETATIVE)

Petunia x hybrida

Black Velvet
Blue A Fuse
A Burpee Home Gardens® Exclusive.
Phantom
Pinstripe

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

GROWING ON TO FINISH

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

Temperature
- Night: 53 to 61ºF (12 to 16ºC)
- Day: 59 to 76ºF (15 to 24ºC)

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

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

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

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

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

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

Common Problems
Black Velvet will develop a few flowers with coloring similar to Phantom. This generally occurs in low light, low fertility situtations. As growing conditions improve, this is minimized.
Insects: Aphids, thrips, whitefly, leafminers, fungus gnats.
Diseases: *Botrytis, Rhizoctonia, Pythium.*

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

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 2 to 3 PP*
Unrooted cuttings	8 to 10	9 to 11
Rooted cuttings	5 to 7	6 to 8

*PP: Plants per pot

TRAILING PETUNIA
(VEGETATIVE)

Petunia x hybrida

Suncatcher™

PROPAGATION

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

GROWING ON TO FINISH

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

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

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

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

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

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

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

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

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

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

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 1 to 2 PP*
Unrooted cuttings	9 to 11	10 to 12
Rooted cuttings	6 to 8	7 to 9

*PP: Plants per pot

RUDBECKIA (SEED)

Rudbeckia hirta

Tiger Eye

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

PLUG PRODUCTION

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

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

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

Temperature
Germination: 75 to 78°F (24 to 25°C)
After germination: Plugs can be grown in the greenhouse at 70 to 75°F (21 to 24°C) days and 64 to 67°F (18 to 19°C) nights until transplant.

Light
Stage 1: Light is required for germination
After germination: 2,500 to 3,000 f.c. (25,000 to 30,000 Lux)
Seedling maturity: Up to 5,000 f.c. (50,000 Lux)

Humidity
Maintain 95 to 100% relative humidity during germination.

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

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

Plant Growth Regulators
Not required.

GROWING ON TO FINISH

Container Size
6-in. (15-cm.) pots

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

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 64 to 67°F (18 to 19°C)
- Maintain these temperatures until bud initiation.

Light
Rudbeckia flowers earlier under long days.

Irrigation
Maintain even moisture. Avoid excessive wetness.

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

Plant Growth Regulators
- Growth regulators can be applied for container production.
- Foliar sprays of B-Nine at 2,500 to 5,000 ppm applied twice after transplant work well. First application can be done 2 weeks after transplant, followed by a second application 2 weeks later.

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

Common Problems
Insects: Whiteflies, thrips and aphids

SALVIA (VEGETATIVE)

Salvia farinacea x longispicata

Mystic Spires Blue

PROPAGATION

- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50°F (7 to 10°C).
- Soil temperature should be maintained at 68 to 73°F (20 to 23°C) until roots are visible.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- Once roots are visible, the media should be kept moderately wet and never saturated. This will prevent iron deficiency and the associated chlorotic foliage which can develop.
- As the rooted cuttings develop, appropriate water stress and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- A B-Nine spray (2,500 to 3,000 ppm) once roots have developed is effective in controlling stretch and encouraging good branching.
- A Bonzi drench (0.5 to 3 ppm) 10 to 12 days after sticking is also effective in controlling stretch.
- Mystic Spires Blue Salvia should be pinched 18 to 24 days after sticking, when roots are well developed, to promote early branching and improve habit.
- Mystic Spires Blue Salvia rooted cuttings should be ready for transplanting 21 to 24 days after sticking.

GROWING ON TO FINISH

Media
- A pH of 5.8 to 6.2 is optimum.
- Mystic Spires Blue Salvia prefers a well-drained soil.

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

Light
- Mystic Spires Blue Salvia should be grown in high light; 6,000 to 10,000 f.c. (60,000 to 100,000 Lux) is the ideal range.
- Plants will stretch badly at light intensities below 4,000 f.c. (40,000 Lux); branching will be reduced, as will flowering, and the overall quality of Mystic Spires Blue Salvia will be reduced significantly.
- Mystic Spires Blue Salvia will bloom quicker under short days.

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

MYSTIC SPIRES BLUE SALVIA
continued

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

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

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

Common Problems
Insects: Thrips, aphids, whitefly, fungus gnats
Diseases: *Botrytis, Pythium, Rhizoctonia*

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	6-in. (15-cm) Pot 1 to 2 PP*
Unrooted cuttings	10 to 14
Rooted cuttings	6 to 10

*PP: Plants per pot

SALVIA (SEED)

Salvia splendens

Vista

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

PLUG PRODUCTION

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

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

Stage 1 – Germination takes approximately 4 to 5 days.
Soil temperature: 75 to 78°F (24 to 25°C)
Light: Lighting is not necessary.
Moisture: Keep soil wet (level 4) during Stage 1 for optimal germination.
Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

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

Stage 3
Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 0.75 to 1.0 and 1.5 mS/cm (1:2 extraction).
Growth Regulators: Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. B-Nine at 2,500 to 5,000 to tone plugs. Test all chemical plant regulators first.

Stage 4
Soil temperature: 60 to 65°F (15 to 18°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

GROWING ON TO FINISH

Container Size
306 tray: 1 plant per cell

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

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

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

Fertilizer
- Apply nitrate-form with low phosphorus fertilizer at rate 3 (175 to 225 ppm) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and balance medium pH. Maintain medium pH 5.8 to 6.2.
- For a constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm) while maintaining the above recommended EC and pH ranges.

Growth Regulators
- Use B-Nine (daminozide) at 2,500 to 5,000 ppm 2 to 3 times starting at 7 days after transplant. Bonzi, Sumagic, and B-Nine/Cycocel tank mix are also effective.
- To determine the best rate for your conditions, we recommend that you run an in-house trials.

Crop Scheduling
Sow to transplant (400 to 288-cell plug): 4 to 6 weeks
Transplant to flower: 5 to 7 weeks
Total crop time: 306 pack, 4 to 5 weeks

Common Problems
Insects: Thrip, Aphids, Whitefly
Diseases: Alternaria Leaf Spot, Powdery Mildew, Rust

SNAPDRAGON (SEED)

Antirrhinum majus

Snapshot™

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

GERMINATION AND PLUG PRODUCTION

Stage 1 - Time of radical emergence.
Use a well-drained, disease-free seedling medium with a pH of 5.5 to 5.8 and EC less than 0.75 mmhos/cm (2:1 extraction).
Germination: 64 to 68°F (18 to 20°C)
Timing: 4 to 8 days
Soil temperature: 64 to 68°F (18 to 20°C)
Moisture: Medium
Light: Not required
Cover: Lightly with vermiculite

Stage 2 - Stem and cotyledons emerge.
Timing: 7 to 14 days
Soil temperature: 65 to 70°F (18 to 21°C)
Moisture: Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering. Irrigate early in the day so that foliage is dry by nightfall.
Light: 450 to 1,500 f.c. (5,000 to 16,000 Lux)
Fertilizer: 50 to 75 ppm N from 14-0-14 or calcium/potassium nitrate feed once per week when cotyledons are fully expanded. Alternate feed with clear water. Maintain water alkalinity at 60-100 ppm and ammonium levels at less than 10 ppm.
Soil pH: 5.5 to 5.8
Soil EC: Less than 0.75 mmhos/cm

Stage 3 - Growth and development of true leaves.
Timing: 14 days
Soil temperature: 62 to 65°F (17 to 18°C)
Moisture: To promote root growth and control shoot growth, allow the soil to dry between irrigations, but avoid wilting.
Light: 1,000 to 2,500 f.c. (11,000 to 27,000 Lux)
Fertilizer: 100 to 150 ppm of 20-10-20 alternating with 15-5-15 or other cal-mag formulations, every 2 or 3 irrigations.
Soil pH: 5.5 to 5.8
Soil EC: Less than 1.0 mmhos/cm
Plant growth regulators: Use DIF whenever possible. A-Rest sprayed 3 and 4 weeks after sowing at 10 ppm is effective in controlling height.

Stage 4 - Plants are ready for transplant or shipping.
Timing: 7 days
Soil temperature: 60 to 62°F (16 to 19°C)
Moisture: Allow soil to dry thoroughly between irrigations, but avoid wilting.
Light: 1,000 to 2,500 f.c. (11,000 to 27,000 Lux)
Fertilizer: 100 to 150 ppm N from 15-5-15 or other cal-mag formulation as needed. Avoid ammonium fertilizers in Stage 4.
Soil pH: 5.5 to 5.8
Soil EC: Less than 0.75 mmhos/cm

GROWING ON TO FINISH

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

Temperature
- Night: 45 to 55°F (10 to 13°C)
- Day: 55 to 70°F (13 to 21°C)
- Avoid night temperatures above 55°F (13°C) as this will reduce stem strength.
- The best time to grow Snapdragons is Autumn through early Spring, when cooler growing conditions can be maintained.

Moisture
Allow soil to dry slightly between waterings, but avoid wilting.

Light
Keep light levels as high as possible while maintaining recommended temperature.

Fertilizer
Every other irrigation, apply 150 ppm N from 15-0-15, 15-5-15 alternating with 20-10-20. Alternate feed with clear water.

Soil pH
5.5 to 6.2

Soil EC
1.0 mmhos/cm (using 1:2 extraction). Provide good airflow at the plant level.

Controlling Height
- Once plants are rooted to the sides of the containers they can be allowed to dry slightly prior to irrigation.
- Withhold fertilizer, especially phosphorous and ammonium-form N.
- Snapdragons are responsive to day/night temperature differential (DIF) and are shorter with a negative DIF.
- When grown as recommended under cool temperatures and high light, no growth regulators should be needed. B-Nine, Bonzi and Sumagic are effective in controlling height in snapdragons, but may delay flowering and will lead to less uniform flowering time.

Crop Scheduling
Sow to transplant (400-cell plug tray): 5 to 6 weeks
Transplant to saleable 306 packs: 4 to 6 weeks

Common Problems
Insects: Thrips, aphids
Diseases: Downy mildew, *Botrytis*, powdery mildew

VERBENA (VEGETATIVE)

Verbena x hybrid

Aztec®

PROPAGATION

- Choose a well-drained medium with an EC of 0.75 to 0.80 mmhos and a pH of 5.8 to 6.2.
- Stick cuttings within 12 to 24 hours of arrival. Cuttings can be stored overnight, if necessary, at 45 to 50ºF (7 to 10ºC).
- Soil temperature should be maintained at 68 to 73ºF (20 to 23ºC) until roots are visible.
- Once roots are visible, the media should be kept moderately wet and never saturated. This will prevent iron deficiency and the associated chlorotic foliage which can develop.
- As rooted cuttings are removed from mist, apply a broad spectrum foliar fungicide.
- Begin fertilization with 75 to 100 ppm N when roots become visible. Increase to 150 to 200 ppm N as roots develop.
- As the rooted cuttings develop, high light and moderate air temperatures should eliminate the need for chemical plant growth regulators (PGRs).
- To improve branching and habit, plants can be pinched 7 to 10 days before transplanting.
- Aztec Verbena rooted cuttings should be ready for transplanting 24 to 28 days after sticking.

GROWING ON TO FINISH

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

Temperature
- Night: 62 to 64ºF (17 to 18ºC)
- Day: 71 to 79ºF (21 to 26ºC)

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

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

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

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

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

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

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

Crop Schedule & Uses
(Crop Schedule in Weeks)

	4-in. (10-cm) Pot 1 PP*	6-in. (15-cm) Pot 2 PP*
Unrooted cuttings	8 to 10	10 to 11
Rooted cuttings	5 to 7	7 to 8

*PP: Plants per pot

VERBENA (SEED)

Verbena x hybrid

Quartz XP

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

PLUG PRODUCTION

Plug Tray Size
392-cell or similar size.

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

Stage 1 - Sow to radicle emergence; 4 to 6 days
Germination temperature: 72 to 75°F (22 to 24°C)
Light: Not required for germination.
Relative humidity: 95 to 97%.

Stage 2 - Radicle emergence to cotyledon expansion; 10 to 14 days
Temperature: The day air temperatures can be set at 70 to 72°F (21 to 22°C) and the night temperature at approximately 60°F (15°C).
Light: Up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.
Moisture: Once the plug trays come out of the germination chamber, grow them under medium-wet (level 4) moisture conditions. Avoid wet (level 5) moisture conditions until the seedlings establish.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

Stage 3 - Cotyledon expansion to growth of all set of true leaves; 10 to 14 days
Temperature: The day air temperatures can be set at 68 to 70°F (20 to 21°C) and the night temperature at approximately 60°F (15°C).
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Stage 4 - Development of all true leaves to shipping/transplant; 7 days
Maintain the recommended growing temperatures and fertilizer regime as in Stage 3. Light levels can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained. Check for powdery mildew from this stage onwards.

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

GROWING ON TO FINISH

Container Size
306-cell packs.

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

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

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

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

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

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

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

Crop Scheduling
Sow to transplant (392-cell plug):
Approximately 4 weeks
Transplant to flower in 306-cell packs:
6 to 8 weeks

Total Crop Time:

Container Size	Number of Plants	Spring
306 pack	1 per cell	10 to 12 weeks

Common Problems
Insects: Mites, thrips
Diseases: Powdery mildew

VINCA (SEED)

Catharanthus roseus

Garden

A Burpee Home Gardens® Exclusive.

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

PLUG PRODUCTION

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

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

Stage 1 – Germination takes 3 to 5 days.
Soil Temperature: 75 to 78°F (24 to 25°C)
Light: Not required
Moisture: Keep soil wet (level 4) during Stage 1.
Humidity: Maintain 95% relative humidity (RH) until the cotyledons emerge.

Stage 2
Soil temperature: 70 to 72°F (21 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm) from nitrate-form fertilizers with low phosphorous.

Stage 3
Soil temperature: 70 to 72°F (21 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm) Maintain medium pH of 5.8 to 6.0 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Stage 4
Soil temperature: 70 to 72°F (21 to 22°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growth regulators: Not needed.

GARDEN VINCA continued

GROWING ON TO FINISH

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

Temperature
- Night: 65 to 68°F (18 to 20°C)
- Day: 75°F (24°C) or above

Light
As high as possible while maintaining optimal production temperatures.

Irrigation
Maintain even moisture. Avoid excessive media and foliage wetness as these conditions are favorable for disease incidence.

Fertilizer
- Starting 1 week after transplant, apply fertilizer at rate 4 (225 to 300 ppm) once a week using predominately a nitrate-form fertilizer with low phosphorus and high potassium.
- Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 5.5 to 6.0.
- For constant fertilizer program, fertilizer can be applied at rate 3 (175 to 225 ppm) while maintaining the above recommended EC and pH ranges.

Growth Regulators
Not required.

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

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

ZINNIA (SEED)

Zinnia spp.

Bridesmaid
A Burpee Home Gardens® Exclusive.

Champagne Toast
A Burpee Home Gardens® Exclusive.

Double Zahara™

UpTown
A Burpee Home Gardens® Exclusive.

White Wedding
A Burpee Home Gardens® Exclusive.

Approximate seed count: 10,000 to 17,000 S./oz. (350 to 600 S./g)

PLUG PRODUCTION

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

Sowing
Plug Tray Size: Can be produced in 288, 200 or similar cell size plug trays. Cover the seed with a medium layer of vermiculite at sowing.

Stage 1 – Germination takes approximately 2 to 3 days
Germination temperature: 68 to 73°F (20 to 22°C)
Light: Light is not required for germination.
Moisture: Keep the soil wet (level 4) during Stage 1
Relative humidity: Maintain 95 to 97% relative humidity (RH) until cotyledons emerge.

Stage 2
Temperature: 68 to 76°F (20 to 24°C) days; 59 to 64°F (15 to 18°C) nights
Light: Can be up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.
Media Moisture: Keep the media medium (level 3) to medium wet (level 4).
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm) with a nitrate-form fertilizer with low phosphorous.

Stage 3
Temperature: 68 to 76°F (20 to 24°C) days; 59 to 64°F (15 to 18°C) nights.
Media Moisture: Keep the media medium wet (level 3) during Stages 3 and 4.
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Stage 4
Temperature: 65 to 70°F (18 to 21°C) days; 59 to 64°F (15 to 18°C) nights
Light: Light levels can be up to 5,000 f.c. (53,800 Lux) if optimal temperatures can be maintained.
Fertilizer: Same as Stage 3.

Plant Growth Regulators
PGRs are generally not required during plug production. If needed, plants can be treated once during the plug stage at about 10 to 14 days after sowing with a foliar spray of B-Nine (daminozide) at 1,250 to 2,500 ppm.

GROWING ON TO FINISH

Container Size
Double Zahara: 306 pack or 4-in. (10-cm) pots.
Bridesmaid, Champagne Toast, Uptown, White Wedding: 4 or 6-in. (10 or 15-cm.) pots.

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

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

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

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

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

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

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

Common Problems
Insects: Monitor for Aphids early in production, and Thrips during flowering.
Disease: Avoid high humidity and condensation in the greenhouse, as these conditions are favorable for *Botrytis* and Powdery Mildew incidence.

Burpee Home Gardens® Vegetable & Herb Variety Culture Chart

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

Crop	Germination Temperature	Cover/ Light	Sow to Transplant (days)[1]	Growing On Temperature	Total Crop Time for 4-in. (10-cm) Pots (Weeks)[5]
VEGETABLES					
Artichoke	70-75°F (21-24°C)	C. Lt.	35-45	55-58°F (13-14°C)	10-12
Arugula	65-70°F (18-21°C)	C	10-15	50-60°F (10-15°C)	7-8
Bean (Pole/Bush)	72-75°F (22-24°C)	C	Direct sow into container[2]	60-65°F (15-18°C)	3-5
Broccoli	70°F (21°C)	C	10-21	50-60°F (10-15°C)	8-9
Brussels Sprouts	70°F (21°C)	C	10-14	50-60°F (10-15°C)	8-9
Cabbage	70°F (21°C)	C	10-15	50-60°F (10-15°C)	8-9
Cauliflower	70°F (21°C)	C	10-16	50-60°F (10-15°C)	8-9
Celery	70-72°F (21-22°C)	C	30-35	58-60°F (14-15°C)	8-10
Collards	70°F (21°C)	C	10-14	50-60°F (10-15°C)	8-9
Cucumber	72°F (22°C)	C	Direct sow into container[2]	60-65°F (15-18°C)	3-5
Eggplant	70-75°F (21-24°C)	C	12-18	60-65°F (15-18°C)	8-9
Fennel	70-72°F (21-22°C)	C	30-35	55-60°F (13-15°C)	9-11
Kohlrabi	65-70°F (18-21°C)	C	28-30	50-60°F (10-15°C)	8-9
Lettuce & Greens	65-70°F (18-21°C)	C/L	Direct sow into container[2]	55-60°F (13-15°C)	6-9
Melon	75-78°F (24-25°C)	C	Direct sow into container[2]	65-70°F (18-21°C)	4-5
Mustard	70°F (21°C)	C	10-14	50-60°F (10-15°C)	8-9
Okra	70°F (21°C)	C. Lt.	14-18	60-65°F (15-18°C)	9-11
Onion	70°F (21°C)	C. Lt.	Direct sow into container[2]	55-60°F (13-15°C)	12-15
Pak Choi	65-70°F (18-21°C)	C	28-32	50-60°F (10-15°C)	7-8
Pea	50-60°F (10-15°C)	C	Direct sow into container[2]	45-55°F (7-13°C)	4-5
Pepper	75-78°F (24-25°C)	C/L	21-26	62-65°F (17-18°C)	9-11
Pumpkin	72°F (22°C)	C	Direct sow into container[2]	62-65°F (17-18°C)	4-6
Spinach	65-70°F (18-21°C)	C/L	Direct sow into container[2]	55-60°F (13-15°C)	6-9
Squash (Summer & Winter)	72°F (22°C)	C	Direct sow into container[2]	60-65°F (15-18°C)	4-6
Strawberry	65-70°F (18-21°C)	C. Lt.	28-38	60-62°F (15-17°C)	9-10
All-Star Strawberry (bareroot) See page 58.					
Swiss Chard	68-72°F (20-22°C)	C	30-35	55-58°F (13-14°C)	10-12
Tomato	70-75°F (21-24°C)	C	12-18	62-65°F (17-18°C)	8-10
Bumper Crop™ Grafted Tomato See page 60.					
Watermelon	75-80°F (24-26°C)	C	Direct sow into container[2]	65-70°F (18-21°C)	6-7
HERBS					
Basil	70°F (21°C)	C	15-18[4]	60-65°F (15-18°C)	8-10
Catnip	70-75°F (21-24°C)	C. Lt.	25-29	55-60°F (13-15°C)	12-13
Chives	70°F (21°C)	C. Lt.	Direct sow into container[3]	55-60°F (13-15°C)	15-17
Cilantro	68-70°F (20-21°C)	C/L	14-18[4]	55-60°F (13-15°C)	10-11
Dill	65-70°F (18-21°C)	L	10-15[4]	55-60°F (13-15°C)	9-11
Lavender	65-75°F (18-24°C)	L	20-32	60-65°F (15-18°C)	18-20
Oregano	70°F (21°C)	C	21-28	50-55°F (10-13°C)	12-13
Parsley	70°F (21°C)	C	21-28[4]	60-65°F (15-18°C)	10-11
Peppermint & Spearmint	70-75°F (21-24°C)	C. Lt.	25-29	55-60°F (13-15°C)	12-13
Rosemary	70°F (21°C)	L	21-28	55-60°F (13-15°C)	16-18
Sage	70°F (21°C)	C	20-27	55-60°F (13-15°C)	12-14
Stevia	70°F (21°C)	C. Lt.	10-14	60-65°F (15-18°C)	7-10
Summer Savory	70-72°F (21-22°C)	L	28-30	60-62°F (16-17°C)	7-8
Summer Thyme	70°F (21°C)	C	12-18	55-60°F (13-15°C)	13-15
Sweet Marjoram	70°F (21°C)	C. Lt.	10-14	55-60°F (13-15°C)	11-12

C: Cover **C. Lt.:** Cover lightly **L:** Light needed to germinate **C/L:** Cover optional
[1] Based on 512-plug (except when direct sown) [2] 2 to 3 seeds per container
[3] Broadcast seed [4] Can broadcast seed into final container to cut cost and growing time
[5] Weeks from sow to saleable size: For packs, reduce the crop time 1 to 2 weeks. For containers larger than 4-in. (10-cm) size, increase the crop time 1 to 2 weeks.

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

ARTICHOKE

Cynara scolymus

Imperial Star

PLUG PRODUCTION

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

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

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

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

GROWING ON TO FINISH

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

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

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

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

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

POST-PRODUCTION CARE

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

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

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

ARUGULA

Eruca sativa

Myway

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (3 to 5 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Arugula is very sensitive to high salts, particularly high ammonium, during germination.

- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

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

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

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

GROWING ON TO FINISH

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

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Arugula prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

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

BEAN

Phaseolus vulgaris

Blue Lake Bush
Blue Lake Pole
Green 'N Gold Mix II

DIRECT SOW
Sow seed directly into finish container.

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

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

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

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

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Beans grow best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Whitefly, Spider mites
Diseases: Fungal diseases

BROCCOLI

Brassica oleracea Botrytis group

Packman
Raab Zamboni

PLUG PRODUCTION

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

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

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

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

GROWING ON TO FINISH

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

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Broccoli prefers cool temperatures; below 70°F (21°C) is recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

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

BRUSSELS SPROUTS

Brassica oleracea Gemmifera group

Franklin
Royal Marvel

PLUG PRODUCTION

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

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

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

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

GROWING ON TO FINISH

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

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

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

Fertilization
- Fertilize every other irrigation with 15-0-15 or 15-5-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen.

- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Brussels Sprouts prefer cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Brussels Sprouts grow best in full sun; however partial shading may be beneficial during retail display.

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

CABBAGE

Brassica oleracea Capitata group

Big Flat Head
Fast Vantage
Pacifica

PLUG PRODUCTION

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

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

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

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

GROWING ON TO FINISH

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

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Cabbage prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

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

CAULIFLOWER

Brassica oleracea Botrytis group

Amazing
Cheddar
Romanesco Veronica
Snow Crown

PLUG PRODUCTION

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

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

Stage 3 – Growth and development of true leaves (10 to 14 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.

CAULIFLOWER continued

- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

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

GROWING ON TO FINISH

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

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Cauliflower prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

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

CELERY

Apium graveolens var. *dulce*

Tango

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (8 to 10 days)
- Soil temperature 70 to 72°F (21 to 22°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Celery is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

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

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

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

GROWING ON TO FINISH

Temperature
- Night: 58 to 60°F (14 to 15°C)
- Day: 60 to 65°F (15 to 18°C)

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

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

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

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Celery prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

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

COLLARDS

Brassica oleracea Acephala group

Georgia

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (3 to 5 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Collards are very sensitive to high salts, particularly high ammonium, during germination.

- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

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

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

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

GROWING ON TO FINISH

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

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Collards prefer cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Collards grow best in full sun; however partial shading may be beneficial during retail display.

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

CUCUMBER

Cucumis sativus

BOOST 'Gold Standard'
A Burpee Home Gardens® Exclusive.

Burpee Hybrid II

Burpless No. 26

Bush Champion
A Burpee Home Gardens® Exclusive.

Homemade Pickles

'Patio Snacker'

Pickalot Hybrid
A Burpee Home Gardens® Exclusive.

DIRECT SOW
Sow seed directly into finish container.

Time of radicle emergence (2 to 4 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) to less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

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

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

Temperature
- Night: 60 to 65°F (16 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Cucumbers grow best in full sun; however partial shading may be beneficial during retail display.

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

EGGPLANT

Solanum melongena

Burpee Hybrid

A Burpee Home Gardens® Exclusive.

Pot Black

Purple Blaze

A Burpee Home Gardens® Exclusive.

White Star Hybrid

A Burpee Home Gardens® Exclusive.

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (3 to 6 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.5 mmhos/cm (2:1 extraction).
- Eggplant is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (7 to 10 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.5 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14 or 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (10 to 14 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

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

GROWING ON TO FINISH

Temperature
- Night: 55 to 65°F (13 to 18°C)
- Day: 60 to 70 °F (15 to 21°C)

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

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

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

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Eggplant is responsive to day/night temperature differential (DIF), and is shorter with a negative DIF.
- Although Sumagic is labeled for use on Eggplant, we do not recommend its use until the grower has at least trialed it on a limited basis. Application rates, timing and variety response may affect growth for the home gardener.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 55 to 65°F (13 to 18°C)
- Day: 60 to 70°F (15 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Eggplant prefers full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids, Thrips, Whitefly
Diseases: *Botrytis, Pythium*

FENNEL

Foeniculum vulgare

Orion

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (5 to 7 days)
- Soil temperature 70 to 72°F (21 to 22°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Fennel is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

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

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

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

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 55 to 65°F (13 to 18°C)

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Fennel prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

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

KOHLRABI

Brassica oleracea Gongylodes group

Quickstar

PLUG PRODUCTION

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

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

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

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

GROWING ON TO FINISH

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

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Kohlrabi prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

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

LETTUCE & GREENS

Lactuca sativa

Burpee Bibb
A Burpee Home Gardens® Exclusive.

Buttercrunch

Little Caesar
A Burpee Home Gardens® Exclusive.

LETTUCE BLENDS

Gourmet Blend
A Burpee Home Gardens® Exclusive.

Heatwave Blend
A Burpee Home Gardens® Exclusive.

MULTI-SPECIES, MULTI-PELLET MIXES

Alfresco Mix

City Garden Mix

Global Gourmet Mix

SALAD MIX

BOOST Healing Hands
A Burpee Home Gardens® Exclusive.

PLUG PRODUCTION

Note: Direct sowing seed into the finish container is an alternative.

Stage 1 – Time of radicle emergence (3 to 5 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Keep media very moist, near saturation.
- Cover the seed very lightly with vermiculite or no covering.
- Light at 100 to 400 foot-candles may be beneficial for germination.

LETTUCE & GREENS continued

- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.50 mmhos/cm (2:1 extraction).
- Lettuce is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (5 to 7 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.50 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14 or 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.
- Growth regulators cannot be used on lettuce.

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

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 55 to 65°F (13 to 18°C)

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Lettuce prefers full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids
Diseases: *Botrytis*, *Pythium*, *Rhizoctonia*

MELON

Cucumis melo

Ambrosia
Doral
Sugar Cube
A Burpee Home Gardens® Exclusive.

Twice As Nice
A Burpee Home Gardens® Exclusive.

DIRECT SOW
Sow seed directly into finish container.

Time of radicle emergence (2 to 4 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

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

GROWING ON TO FINISH
Growth and development after the development of true leaves (4 to 5 weeks)

Temperature
- Night: 65 to 70°F (18 to 21°C)
- Day: 68 to 75°F (20 to 24°C)
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 65 to 70°F (18 to 21°C)
- Day: 65 to 75°F (18 to 24°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Melon prefers full sun, however partial shade may be beneficial in retail areas.

Common Problems
Insects: Whitefly, Spider mites
Diseases: Fungal diseases

MUSTARD

Brassica juncea

Florida Broadleaf

PLUG PRODUCTION

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

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

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

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

GROWING ON TO FINISH

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

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Mustard prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

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

OKRA

Abelmoschus esculentus

Clemson Spineless

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (5 to 7 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Okra is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed lightly with coarse vermiculite.

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

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

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

GROWING ON TO FINISH

Temperature
- Night: 60 to 65°F (15 to 18°C)
- Day: 65 to 75°F (18 to 24°C)

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

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

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

OKRA continued

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

POST-PRODUCTION CARE

Optimum Temperature
- Okra prefers temperatures of 68°F (20°C) during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

Common Problems
Insects: Aphids, Whitefly
Diseases: *Pythium, Rhizoctonia*

ONION

Allium cepa

Parade Bunching
Red Zeppelin
White Sweet Spanish
Yellow Sweet Spanish

DIRECT SOW

Sow seed directly into finish container.

Time of radicle emergence (2 to 4 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) to less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

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

GROWING ON TO FINISH

Growth and development after the development of true leaves (12 to 15 weeks)

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 65 to 70°F (18 to 21°C)
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Onions grow best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Diseases: Fungal diseases

PAK CHOI

Brassica rapa Chinensis group

Toy Choy

PLUG PRODUCTION

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

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

Stage 3 – Growth and development of true leaves (4 to 7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.

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

GROWING ON TO FINISH

Temperature
- Night: 50 to 60°F (10 to 15°C)
- Day: 55 to 60°F (18 to 15°C)

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)
- Pak Choi prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

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

PEA

Pisum sativum

RSVPea
A Burpee Home Gardens® Exclusive.

DIRECT SOW
- Sow seed directly into finish container.
- Peas are a cool season crop and should be produced early in the season.

Time of radicle emergence (4 to 6 days)
- Soil temperature 50 to 60°F (10 to 15°C).
- Keep media very moist, near saturation.
- Cover seed.
- Soil pH 5.8 to 6.2 and soluble salts (EC) to less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

After stem and cotyledon emergence (7 to 10 days)
- Soil temperature 50 to 60°F (10 to 15°C).
- Reduce moisture levels. Allow the soil to dry out slightly before watering for best rooting.
- Keep soil pH to 5.8 to 6.2 and EC to less than 0.75 mmhos/cm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14 or 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

GROWING ON TO FINISH
Growth and development after the development of true leaves (2 to 3 weeks)

Temperature
- Night: 45 to 55°F (7 to 13°C)C)
- Day: 55 to 60°F (13 to 15°C)
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

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

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

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

Controlling Height
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 60°F (13 to 15°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Peas grow best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids, Whitefly, Spider mites
Diseases: Fungal diseases

PEPPER

Capsicum annuum

Bananarama
A Burpee Home Gardens® Exclusive.

Baron

Better Belle II

Big Bertha

Big Daddy Hybrid
A Burpee Home Gardens® Exclusive.

Big Guy
A Burpee Home Gardens® Exclusive.

BOOST 'Sweet Heat'

Burning Bush

Cajun Belle

Costa Rican Sweet Hybrid
A Burpee Home Gardens® Exclusive.

'Cute Stuff Gold'

'Cute Stuff Red'

Flavorburst Hybrid

Great Stuff Hybrid
A Burpee Home Gardens® Exclusive.

Hot Lemon
A Burpee Home Gardens® Exclusive.

Hungarian Yellow Wax

Jalapeño Gigante
A Burpee Home Gardens® Exclusive variety.

Pinot Noir

Ristra Cayenne Hybrid
A Burpee Home Gardens® Exclusive variety.

Tabasco

Zavory
A Burpee Home Gardens® Exclusive.

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (5 to 7 days)
- Soil temperature 75 to 78°F (24 to 26°C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Light is not necessary for germination until radicle emergence.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.5 mmhos/cm (2:1 extraction).
- Peppers are very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (7 to 10 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Increase light levels to 1,000 to 2,500 foot-candles.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.5 mmhos/cm.

PEPPER continued

- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (10 to 14 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

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

GROWING ON TO FINISH

Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Peppers will be damaged by temperatures below 45°F (7°C).

Light
Maintain high light levels while maintaining moderate temperatures.

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

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

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Peppers are responsive to day/night temperature differential (DIF), and are shorter with a negative DIF.
- Although Sumagic is labeled for use on Peppers, we do not recommend its use until the grower has at least trialed it on a limited basis. Application rates, timing and variety response may affect growth for the home gardener.

POST-PRODUCTION CARE

Optimum Temperature
- Night: 55 to 65°F (13 to 18°C)
- Day: 60 to 70°F (15 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Peppers prefer full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids, Thrips, Whitefly
Diseases: *Botrytis*

PUMPKIN

Cucurbita maxima

Casper
A Burpee Home Gardens® Exclusive.

Harvest Moon

Howden

Jack-Be-Little

DIRECT SOW
Sow seed directly into finish container.

Time of radicle emergence (2 to 4 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

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

GROWING ON TO FINISH
Growth and development after the development of true leaves (4 to 6 weeks)

Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 66 to 70°F (19 to 21°C)
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Pumpkins prefer full sun, although partial shade may be beneficial in retail areas.

Common Problems
Insects: Whitefly, Spider mites
Diseases: Fungal diseases

SPINACH

Spinica oleracea

Baby's Leaf Hybrid

A Burpee Home Gardens® Exclusive.

Bloomsdale

PLUG PRODUCTION

Note: Direct sowing seed into the finish container is an alternative.

Stage 1 – Time of radicle emergence (3 to 5 days)

- Soil temperature 65 to 70°F (18 to 21°C).
- Keep media very moist, near saturation.
- Cover the seed.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.50 mmhos/cm (2:1 extraction).
- Spinach is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (7 to 14 days)

- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.50 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (7 to 14 days)

- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.
- Chemical PGRs can not be used on vegetables and herbs.

Stage 4 – Plugs ready for transplanting or shipping (7 days)

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

GROWING ON TO FINISH

Temperature

- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)

Light

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

Media

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

Fertilization

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

Controlling Height

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

POST-PRODUCTION CARE

Optimum Temperature

- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light

Spinach should be placed in partial shade during retail display.

Common Problems

Insects: Aphids
Diseases: *Botrytis, Pythium, Rhizoctonia*

SQUASH

Cucurbita pepo (Summer squash)
Cucurbita maxima (Winter squash)

Burpee Golden (Zucchini)

A Burpee Home Gardens® Exclusive.

Burpee Hybrid (Zucchini)

A Burpee Home Gardens® Exclusive.

Burpee's Bush Table Queen

A Burpee Home Gardens® Exclusive.

Burpee's Butterbush

A Burpee Home Gardens® Exclusive.

Limelight (Zucchini)

A Burpee Home Gardens® Exclusive.

Lunar

Pic-N-Pic Hybrid

A Burpee Home Gardens® Exclusive.

Smooth Pickin' (Zucchini)

A Burpee Home Gardens® Exclusive.

DIRECT SOW

Sow seed directly into finish container.

Time of radicle emergence (2 to 4 days)

- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

After stem and cotyledon emergence (7 days)

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

GROWING ON TO FINISH

Growth and development after the development of true leaves (4 to 5 weeks)

Temperature

- Night: 60 to 65°F (15 to 18°C)
- Day: 68 to 75°F (20 to 24°C)
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

Light

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

Media

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

SQUASH continued

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Squash prefers full sun, although partial shade may be beneficial in retail areas.

Common Problems
Insects: Whitefly, Spider mites
Diseases: Fungal diseases

STRAWBERRY (BAREROOT)

Fragaria x ananassa

All Star

GROWING ON TO FINISH

Media
- Use a sterile, well-drained soilless media.
- Plant with crown just above the soil surface.

Temperature
- Nights: 60°F (16°C)
- Days: 70°F (21°C)

Fertilizer
- Use a constant liquid feed program of 20-10-20 at 150 ppm.
- Maintain good fertility and moisture levels.
- An application of slow-release fertilizer before sale will help the customer be more successful.

Crop Schedule & Uses
(Crop Schedule in Weeks)

	Bareroot
18 Tray (3.5-in./9-cm cell) 1 PP*	2 to 3
4 to 4.5-in. (10 to 11-cm) Pot 1 PP*	3 to 4
10-in. (25-cm) Basket 4 to 5 PP*	4 to 6
12-in. (30-cm) Pot 4 to 5 PP*	5 to 7

*PP: Plants per pot or basket

NOTE: June-bearing strawberries produce a single crop each year during June–July.

STRAWBERRY (SEED)

Fragaria x ananassa

Berri Basket® White
Berries Galore® Pink, Rose & White

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (5 to 7 days)
- Soil temperature 70°F (21°C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Light at 100 to 400 foot-candles may be beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Strawberries are very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (16 to 21 days)
- Soil temperature 70°F (21°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Gradually increase the light intensity to 500 to 1,500 foot-candles.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (7 to 14 days)
- Soil temperature 65 to 68°F (18 to 20°C).
- Allow the soil to dry slightly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Gradually increase the light intensity to 1,500 to 2,500 foot-candles.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

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

GROWING ON TO FINISH

Temperature
- Night: 60 to 62°F (15 to 17°C)
- Day: 60 to 65°F (15 to 18°C)

Light
Maintain high light levels while maintaining moderate temperatures.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 6.5 to 7.5.

Watering
- Keep the media moist but not soggy.
- Do not allow the media to dry out.

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 60 to 62°F (15 to 17°C)
- Day: 60 to 65°F (15 to 18°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Strawberries perform best in full sun; however partial shading may be beneficial during retail display.

Crop Timing
Baskets with 3 to 4 plugs per baskets:
11 to 13 weeks

Common Problems
Insects: Spider mites
Diseases: Leaf spots, Mildew

SWISS CHARD

Beta vulgaris ssp. *Cicla*

Bright Lights

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (4 to 8 days)
- Soil temperature 68 to 72°F (20 to 22°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Swiss Chard is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed with coarse vermiculite.

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

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

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

GROWING ON TO FINISH

Temperature
- Night: 55 to 58°F (13 to 14°C)
- Day: 60 to 62°F (15 to 17°C)

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

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

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

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Growth can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Chemical PGRs can not be used on most vegetables and herbs.

POST-PRODUCTION CARE

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

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

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

BUMPER CROP GRAFTED TOMATO

Big Rainbow
A Burpee Home Gardens® Exclusive.

Black Krim
A Burpee Home Gardens® Exclusive.

Brandywine Pink
A Burpee Home Gardens® Exclusive.

Brandywine Red
A Burpee Home Gardens® Exclusive.

Mortgage Lifter
A Burpee Home Gardens® Exclusive.

San Marzano
A Burpee Home Gardens® Exclusive.

GROWING ON TO FINISH

IMPORTANT: Always plant the graft above the soil line.

Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)

Light
Maintain high light levels while maintaining moderate temperatures.

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

Fertilization
- Tomatoes respond to increased fertilization with increased growth.
- Earliest garden yield comes from plants which have not been stressed from insufficient nutrition.
- Fertilize every third irrigation with 15-0-15 or 15-5-15 at 100 to 150 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Tomatoes are responsive to day/night temperature differential (DIF), and are shorter with a negative DIF.
- Although Sumagic is labeled for use on Tomatoes, we do not recommend its use until the grower has at least trialed it on a limited basis. Application rates, timing and variety response may affect growth for the home gardener.

POST-PRODUCTION CARE

Temperature
- Tomatoes will tolerate warm temperatures, however temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Tomatoes grow best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids, Thrips, Whitefly
Diseases: *Botrytis*, TSWV (INSV), *Pythium, Rhizoctonia*

TOMATO

Lycopersicon escuelentum

Better Boy
Big Beef
Big Daddy
A Burpee Home Gardens® Exclusive.
Big Mama Hybrid
A Burpee Home Gardens® Exclusive.
Big Pink
A Burpee Home Gardens® Exclusive.
Black Cherry
Black Pearl Hybrid
A Burpee Home Gardens® Exclusive.
Black Prince
Brandy Boy Hybrid
A Burpee Home Gardens® Exclusive.
Brandywine Pink
Brandywine Red
BOOST 'Cherry Punch'
A Burpee Home Gardens® Exclusive.
BOOST Mighty Sweet
A Burpee Home Gardens® Exclusive.
BOOST 'Power Pops'
A Burpee Home Gardens® Exclusive.
BOOST 'Solar Power'
A Burpee Home Gardens® Exclusive.
BOOST Tasti-Lee®
A Burpee Home Gardens® Exclusive.
Burpee's Big Boy®
Bush Champion II
Bush Early Girl
Celebrity
Champion II
Cherokee Purple
Delicious
Early Girl
Fourth Of July
A Burpee Home Gardens® Exclusive.
Fresh Salsa Hybrid
A Burpee Home Gardens® Exclusive.
Jet Star
Jubilee
Lemon Boy
Mortgage Lifter
Napa Grape Hybrid
A Burpee Home Gardens® Exclusive.
Old German
Orange Wellington
A Burpee Home Gardens® Exclusive.
Phoenix
Pineapple
Red Grape
Rutgers
Steak Sandwich Hybrid
A Burpee Home Gardens® Exclusive.
Sungold
Supersteak Hybrid
SuperTasty Hybrid
A Burpee Home Gardens® Exclusive.
Sweet 100
Sweet Seedless Hybrid
Tomatoberry Garden
Tumbler
Tye Dye
Yellow Pear

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (2 to 3 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media evenly moist but not saturated.
- Cover the seed with coarse vermiculite.
- Light is not needed for germination until radicle emergence.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.50 mmhos/cm (2:1 extraction).
- Tomatoes are very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (7 days)
- Soil temperature 68 to 72°F (20 to 22°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Light levels can be increased to 1,000 to 1,500 foot-candles.
- Keep soil pH to 5.5 to 5.8 and EC to less than 0.50 mmhos/cm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Keep ammonium levels to less than 10 ppm.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (7 days)
- Soil temperature 60 to 65ºF (15 to 18ºC).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Increase light intensity to 1,000 to 2,500 foot-candles.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 50 to 75 ppm N with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.

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

GROWING ON TO FINISH

Temperature
- Night: 62 to 65ºF (17 to 18ºC)
- Day: 65 to 70ºF (18 to 21ºC)

Light
Maintain high light levels while maintaining moderate temperatures.

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

Fertilization
- Tomatoes respond to increased fertilization with increased growth.
- Earliest garden yield comes from plants which have not been stressed from insufficient nutrition.
- Fertilize every third irrigation with 15-0-15 or 15-5-15 at 100 to 150 ppm nitrogen.
- Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
- Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control.
- Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.
- Tomatoes are responsive to day/night temperature differential (DIF), and are shorter with a negative DIF.
- Although Sumagic is labeled for use on Tomatoes, we do not recommend its use until the grower has at least trialed it on a limited basis. Application rates, timing and variety response may affect growth for the home gardener.

POST-PRODUCTION CARE

Temperature
- Tomatoes will tolerate warm temperatures, however temperatures below 70ºF (21ºC) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Tomatoes grow best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids, Thrips, Whitefly
Diseases: *Botrytis,* TSWV (INSV), *Pythium, Rhizoctonia*

WATERMELON

Citrullus lanatus

Crimson Sweet
Sugar Baby

DIRECT SOW
Sow seed directly into finish container.

Time of radicle emergence (2 to 4 days)
- Soil temperature 75 to 80ºF (24 to 27ºC).
- Keep media very moist, near saturation.
- Seed are to be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

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

GROWING ON TO FINISH
Growth and development after the development of true leaves (4 to 5 weeks)

Temperature
- Night: 65 to 70ºF (18 to 21ºC)
- Day: 68 to 75ºF (20 to 24ºC)
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 65 to 70ºF (18 to 21ºC)
- Day: 70 to 75ºF (18 to 24ºC)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Watermelon prefers full sun although partial shade may be beneficial in retail areas.

Common Problems
Insects: Whitefly, Spider mites
Diseases: Fungal diseases

BASIL

Ocimum basilicum

Boxwood
Cardinal
Nufar
Red Rubin
Siam Queen
Sweet Dani Lemon
Sweet Italian Large Leaf
Sweet Mammoth

PLUG PRODUCTION

Note: Direct sowing into the finish container is an alternative.

Stage 1 – Time of radicle emergence (5 to 8 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Keep media very moist, near saturation.
- Seed should be covered.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Basil is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

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

Stage 3 – Growth and development of true leaves (7 to 10 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

Stage 4 – Plugs ready for transplanting or shipping (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

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

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

Common Problems
Insects: White fly, Aphids
Diseases: Fungal diseases

CATNIP

Nepeta cataria
Hardy zones 3–9

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (2 to 3 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Light is not needed for germination until radicle emergence.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Mint is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (3 to 5 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (5 to 7 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

Stage 4 - Plugs ready for transplanting or shipping (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 62°F (15 to 17°C)
- Cooler temperatures will produce more compact growth.
- Warm temperatures promote weak growth and stretching.

Light
Maintain high light levels while maintaining moderate temperatures.

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

Common Problems
Insects: Aphids, Whitefly
Diseases: *Botrytis*

CHIVES

Garlic *Allium tuberosum*

Onion *Allium schoenoprasum*
Hardy zones 3–9

DIRECT SOW
Sow seed directly into finish container.

Time of radicle emergence (2 to 5 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media very moist, near saturation.
- Seed should be covered.
- Soil pH 5.8 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Avoid high salts and particularly high ammonium during germination.
- Keep ammonium levels to less than 10 ppm.

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

GROWING ON TO FINISH
Growth and development after the development of true leaves (13 to 15 weeks)

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 65 to 70°F (18 to 21°C)
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Chives prefer full sun.

Common Problems
Diseases: Fungal diseases

CILANTRO

Coriandrum sativum (Coriander)

Santo

PLUG PRODUCTION
NOTE: Direct sowing into the finish container is an alternative.

Stage 1 – Time of radicle emergence (3 to 5 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Keep media very moist, near saturation.
- Cover the seed very lightly with vermiculite or no covering.
- Light at 100 to 400 foot-candles may be beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.50 mmhos/cm (2:1 extraction).
- Cilantro is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (7 to 10 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.50 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

CILANTRO continued

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

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 55 to 65°F (13 to 18°C)

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

Common Problems
Insects: Aphids
Diseases: *Botrytis, Pythium, Rhizoctonia*

DILL

Anethum graveolens

Dill
Fernleaf

PLUG PRODUCTION

Note: Direct sowing into the finish container is recommended.

Stage 1 – Time of radicle emergence (4 to 7 days)
- Soil temperature 68 to 72°F (20 to 22°C).
- Keep media evenly moist but not saturated.
- Do not cover or bury the seed.
- Light at 100 to 400 foot-candles may be beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Dill is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (5 to 8 days)
- Soil temperature 68 to 72°F (20 to 22°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Gradually increase light levels to 500 to 1,000 foot-candles.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (14 to 21 days)
- Soil temperature 65 to 68°F (18 to 20°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14 or other calcium/potassium nitrate fertilizer.
- Gradually increase light intensity to 1,000 to 1,500 foot-candles.
- Fertilize every 2 to 3 irrigations.
- If 15-0-15 is used, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.
- Chemical PGRs can not be used on vegetables and herbs.

Stage 4 – Plugs ready for transplanting or shipping (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Gradually increase light intensity to 1,500 to 2,500 foot-candles.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
- If not potted up once established in the cell pack, dill will flower within 10 weeks.

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)

Light
Maintain high light levels while maintaining moderate temperatures.

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

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

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

POST-PRODUCTION CARE

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (16 to 18°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.
- Using a negative DIF will help keep the plants short and of high quality.

Light
Dill prefers full sun. Partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids
Diseases: Fungal diseases

LAVENDER

Lavandula angustifolia
Hardy zones 5–8

Ellagance Ice, Purple & Sky

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (7 to 10 days)
- Soil temperature 68 to 72°F (20 to 22°C).
- Keep media evenly moist but not saturated.
- Do not cover or bury the seed.
- Light at 100 to 400 foot-candles is beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Lavender is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (7 to 14 days)
- Soil temperature 68 to 72°F (20 to 22°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Gradually increase light levels to 500 to 1,000 foot-candles.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (14 to 21 days)
- Soil temperature 65 to 68°F (18 to 20°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14 or other calcium/potassium nitrate fertilizer.
- Gradually increase light intensity to 1,000 to 1,500 foot-candles.
- Fertilize every 2 to 3 irrigations.
- If 15-0-15 is used, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.
- Chemical PGRs can not be used on vegetables and herbs.

Stage 4 – Plugs ready for transplanting or shipping (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Gradually increase light intensity to full intensity.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

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

Light
Maintain high light levels while maintaining moderate temperatures.

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Lavender prefers full sun. Partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids
Diseases: Fungal diseases

OREGANO

Origanum vulgare (Common Oregano)
Origanum herocieoticum (Greek Oregano)
Hardy zones 5–9

Oregano
Greek Oregano

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (5 to 7 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Oregano is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed lightly with coarse vermiculite

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

Stage 3 – Growth and development of true leaves (10 to 14 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

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

OREGANO continued

GROWING ON TO FINISH

Temperature
- Night: 50 to 55ºF (10 to 13ºC)
- Day: 60 to 65ºF (15 to 18ºC)

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 50 to 55ºF (10 to 13ºC)
- Day: 60 to 65ºF (15 to 18ºC)
- Oregano prefers cool temperatures. Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

Common Problems
Insects: Aphids, Whitefly
Diseases: *Pythium, Rhizoctonia*

PARSLEY

Petroselinum crispum

Italian Dark Single Triple Curled

PLUG PRODUCTION

Note: Direct sowing into the finish container is an alternative.

Stage 1 – Time of radicle emergence (3 to 5 days)
- Soil temperature 68 to 70ºF (20 to 21ºC).
- Keep media very moist, near saturation.
- Cover the seed lightly with vermiculite or do not cover.
- Light at 100 to 400 foot-candles may be beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.50 mmhos/cm (2:1 extraction).
- Parsley is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (7 to 10 days)
- Soil temperature 65 to 70ºF (18 to 21ºC).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.50 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (7 days)
- Soil temperature 62 to 65ºF (17 to 18ºC).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.
- Chemical PGRs can not be used on vegetables and herbs.

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

GROWING ON TO FINISH

Temperature
- Night: 60 to 65ºF (15 to 18ºC)
- Day: 65 to 70ºF (18 to 21ºC)

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 50 to 55ºF (10 to 13ºC)
- Day: 55 to 58ºF (13 to 14ºC)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

Common Problems
Insects: Aphids
Diseases: *Botrytis, Pythium, Rhizoctonia*

PEPPERMINT & SPEARMINT

Mentha piperita (Peppermint)
Mentha spicata (Spearmint)
Hardy zones 5–9

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (2 to 3 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Keep media evenly moist but not saturated.
- Cover the seed lightly with coarse vermiculite.
- Light is not needed for germination until radicle emergence.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Mints are very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (3 to 5 days)
- Soil temperature 70 to 75°F (21 to 24°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (5 to 7 days)
- Soil temperature 65 to 70°F (18 to 21°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

Stage 4 – Plugs ready for transplanting or shipping (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 62°F (15 to 17°C)
- Cooler temperatures will produce more compact growth.
- Warm temperatures promote weak growth and stretching.

Light
Maintain high light levels while maintaining moderate temperatures.

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 50 to 55°F (10 to 13°C)
- Day: 55 to 58°F (13 to 14°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Mints grow best in full sun; however partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids, Whitefly
Diseases: *Botrytis*

ROSEMARY

Rosmarinus officinalis
Hardy zones 7–10

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (4 to 7 days)
- Soil temperature 68 to 72°F (20 to 22°C).
- Keep media evenly moist but not saturated.
- Do not cover or bury the seed.
- Light at 100 to 400 foot-candles may be beneficial for germination.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Rosemary is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

Stage 2 – Stem and cotyledon emergence (5 to 8 days)
- Soil temperature 68 to 72°F (20 to 22°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Gradually increase light levels to 500 to 1,000 foot-candles.
- Keep soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Keep ammonium levels to less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14, 15-5-15 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

Stage 3 – Growth and development of true leaves (14 to 21 days)
- Soil temperature 65 to 68°F (18 to 20°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Gradually increase light intensity to 1,000 to 1,500 foot-candles.
- Fertilize every 2 to 3 irrigations.
- If 15-0-15 is used, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.
- Chemical PGRs can not be used on vegetables and herbs.

ROSEMARY continued

Stage 4 – Plugs ready for transplanting or shipping (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Gradually increase light intensity to 1,500 to 2,500 foot-candles.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.
- If not potted up once established in the cell pack, Rosemary will flower within 10 weeks.

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)

Light
Maintain high light levels while maintaining moderate temperatures.

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Rosemary prefers full sun. Partial shading may be beneficial during retail display.

Common Problems
Insects: Aphids
Diseases: *Pythium*

SAGE

Salvia officinalis
Hardy zones 5–8

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (5 to 7 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Sage is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed lightly with coarse vermiculite.

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

Stage 3 – Growth and development of true leaves (10 to 14 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

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

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 60 to 65°F (15 to 18°C)

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Sage prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

Common Problems
Insects: Aphids, Whitefly
Diseases: *Pythium, Rhizoctonia*

SPEARMINT

See page 67.

STEVIA

Stevia rebaudiana

Sweet Leaf

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (5 to 7 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).

- Stevia is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Cover the seed lightly with coarse vermiculite.

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

Stage 3 – Growth and development of true leaves (7 to 10 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

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

GROWING ON TO FINISH

Temperature
- Night: 60 to 65°F (15 to 18°C)
- Day: 65 to 75°F (18 to 24°C)

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- 68°F (20°C) is recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

Common Problems
Insects: Aphids, Whitefly
Diseases: *Pythium, Rhizoctonia*

SUMMER SAVORY

Satureja hortensis

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (10 to 12 days)
- Soil temperature 70 to 72°F (21 to 22°C).
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Summer Savory is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.
- Do not cover the seed.

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

Stage 3 – Growth and development of true leaves (7 to 10 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20 alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, especially the first 2 hours after sunrise, to control plant height.

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

GROWING ON TO FINISH

Temperature
- Night: 60 to 62°F (15 to 17°C)
- Day: 62 to 65°F (17 to 18°C)

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

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

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

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

SUMMER SAVORY continued

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Summer Savory prefers cool temperatures; temperatures below 70°F (21°C) are recommended during retail display.
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

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

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

SUMMER THYME

Thymus vulgaris
Hardy zones 4–8

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (4 to 8 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Keep media very moist, near saturation.
- Seed may be covered.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Thyme is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

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

Stage 3 – Growth and development of true leaves (14 to 20 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

Stage 4 – Plugs ready for transplanting or shipping (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 65 to 70°F (19 to 21°C)

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Thyme prefers full sun. Partial shading may be beneficial during retail display.

Common Problems
Insects: Spider mites, Aphids
Diseases: Fungal diseases

SWEET MARJORAM

Origanum majorana

PLUG PRODUCTION

Stage 1 – Time of radicle emergence (4 to 8 days)
- Soil temperature 68 to 70°F (20 to 21°C).
- Keep media very moist, near saturation.
- Seed may be covered lightly.
- Soil pH 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Sweet Marjoram is very sensitive to high salts, particularly high ammonium, during germination.
- Keep ammonium levels to less than 10 ppm.

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

Stage 3 – Growth and development of true leaves (14 to 20 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow the soil to dry thoroughly between irrigations but avoid permanent wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14, 15-5-15 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- If using 15-0-15, supplement with magnesium 1 to 2 times during this stage, using magnesium sulfate (16 oz./100 gal.) or magnesium nitrate. Do not mix magnesium sulfate with calcium nitrate as precipitate will form.
- Use DIF whenever possible, for the first 2 hours after sunrise, to control plant height.

Stage 4 – Plugs ready for transplanting or shipping (7 days)
- Soil temperature 62 to 65°F (17 to 18°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14, 15-5-15 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

GROWING ON TO FINISH

Temperature
- Night: 55 to 60°F (13 to 15°C)
- Day: 65 to 70°F (18 to 21°C)

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

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

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

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

POST-PRODUCTION CARE

Optimum Temperature
- Night: 62 to 65°F (17 to 18°C)
- Day: 65 to 70°F (18 to 21°C)
- Optimum conditions may be difficult to maintain, especially if plants are displayed outside.

Light
Sweet Marjoram prefers full sun. Partial shading may be beneficial during retail display.

Common Problems
Insects: Spider mites, Aphids
Diseases: Fungal diseases

Burpee Home Gardens® "To Go" Culture Charts

Note: This chart includes general culture guidelines. Please refer to the GrowerFacts on pages 44 to 61 for detailed growing information.

Cucumber, Eggplant, Pepper & Tomato Planters

Cucumber: Bush Champion, 'Patio Snacker'
Eggplant: Burpee Hybrid
Pepper: Baron, Better Belle II, BOOST 'Sweet Heat', Flavorburst Hybrid, Jalapeño Gigante
Grafted Tomato: Big Rainbow, Black Krim, Brandywine Pink, Brandywine Red, Mortgage Lifter, San Marzano
Tomato: BOOST 'Cherry Punch', BOOST Mighty Sweet, BOOST 'Power Pops', BOOST 'Solar Power,' BOOST Tasti-Lee®, Bush Champion II, Bush Early Girl, Celebrity, Fourth of July, Fresh Salsa Hybrid, Phoenix, Tumbler

Recommended for 12-in. (30-cm) or larger patio pots.
NOTE: Tomatoes and cucumbers will benefit from some type of "cage" to contain the plants. Fourth of July tomato is indeterminate and will also benefit from a "stake" to support its vertical growth.

	Sow to transplant (weeks)	Seeds per 200-plug tray [1]	Number of plugs to transplant into a 4-4.5-in. (10-11-cm) pot	Growing on in 4-4.5-in. (10-11-cm) pots (weeks)	Number of 4-4.5-in. (10-11-cm) pots to plant in a 12-in. (30-cm) or larger container	Transplant to sale in a 12-in. (30-cm) or larger container (weeks)	Total crop time sow to sell (weeks)
Cucumber	Direct sow to 4-4.5-in. (10-11-cm) pots	—	—	3-5	3	1-3	4-8
Eggplant	2-3	1	1	7-9	3	2-3	11-15
Pepper	3-4	1-2	1	6-7	3-5	3-4	12-15
Tomato	2-3	1	1	6-8	3	2-3	10-14

[1] A 200-plug tray is recommended to grow eggplant, peppers and tomatoes for the "To Go" program

Mixed Salad Bowls

Multi-Species, Multi-Pellet Mixes: Alfresco Mix, City Garden Mix, Global Gourmet Mix
Lettuce Blends: Gourmet Blend, Heatwave Blend
Salad Mix: BOOST Healing Hands

Recommended for 10 to 12-in. (25 to 30-cm) color bowls.

	Sow to transplant (weeks)	Seeds or pellets per 105/128-plug tray	Number of plugs to transplant into a 10-12-in. (25-30-cm) container [4]	Transplant to sale in a 10-12-in. (25-30-cm) container	Total crop time sow to sell (weeks)
Multi-Species, Multi-Pellet Mixes	2-3	1-2 pellets [2]	4-7	4-7	6-9
Lettuce Blends	2-3	3-4 seeds [3]	4-7	4-7	6-9

[2] These mixes are offered as a pellet containing several varieties of greens. Only 1 to 2 pellets need to be sown per cell.
[3] These blends should be sown using 3 to 4 seeds per cell to produce a representative assortment of varieties. Since 4 to 7 plugs are used in each color bowl, an excellent mix is produced.
[4] For best results, plant the plugs directly in the finish container to minimize checking the growth.

Herb Combos

Good Grillin': Chives, parsley and rosemary
Kitchen Favorites: Basil, dill, oregano and parsley
Tuscan Trio: Basil, oregano and parsley

Recommended for color bowls or 10-in. (25-cm) or larger patio pots.

	Sow to transplant (weeks)	Seeds per 200-plug tray [5]	Number of plugs to transplant into a 4-4.5-in. (10-11-cm) pot	Growing on in 4-4.5-in. (10-11-cm) pots (weeks)	Number of 4-4.5-in. (10-11-cm) pots to plant in a 12-in. (30-cm) or larger container	Transplant to sale in a 10-12-in. (25-30-cm) or larger container (weeks)	Total crop time sow to sell (weeks)
Basil	5-6	1-2	Standard: 1 Boxwood: 3	3-4	Depending on the size of the container, 4 to 7 4-5-in. (10-11-cm) pots make a saleable container.	1-3	9-13
Chives	5-6	7-8	6-7	3-4		1-3	9-13
Dill	3-4	2-3	5-6	3-4		1-3	7-11
Oregano	5-6	1-2	3-4	4-6		1-3	9-13
Parsley	5-6	2-3	3-4	3-4		1-3	9-13
Rosemary	9-10	1-2	1-2	4-6		1-3	14-19

[5] A 200-plug tray is recommended to grow these herb varieties for the "To Go" program

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