

PERENNIAL CULTURE CHART

Weeks to finished plug

Grower Facts	Class	Series/Variety	Hardiness Zone	First year flower	Exposure	Seed info	Recomm- ended plug size**	Seeds/ cell	Cover seed	Germin- ation conditions	Days to germin- ation	Stage 2-3 temp.	Plug PGRs	Plug crop wks.	Plug tips	Vernalization	Recommended containers (ppp : plugs/pot)	Growing on temps.	Media pH/EC	PGR ppm	Photoperiod response	Annual crop weeks to flower from transplant with recommendations †	Overwinter crop weeks to flower from transplant with recommendations †	Tips, diseases & recommendations	Mature height & spread	Heat tolerant	Cool crop
	AGASTACHE <i>A. astromontana</i>	Pink Pop	7-10	✓	☀	100,000-115,000 S/oz. (3,500-4,000 S/g) SED	288-cell	4	No	65-68°F (18-20°C); light not required	5-7	60-65°F (16-18°C)	B-Nine 500 ppm	6-7		No	4-5 in. (10-13 cm), 1 ppp; 1 Gallon, 1-3 ppp	65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night	5.8-6.2 / 1.2-1.4	B-Nine 2000	Long day beneficial	7-10; Sow: March-May; Finish: May-August	–	Growing at day temp below 65°F (18°C) will significantly delay crop time; <i>Botrytis</i> , powdery mildew and Sclerotinia	10-12 in. (25-30 cm) height; 8-10 in. (20-25 cm) spread	✓	
	ALCHEMILLA <i>A. erythropda</i>	Alma	3-8		☀	46,000-51,000 S/oz. (1,600-1,800 S/g) TUN	288-cell	4	Optional	65-68°F (18-20°C); light not required	8-10	60-65°F (16-18°C)	None	8-10	Spray damp-off fungicide	Yes; duration of 10 weeks; max 40°F (4°C)	4-5 in. (10-13 cm), 1 ppp; 1 Gallon, 1-3 ppp	57-62°F (14-17°C) Day; 50-55°F (10-13°C) Night	5.8-6.5 / 1.0-1.2	None	–	–	32-38; Sow: June July; Finish: April-June	No fertilizer in winter; restart after visible growth; prevent Mg and Fe deficiency; aphids	6-8 in. (15-20 cm) height; 12-14 in. (30-36 cm) spread		✓
	ALYSSUM <i>A. montanum</i>	Luna	4-8	✓	☀	17,000-23,000 S/oz. (600-800 S/g) SED	288-cell	4	No	65-68°F (18-20°C); light not required	3-5	60-65°F (16-18°C)	None	6-8		No	4-5 in. (10-13 cm)	54-65°F (12-18°C) Day; 50-54°F (10-12°C) Night	5.5-6.4 / 1.1-1.3	B-Nine 2500	Day neutral	10-12; Sow: February-May; Finish: May-July	32-38; Sow: July-August; Finish: April-May	Warmth gives stretch; downy mildew, aphids and flea beetles; grow relatively low RH	4-6 in. (10-15 cm) height; 8-12 in. (20-30 cm) spread		✓
	AQUILEGIA <i>A. vulgaris</i>	Clementine	3-8		☀	17,000-23,000 S/oz. (600-800 S/g) SED	288-cell	2-3	Cover lightly	68-72°F (20-22°C); light optional	7-12	65-68°F (18-20°C)	None	7-8		Yes; duration of 10-12 weeks; juvenility min. 10 true leaves	Gallon (17 cm), 1 ppp	65°F (18°C) Day; 50-54°F (10-12°C) Night	5.8-6.4 / 1.0-2.0	B-Nine/ Alar 1250-2500	Day neutral	–	36-40; Sow: June-July; Finish: April - May	Keep RH opt 65%; powdery mildew, Sclerotinia, aphids, leaf miner, sciara and spidermites; outside crops can be forced indoors at 54-59°F (12-15°C)	14-16 in. (35-40 cm) height; 12-14 in. (30-36 cm) spread		✓
Pg 131	AQUILEGIA <i>A. vulgaris</i>	Winky Single, Winky Double Series	3-8		☀	17,000-23,000 S/oz. (600-800 S/g) SED	288-cell	2-3	Cover lightly	68-72°F (20-22°C); light optional	7-12	65-68°F (18-20°C)	None	7-8		Yes; duration of 8-10 weeks; juvenility min. 10 true leaves	5 in. (13 cm), 1 ppp; 1 Gallon, 1 ppp	60-72°F (16-22°C) Day; 50-59°F (10-15°C) Night	5.8-6.4 / 1.0-2.0	Optional; B-Nine 2500 ppm	Day neutral	–	36-40; Sow: June-July; Finish: April - May	Keep RH opt 65%; powdery mildew, Sclerotinia, aphids, leafminer, sciara and spidermites; outside crops can be forced indoors at 54-59°F (12-15°C)	12-14 in. (30-36 cm) height; 12-14 in. (30-36 cm) spread		✓
Online*	AQUILEGIA <i>A. x caerulea</i> (Rocky Mountain Columbine)	Songbird F1 Series	3-9	✓	☀	26,900 S/oz. (950 S/g) SED	406-cell or larger	1	Yes	70-75°F (21-24°C); light required	10-14	65-68°F (18-20°C)	Tank mix of B-Nine 2500 ppm and A-Rest 10 ppm spray	6-8		Yes, but vernalization temperature can go as high as 55°F (13°C) at night and 60°F (15°C) at day; duration of 4 weeks at 41°F (5°C) or 6 weeks at 55°F (13°C); start cool treatment after 12-15 leaf stage	6 in. (15 cm)	60-68°F (16-20°C) Day; 55-64°F (13-18°C) Night	5.8-6.4 / 1.0-2.0	Tank mix of B-Nine 2500 ppm and A-Rest 10 ppm spray	Long day without vernalization; day neutral after vernalization	22-28; Sow: mid September-late October; Finish: late April-mid May	32-38; Sow: July-August; Finish: late April-mid May	Requires night temperatures below 55°F (13°C) to initiate flower buds; see Grower Facts for details	11-18 in. (28-45 cm) height; 10-14 in. (25-35 cm) spread		✓
Online*	AQUILEGIA <i>A. x caerulea</i> (Rocky Mountain Columbine)	Swan F1 Series	3-9	✓	☀	26,900 S/oz. (950 S/g) SED	406-cell or larger	1	Yes	70-75°F (21-24°C); light required	10-14	65-68°F (18-20°C)	Tank mix of B-Nine 2500 ppm and A-Rest 10 ppm spray	6-9		Yes, but vernalization temperature can go as high as 55°F (13°C) at night and 60°F (15°C) at day; duration of 4 weeks at 41°F (5°C) or 6 weeks at 55°F (13°C); start cool treatment after 12-15 leaf stage	6 in. (15 cm)	60-68°F (16-20°C) Day; 55-64°F (13-18°C) Night	5.8-6.4 / 1.0-2.0	Tank mix of B-Nine 2500 ppm and A-Rest 10 ppm spray	Long day without vernalization; day neutral after vernalization	22-28; Sow: mid September-late October; Finish: late April-mid May	32-38; Sow: July-August; Finish: late April-mid May	Requires night temperatures below 55°F (13°C) to initiate flower buds; see Grower Facts for details	20-24 in. (51-61 cm) height; 12-14 in. (30-35 cm) spread		✓

*Find online Grower Facts culture at panamseed.com **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)

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	ARABIS <i>A. blepharophylla</i>	Spring Charm	4-7		☀	51,000-63,000 S/oz. (1,800-2,200 S/g) SED	288-cell	4	No	68-72°F (20-22°C); light optional	3-5	65-68°F (18-20°C)	None	6-8		Yes; duration of 8-10 weeks	3.5-5 in. (9-13 cm)	60-65°F (16-18°C) Day; 50-54°F (10-12°C) Night	5.5-6.5 / 1.0-1.2	None		—	30-36; Sow: June-August; Finish: April-May	Well-drained soil; dislikes winter wet; moderate fertilization; <i>Botrytis</i> , <i>Pythium</i> , downy mildew, <i>Rhizoctonia</i> and aphids	4-6 in. (10-15 cm) height; 4-6 in. (10-15 cm) spread		✓
	ARENARIA <i>A. montana</i>	Avalanche	4-8		☀	21,000-26,000 S/oz. (750-900 S/g) SED	288-cell	4	Yes, lightly vermiculite	Pre-chill 2 wks at 50°F (10°C) then 60-65°F (16-18°C)	8-10	60-65°F (16-18°C)	None	8-10	Grows dry not wet; spray damp-off fungicide	Yes; duration of 8-10 weeks	5 in. (13 cm), 1 ppp; 1 Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 50-54°F (10-12°C) Night	5.8-6.5 / 1.0-1.2	Long day beneficial	—	40-44; Sow: June-July; Finish: May-June	Low to moderate feeder; prevent Mg and Fe deficiency; aphids; if pinch, no later than September	6-8 in. (15-20 cm) height; 10-12 in. (25-30 cm) spread		✓	
Pg 131	ARMERIA <i>A. psudermania</i>	Ballerina Series	6-9	✓	☀☀	29,000-31,000 S/oz. (1,000-1,100 S/g) SED	288-cell	2-4	No	60-65°F (16-18°C); light optional	3-6	60-65°F (16-18°C)	None	5-6		No	4-5 in. (10-13 cm), 1 ppp; 1 Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 50-58°F (10-14°C) Night	5.8-6.2 / 1.2-1.4	None	Day neutral	12-15; Sow: February-May; Finish: May-September	28-36; Sow: August-September; Finish: late March-May	Prevent Mg and Fe deficiency; Red spider mites and aphids; good centerpiece in combos	8-10 in. (20-25 cm) height; 8-10 in. (20-25 cm) spread	✓	✓
	BARBAREA <i>B. rupicola</i>	Sunnyola	6-8		☀☀	31,000-37,000 S/oz. (1,100-1,300 S/g) SED	288-cell	3	Yes	65-68°F (18-20°C); light not required	3-5	60-65°F (16-18°C)	None	6-7		Yes; duration of 8-10 weeks	5 in. (13 cm)	60-65°F (16-18°C) Day; 50-54°F (10-12°C) Night	5.8-6.5 / 1.0-1.2	None	—	32-38; Sow: June-August; Finish: late April-May	Low to moderate feeder, prevent Mg and Fe deficiency; aphids and flea beetles; spray field with weed killer, after this crop	5-6 in. (13-15 cm) height; 6-8 in. (15-20 cm) spread		✓	
Online*	BELLIS <i>B. perennis</i>	Bellissima Series	4-7		☀	21,428 S/oz. (750 S/g)	406-cell or larger		Yes	65-72°F (18-22°C)	3-5			5			Pack, 306 (9 cm), 5 in. (13 cm) 3 ppp	60-65°F (16-18°C) Day; 40-45°F (5-7°C) Night	5.8-6.5 / 1.2-1.4	B-Nine 2000	Long day required	6-10 (U.S. Autumn/Spring)	13-15 Spring/7-9 Autumn North Europe	Use a medium covering of coarse-grade vermiculite to improve seedling uniformity. Grow as cool as possible but avoid freezing temperatures. For forcing the crop when grown at these temperatures, grow at 55-58°F (10-12°C) for 4 weeks before sale.	6-10 in. (15-25 cm) height; 5-8 in. (13-20 cm) spread		✓
	CAMPANULA <i>C. cochlearifolia</i>	Advance Series	4-7	✓	☀☀	629,000-743,000 S/oz. (22,000-26,000 S/g) SED	288-cell	4	No	68-72°F (20-22°C); light required	5-7	65-68°F (18-20°C)	B-Nine 2000	6-8	Spray damp-off fungicide	No	4-5 in. (10-13 cm)	60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night	5.8-6.5 / 1.2-1.4	B-Nine 2000 ppm	Long day required	11-14 (LD); Sow: February-May; Finish: May-July	—	Prevent Mg and Fe deficiency; <i>Botrytis</i> , <i>Rhizoctonia</i> , <i>Pythium</i> , slugs, snail and aphids; use well-drained medium with coarse parts or bark	6-8 in. (15-20 cm) height; 8-10 in. (20-25 cm) spread		✓
	CATANANCHE <i>C. caerulea</i>	Amor Series	4-9	✓	☀	5,600-11,200 S/oz (200-400 S/g) SED	288-cell	4	Yes	65-68°F (18-20°C); light not required	3-5	65-68°F (18-20°C)	None	6-8		No	Gallon (17 cm), 1-3 ppp	65-68°F (18-20°C) Day; 58-60°F (14-16°C) Night	5.8-6.5 / 1.2-1.4	A-Rest 1-2 ppm	Long day beneficial	12-15; Sow: February-May; Finish: May-September	Well-drained soil; dislikes winter wet; moderate fertilization; downy mildew, aphids				
	CHAENORHINUM <i>C. origanifolium</i>	Arista	7-9	✓	☀	29,000-31,000 S/oz. (1,000-1,100 S/g) PEL	288-cell	4	No	65-68°F (18-20°C); light optional	3-5	60-65°F (16-18°C)	B-Nine 2000	6-8	Spray damp-off fungicide	No	3.5-5 in. (9-13 cm)	65-68°F (18-20°C) Day; 54-60°F (12-16°C) Night	5.8-6.5 / 1.0-1.2	B-Nine 2000	Long day beneficial	10-16; Sow: February-May; Finish: May-August	—	Grow relatively dry; needs well drained medium; <i>Botrytis</i> , slugs and snails; nice perennial combo edging	6-7 in. (15-18 cm) height; 6-10 in. (15-25 in.) spread		✓
	CHRYSANTHEMUM <i>C. x leucanthemum</i>	White Knight	4-7	✓	☀	26,000-31,000 S/oz. (900-1,100 S/g) SED	288-cell	2-3	Yes	65-68°F (18-20°C); light not required	3-5	60-65°F (16-18°C)	B-Nine 2000	6-8	Spray damp-off fungicide	No	5 in. (13 cm), 1 ppp; 1 Gallon, 1-3 ppp; 2 Gallon, 3-5 ppp	65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night	5.8-6.5 / 1.2-1.5	B-Nine 2500	Long day beneficial	10-12; Sow: January-May; Finish: mid-late August	—	Relatively high feed; do not use Vertimec (abamectine) to avoid leaf damage; let topsoil dry in between waterings; <i>Botrytis</i> , powdery mildew, white rust, aphids, leaf miners and spidermites; use long day 16 hrs 2-3 wks after transplant to initiate early potting in short day conditions	10-14 in. (25-36 cm) height; 12-16 in. (30-41 cm) spread		✓

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Online*	COREOPSIS <i>C. grandiflora</i>	Early Sunrise	4-9	✓	☀️	10,700 S/oz. (375 S/g) SED	392-cell or larger	1	Cover lightly	68-72°F (20-22°C); light required	4-6	70-75°F (21-24°C) days; 60-65°F (16-18°C) nights	None	5		No	4 in. (10 cm), 1 ppp; Gallon (17cm), 1-3 ppp	60-70°F (16-21°C) Day; 55-60°F (13-16°C) Night	5.8-6.2 / 1.5-2.0	None	Obligate long day min. 14 hours	9-12; Finish: late May-early June	—	Whiteflies, thrips, aphids and powdery mildew	24 in. (60 cm) height; 22-24 in. (55-60 cm) spread	✓	
Online*	COREOPSIS <i>C. grandiflora</i>	Rising Sun	4-9	✓	☀️	10,700 S/oz. (375 S/g) SED	392-cell or larger	1	Cover lightly	68-72°F (20-22°C); light required	4-6	70-75°F (21-24°C) days; 60-65°F (16-18°C) nights	None	5		No	4 in. (10 cm), 1 ppp; Gallon (17cm), 1-3 ppp	60-70°F (16-21°C) Day; 55-60°F (13-16°C) Night	5.8-6.2 / 1.5-2.0	None	Long day required	8-10; Finish: mid-late May	—	Whiteflies, thrips and aphids	18-30 in. (45-75 cm) height; 24-26 in. (60-65 cm) spread	✓	
Online*	COREOPSIS <i>C. grandiflora</i>	Sunfire	4-9	✓	☀️	10,700 S/oz. (375 S/g) SED	392-cell or larger	1	Cover lightly	68-72°F (20-22°C); light required	4-6	70-75°F (21-24°C) days; 60-65°F (16-18°C) nights	None	5		No	4 in. (10 cm), 1 ppp; Gallon (17cm), 1-3 ppp	60-70°F (16-21°C) Day; 55-60°F (13-16°C) Night	5.8-6.2 / 1.5-2.0	None	Long day required	8-10; Finish: mid-late May	—	Whiteflies, thrips and aphids	24 in. (60 cm) height; 22-24 in. (55-60 cm) spread	✓	
	DELPHINIUM <i>D. nudicaule</i>	Red Cap	6-9	✓	☀️	20,000-23,000 S/oz. (700-800 S/g) SED	288-cell	3-4	Yes	68-72°F (20-22°C); light optional	7-10	65-68°F (18-20°C)	6-8	Spray damp-off fungicide		No	4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night	5.5-6.5 / 1.2-1.4	B-Nine 3000	Day neutral	12-14; Sow: February-May; Finish: May-July	—	Needs moderate fertilization; well-drained medium; let pot soil dry in between waterings; NO WET; prevent Mg and Fe deficiency; powdery mildew, leafspot, slugs, snails and leaf miners	8-12 in. (20-30 cm) height; 8-10 in. (20-25 cm) spread	✓	
Online*	DELPHINIUM <i>D. elatum</i>	Guardian F1 Series	4-7	✓	☀️	9,285 S/oz. (325 S/g) SED	200-cell	1	Yes	68-70°F (20-21°C); light optional	7-8	68-72°F (20-22°C)	None	6-7		No	6 in. (15 cm) and larger, 1-3 ppp; Gallon (15-18 cm)	65-70°F (18-21°C) Day; 60°F (16°C) Night	5.8-6.2 / 1.5	Bonzi 20 ppm sp	Day neutral	16; Finish: mid May-June	—	See also Cut Flower section for more details (pg 48)	30-39 in. (75-100 cm) height; 10-12 in. (25-30 cm) spread	✓	
Online*	DELPHINIUM <i>D. elatum</i> , <i>x belladonna</i> , <i>x bellamosum</i>	Dasante Blue F1	4-7	✓	☀️	14,000-21,250 S/oz. (500-750 S/g) SED	200-cell	1	Yes	68-70°F (20-21°C); light optional	7-8	68-72°F (20-22°C)	None	6-7		No	Gallon (15-18 cm), 1-2 ppp; 2 Gallon (20 cm), 3 ppp	65-70°F (18-21°C) Day; 55-63°F (13-17°C) Night	5.8-6.0 / 1.5-2.0	Bonzi 20 ppm sp	Day neutral	17-18; Finish: mid May-June	—	Ship this crop when bottom one-third of the florets on the first flower spike are open to reduce risk of flower shattering during shipping	28-34 in. (70-85 cm) height; 12-14 in. (30-35 cm) spread	✓	
Online*	DELPHINIUM <i>D. grandiflorum</i>	Diamonds Blue F1	4-7	✓	☀️	17,000-24,100 S/oz. (600-850 S/g) SED	200-cell	1	Yes	68-70°F (20-21°C); light optional	7-8	68-72°F (20-22°C)	None	6-7		No	Gallon (15-18 cm), 1-3 ppp; 2 Gallon (20 cm), 3 ppp	65-70°F (18-21°C) Day; 55-63°F (13-17°C) Night	5.8-6.0 / 1.5-2.0	Bonzi 20 ppm sp	Day neutral	14-15; Finish: late May-June	—		16-24 in. (40-60 cm) height; 10-12 in. (25-30 cm) spread	✓	
	DIANTHUS <i>D. deltoides</i>	Shrimp, Arctic Fire	4-7	✓	☀️	100,000-129,000 S/oz. (3,500-4,500 S/g) SED	288-cell	4	Yes, lightly vermiculite	65-68°F (18-20°C); light required	5-7	60-65°F (16-18°C)	6-8	Spray damp-off fungicide		No	4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 50-54°F (10-12°C) Night	5.8-6.5 / 1.0-1.2	CCC 2000 ppm	Day neutral	10-14; Sow: February-May; Finish: May-July	36-44; Sow: July; Finish: late April-May	Low fertilization; prevent Mg and Fe deficiency; rust, Fusarium wilt, aphids and slugs	6-8 in. (15-20 cm) height; 8-10 in. (20-25 cm) spread	✓	✓
Online*	DIANTHUS <i>D. barbatus interspecific</i>	Bouquet F1 Series	4-9	✓	☀️	8,575 S/oz. (300 S/g) PEL	406-cell or larger	1	Yes	64-68°F (18-20°C); light required	3-5	60-65°F (16-18°C)	Bonzi 6 ppm spray	4-5		No	6 in. (15 cm); Gallon (15-18 cm), 1-3 ppp	60-72°F (16-22°C) Day; 50-60°F (10-16°C) Night	5.8-6.2 / 1.5-2.0	1-2x Bonzi 20 ppm sp	Day neutral	8-9	—	Responsive to PGRs; PGRs are needed to produce as a bedding plant; see Grower Facts for recommendations and Cut Flower section for more details (pg 48)	18-30 in. (45-75 cm) height; 10-12 in. (25-30 cm) spread	✓	
Online*	DIANTHUS, DOUBLE <i>D. barbatus interspecific</i>	Dynasty F1 Series	6-8	✓	☀️	7,085-8,500 S/oz. (250-300 S/g) PEL	406-cell or larger	1	Yes	64-68°F (18-20°C); light required	3-5	60-65°F (16-18°C)	Bonzi 6 ppm spray	4-5		No	4 in. (10 cm); 6 in. (15 cm)	60-72°F (16-22°C) Day; 50-60°F (10-16°C) Night	5.8-6.2 / 1.5-2.0	2-3x Bonzi 20 ppm sp	Long day beneficial	8-9	—		16-20 in. (40-50 cm) height; 10 in. (25 cm) spread	✓	

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Weeks to finished plug

Grower Facts	Class	Series/Variety	Hardiness Zone	First year flower	Exposure	Seed info	Recomm- ended plug size**	Seeds/ cell	Cover seed	Germin- ation conditions	Days to germin- ation	Stage 2-3 temp.	Plug PGRs	Plug crop wks.	Plug tips	Vernalization	Recommended containers (ppp : plugs/pot)	Growing on temps.	Media pH/EC	PGR ppm	Photoperiod response	Annual crop weeks to flower from transplant with recommendations †	Overwinter crop weeks to flower from transplant with recommendations †	Tips, diseases & recommendations	Mature height & spread	Heat tolerant	Cool crop
	DIGITALIS <i>D. grandiflora</i>	Carillon	4-7	✓	☀️	157,000-186,000 S/oz. (5,500-6,500 S/g) SED	288-cell	4	No	65-68°F (18-20°C); light optional	5-6	60-65°F (16-18°C)		6-8	Spray damp-off fungicide	No	Gallon, 1 ppp; 2 Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 50-54°F (10-12°C) Night	5.8-6.2 / start 1.0-1.2 to 1.3-1.5	B-Nine 2500; Bonzi 5-10 ppm; Tilt 0.03% (0.3 cc/ liter)	Long day beneficial	10-14; Sow: February-May; Finish: May-July	36-40; Sow: June-July; Finish: mid May-June	Digitalis can be grown under high light if provided enough moisture; low flowering % under low light level; downy mildew, leafspot, <i>Botrytis</i> and aphids	14-16 in. (35-40 cm) height; 12-14 in. (30-36 cm) spread		✓
Pg 134	DIGITALIS <i>D. purp</i>	Dalmatian Series	5-9	✓	☀️	23,000-29,000 S/oz. (800-1,000 S/g) PEL	288-cell for 5-in (13-cm); 84-cell for 1 Gallon	1/288 4/84	No	65-68°F (18-20°C); light optional	5-6	65-68°F (18-20°C)	B-Nine 2000; Bonzi 5 ppm spray; Sumagic 3 ppm spray	288: 5-6; 84: 6-7	Spray damp-off fungicide	No	6 in. (1x288); 1 Gallon (1x84); 2 Gallon (1-3x84)	60-68°F (16-20°C) Day; 50-65°F (10-18°C) Night	5.8-6.2 / start 1.0-1.2 to 1.3-1.5	Sumagic 5 ppm; B-Nine 2500; Bonzi 5-10 ppm; Tilt 0.03% (0,3cc/ liter)	Long day beneficial	11-14; Sow: February-March; Finish: late May-July	-	Digitalis can be grown under high light , provided enough moisture	16-20 in. (40-50 cm) height; 12-14 in. (30-36 cm) spread		✓
	DIGITALIS <i>D. x mertonensis</i>	Summer King	4-7	✓	☀️	114,000-129,000 S/oz. (4,000-4,500 S/g) SED	288-cell	4	No	65-68°F (18-20°C); light optional	5-6	65-68°F (18-20°C)		6-8	Spray damp-off fungicide	No	Gallon, 1 ppp; 2 Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 50-54°F (10-12°C) Night	5.8-6.2 / start 1.0-1.2 to 1.3-1.5	B-Nine 2500; Bonzi 5-10 ppm; Tilt 0.03% (0.3cc/ liter)	Long day beneficial	-	40-44; Sow: June-July; Finish: May-June	Digitalis can be grown under high light if provided enough moisture	14-16 in. (35-40 cm) height; 12-14 in. (30-36 cm) spread		✓
Pg 135	ECHINACEA <i>E. purpurea</i> (Coneflower)	'Cheyenne Spirit,' PowWow™ Series	4-10	✓	☀️	7,400-7,600 S/oz. (260-270 S/g) SED	288-cell or larger	1	Yes	71-76°F (22-24°C); light optional	4-10	71-73°F (22-23°C) Stage 2; 68-70°F (20-21°C) Stage 3	None	288: 5-6; 128: 6-7; 72: 6-7	Patch plugs as late as possible	No, but beneficial; duration of 10 weeks; flowering will occur 2-3 weeks earlier after vernalization	Quart or 5 in. (13 cm); 1 Gallon (17 cm)	60-75°F (16-24°C) Day; 50-60°F (10-16°C) Night	6.0-6.5 / 1.5-2.0	Tank mix of B-Nine 2500 ppm and CCC 750-1000 ppm	Intermediate day	13-17; Sow: early January; Finish: mid-late May	30-40; Sow: July-early September; Finish: late May-early June	Keep soil media dry during overwinter period and bark media is recommended; aphid, fungus gnat and powdery mildew; plants from overwinter production will flower slightly early, have better branching and shorter flower stems	20 in. (40-50 cm) first year height; 22-24 in. (56-61 cm) second year height; 12-16 in. (30-40 cm) spread		✓
	ERIGERON <i>E. karvinskianus</i>	Stallone	6-9	✓	☀️	286,000-343,000 S/oz. (10,000 -12,000 S/g) SED	288-cell	4	No	61-64°F (16-18°C); light not required	7-10	61-64°F (16-18°C)		7-9	Spray damp-off fungicide	No	4-5 in. (10-13 cm), 1 ppp; 1 Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night	5.8-6.5 / 1.1-1.3	Cycocel 2000	Long day required min. 13 hours	10-14 (LD); Finish: May-July	36-40; Finish: May-July	Grow relatively dry; needs low RH and high light for compact growth; prevent MG and Fe deficiency; powdery mildew and slugs; nice perennial combo edging	6-8 in. (15-20 cm) height; 12-14 in. (30-36 cm) spread	✓	✓
	ERYSIMUM <i>E. perovskianum</i>	Goldrush	6-9	✓	☀️	14,000-17,000 S/oz. (500-600 S/g) SED	288-cell	4	Yes	65-68°F (18-20°C); light not required	5-7	60-65°F (16-18°C)		6-7	Spray damp-off fungicide	No	5 in. (13 cm) 1 ppp; 1 Gallon 1-3 ppp	65-68°F (18-20°C) Day; 54-60°F (12-16°C) Night	5.5-6.5 / 1.2-1.4		10-14; Sow: February-April; Finish: April-June	-	Treat preventively against <i>Botrytis</i> ; grow relatively dry and keep dry in between waterings; <i>Botrytis</i> , true & downy mildew and leafspot	10-14 in. (25-36 cm) height; 8-12 in. (20-30 cm) spread		✓	
Pg 137	GAILLARDIA <i>G. x aristata</i>	Mesa Series	5-10	✓	☀️	7,080 S/oz. (250 S/g) SED	288-cell or larger	1	Yes	68-74°F (20-23°C); light optional	4-5	65-68°F (18-20°C)	None	288: 5-6; 128: 6-7; 72: 6-7	Flowering will occur 4-5 weeks earlier after vernalization	No, but beneficial; duration of 10 weeks; flowering will occur 4-5 weeks earlier after vernalization	Quart or 5 in. (13 cm); 1 Gallon (17 cm)	60-70°F (16-21°C) Day; 50-60°F (10-16°C) Night	6.0-6.5 / 1.5-2.0	B-Nine 5000 ppm	Long day beneficial	11-13; Sow: early February; Finish: late May-early June	30-38; Sow: July-early September; Finish: April-early May	Fungus gnat larva, thrips/ INSV, white smut and powdery mildew	16-18 in. (40-45 cm) height; 20-22 in. (50-55 cm) spread	✓	✓
Pg 139	GYPSOPHILA <i>G. cerastoides</i>	Pixie Splash	4-7	✓	☀️	60,000-69,000 S/oz. (2,100-2,400 S/g) TUN	288-cell	4	No	60-65°F (16-18°C); light required	3-4	60-65°F (16-18°C)		5-6	Spray damp-off fungicide	Yes; duration of 8 weeks; max 40°F (4°C)	3-4 in. (8-10 cm)	60-65°F (16-18°C) Day; 50-58°F (10-14°C) Night	5.8-6.5 / 1.0-1.2	None	Day neutral	-	36-40; Sow: July-August; Finish: late April-May	Well-drained soil; dislikes winter wet; Moderate fertilization; <i>Botrytis</i> , aphids, spider mites and whitefly; nice perennial combo edging	3-5 in. (8-13 cm) height; 5-7 in. (13-18 cm) spread		✓

*Find online Grower Facts culture at panamseed.com **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)

†Crop time and scheduling info is based on Northern climate.

PERENNIAL CULTURE CHART

Weeks to finished plug

Grower Facts	Class	Series/Variety	Hard-iness Zone	First year flower	Exposure	Seed info	Recomm-ended plug size**	Seeds/cell	Cover seed	Germin-ation conditions	Days to germin-ation	Stage 2-3 temp.	Plug PGRs	Plug crop wks.	Plug tips	Vernalization	Recommended containers (ppp : plugs/pot)	Growing on temps.	Media pH/EC	PGR ppm	Photoperiod response	Annual crop weeks to flower from transplant with recommendations †	Overwinter crop weeks to flower from transplant with recommendations †	Tips, diseases & recommendations	Mature height & spread	Heat tolerant	Cool crop
Pg 139	HEUCHERA <i>H. hybrida</i>	Melting Fire, Malachite	5-8		☀	26,000-31,000 S./oz. (900-1,100 S/g) PEL	288-cell	6-8	No vermiculite, cover with fleece/white plastic	68-72°F (20-22°C); light required	10-14	65-68°F (18-20°C)		8-10	Spray damp-off fungicide	No	4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp	60-68°F (16-20°C) Day; 58-60°F (14-16°C) Night	5.8-6.2 / 1.2-1.4	None	N/A	12-16; Sow: January-May; Finish: May-July	32-36; Sow: June-July; Finish: March-May	Avoid wet and overly dry; needs well-drained medium; <i>Pythium</i> , <i>Botrytis</i> , powdery mildew, aphids, leaf nematodes and leaf eelworms	8-in. (20 cm) foliage height; 18 in. (46 cm) flower height; 12-14 in. (30-36 cm) spread		✓
	HEUCHERA <i>H. micrantha</i>	Palace Purple	4-7		☀	26,000-31,000 S./oz. (900-1,100 S/g) SED or PEL	288-cell	4	No vermiculite, cover with fleece/white plastic	68-72°F (20-22°C); light required	7-10	65-68°F (18-20°C)		6-8	Spray damp-off fungicide	No	4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp	65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night	5.8-6.2 / 1.2-1.4	None	N/A	10-12; Sow: January-May; Finish: May-July	30-34; Sow: June-July; Finish: March-May	Grow relatively dry; needs well-drained medium; <i>Pythium</i> , <i>Botrytis</i> , powdery mildew, aphids, leaf nematodes and leaf eelworms	10 in. (25 cm) foliage height; 20 in. (51 cm) flower height; 14-16 in. (36-41 cm) spread		✓
Pg 140	HIBISCUS <i>H. moscheutos</i>	Luna F1 Series	5-9	✓	☀	2,835 S/oz. (100 S/g) SED	200-cell or larger	1	Yes, cover with medium	68-75°F (20-24°C); light optional	3-5	68-70°F (20-21°C)	Cycocel 300 ppm spray	3-4	Cover seed with plug media; grow plants under daily average temperature above 68°F (20°C) and keep media moist to wet	No; plugs dies when cooled at 41°F (5°C)	Quart (13 cm), 1 ppp; Gallon (15-18 cm), 1 ppp	70-85°F (21-30°C) Day; 65-70°F (18-21°C) Night	5.8-6.2 / 1.5-2.0	Tank mix of B-Nine 2500 ppm and CCC 750-1000 ppm	Long day	10-13; Sow: March-May; Finish: June-August	—	Does not need pinching; maintain media in high moisture; growing plant too dry will result in flower bud abortion; thrips, aphids and spidermites; growth stops and lower leaves turn yellow when grown below 68°F (20°C)	24-36 in. (60-90 cm) height; 24 in. (60 cm) spread		✓
	IBERIS <i>I. sempervirens</i>	Snowflake	3-8		☀	7,000-10,000 S/oz. (250-350 S/g) SED	288-cell	4-6	Yes	65-68°F (18-20°C); light not required	7-10	60-65°F (16-18°C)	None	6-8		Yes; bulk to desired size before vernalizing to ensure pot fill	5 in. (13 cm), 1 ppp; Gallon, 1-3 ppp	54-60°F (12-16°C) Day; 46-54°F (8-12°C) Night	5.5-6.2 / 1.2-1.4		Day neutral	—	36-40; Sow: May-June; Finish: April-May	Pinch no later than August; avoid wet; well-drained medium; <i>Botrytis</i> , powdery mildew, spidermites and slugs	6-8 in. (15-20 cm) height; 8-12 in. (20-30 cm) spread	✓	✓
Pg 141	LAVENDER <i>Lavandula angustifolia</i>	Ellagance Series	5-8	✓	☀	20,000-34,000 S/oz. (700-1,200 S/g) TUN	288-cell	4	Yes	65-68°F (18-20°C); light not required but beneficial	4-5	65-68°F (18-20°C) Stage 2; 59-63°F (15-17°C) Stage 3	B-Nine 2000 ppm (2g/liter)	5-6	Spray damp-off fungicide	No	4-5 in. quart (10-13cm), 1 ppp; Gallon, 1-3 ppp	60-72°F (16-22°C) Day; 54-60°F (12-16°C) Night	5.8-6.5 / 1.1-1.2 to 1.4-1.5	B-Nine 2000-3000; Sumagic 10-15 ppm	Long day beneficial for Purple; long day required for all others	Purple 9-12; Sky 10-13; Ice & Snow 12 -15; Sow: January-May; Finish: late May-July	32-36; Sow: July-August; Finish: April-May	Grow low RH and high light; let top soil dry in between waterings but do not allow medium to dry as high EC could cause root damage; <i>Botrytis</i> , root rot, leafspot, aphids and mites; for shipping, keep soil moist and plant dry	12-14 in. (30-36 cm) height; 10-12 in. (25-30 cm) spread		✓
Pg 141	LAVENDER <i>Lavandula angustifolia</i>	Lavance	5-8	✓	☀	29,000-37,000 S. oz. (1,000-1,300 S/g) TUN	288-cell	4	Yes	65-68°F (18-20°C); light not required but beneficial	4-5	65-68°F (18-20°C) Stage 2; 59-63°F (15-17°C) Stage 3	B-Nine 2000 ppm (2g/liter)	5-6	Spray damp-off fungicide	No	4-5 in. quart (10-13cm), 1 ppp; Gallon, 1-3 ppp	60-72°F (16-22°C) Day; 60-65°F (16-18°C) Night	5.8-6.5 / 1.1-1.2 to 1.4-1.5	B-Nine 2000-3000; Sumagic 10-15 ppm	Long day required	10-12 (needs potting late Spring); Sow: March-June; Finish: late May-July	32-36; Sow: July-August; Finish: late April-May	Grow low RH and high light; let top soil dry in between waterings but do not allow medium to dry as high EC could cause root damage; <i>Botrytis</i> , root rot, leafspot, aphids and mites; for shipping, keep soil moist and plant dry	10-12 in. (25-30 cm) height; 10-12 in. (25-30 cm) spread		✓
	LAVENDER <i>Lavandula angustifolia</i>	Lavender Lady	5-8	✓	☀	27,000 S/oz. (950 S/g) SED	406-cell or larger	4	Yes	65-75°F (18-24°C); light not required but beneficial	4-5	65-68°F (18-20°C) Stage 2; 59-63°F (15-17°C) Stage 3	B-Nine 2500 ppm spray	6-8	Cover and give good light as soon as germination occurs; seedlings get very leggy when grown under low light	No	Pack, 4 in. (10 cm)	70-75°F (21-24°C) Day; 65-70°F (18-21°C) Night	5.8-6.5 / 1.1-1.2 to 1.4-1.5			Pack: 14-15; 4-in. (10-cm): 18-20; Finish: late May-July	—		8-10 in. (20-25 cm) height; 10 in (25 cm) spread		✓

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†Crop time and scheduling info is based on Northern climate.

Weeks to finished plug

Grower Facts	Class	Series/Variety	Hardiness Zone	First year flower	Exposure	Seed info	Recomm- ended plug size**	Seeds/ cell	Cover seed	Germin- ation conditions	Days to germin- ation	Stage 2-3 temp.	Plug PGRs	Plug crop wks.	Plug tips	Vernalization	Recommended containers (ppp : plugs/pot)	Growing on temps.	Media pH/EC	PGR ppm	Photoperiod response	Annual crop weeks to flower from transplant with recommendations †	Overwinter crop weeks to flower from transplant with recommendations †	Tips, diseases & recommendations	Mature height & spread	Heat tolerant	Cool crop
	LAVENDER <i>Lavandula angustifolia</i>	Munstead Strain	5-8	✓	☀	27,000 S/oz. (950 S/g) SED	406-cell or larger	4	Yes	65-75°F (18-24°C); light not required but beneficial	4-5	65-68°F (18-20°C) Stage 2; 59-63°F (15-17°C) Stage 3	B-Nine 2500 ppm spray	6-8		No	Pack, 4 in. (10 cm)	70-75°F (21-24°C) / start Day; 65-70°F (18-21°C) Night	5.8-6.5 / 1.1-1.2 to 1.4-1.5	B-Nine 2500	Long day beneficial	Pack: 17-20; 4-in. (10-cm): 21-23; Finish: late May-July	—		12 in. (30 cm) heights; 12-18 in. (30-45 cm) spread		
	NEPETA <i>N. nervosa</i>	Blue Moon & Pink Cat	4-7	✓	☀	57,000-69,000 S/oz. (2,000-2,400 S/g) SED	288-cell	4	Yes	65-68°F (18-20°C); light not required but beneficial	4-5	60-65°F (16-18°C)	B-Nine 2000	5-6	Spray damp-off fungicide	No	5 in., 1 ppp; Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night	5.8-6.5 / 1.2-1.4	B-Nine 2500	Long day beneficial	8-10; Sow: March-May; Finish: May-July	—	Grow relatively dry; prevent Mg and Fe deficiencies; Botrytis, downy mildew and aphids	10-12 in. (25-30 cm) height; 10-12 in. (25-30 cm) spread	✓	
	LUPINE <i>L. Polyphyllus</i>	Gallery Series	4-7	✓	☀	840-1680/Oz (30-60S/g) TUN	180 or 84	2 (180 tr) 4-6 (84 tr)	Yes, thick, best with sand	60-65°F (16-18°C); light not required	3-6	60-65°F (16-18°C)	B-Nine 1500 ppm (1.5g/liter)	6 wks for 288; 8 wks 84	Yes, thick, best with sand	No	5 in. (13 cm), 1 ppp; Gallon, 1-3 ppp	60-72°F (16-22°C) Day; 50-59°F (10-15°C) Night	5.5- 6,3 avoid 6,4 and up / 1,1-1,3	B-Nine 2500 ppm; or Tankmx Sumagic 4ppm and B-Nine 2000ppm	Long day beneficial	10-12 weeks	—	Requires well drained soil; medium fertilisation; not heavy; allow leaves and top level soil to dry between watergifts	30 in. x 20 in.		
	MYOSOTIS <i>M. sylvatica</i>	Mon Amie Blue	6-8	✓	☀	48,195-59,535 S/oz. (1,700-2,100 S/g) SED	400-cell or larger		No	68-74°F (20-23°C)	3-5			4			306 (9 cm), 4 in. (10 cm), 6 in. (15 cm) 3 ppp	60-70°F (16-21°C) Days; 50-55°F (10-13°C) Night		B-Nine 2500	Day neutral	Pack: 5-9; 4-in. (10-cm): 5-9	—	Maintain low pH. Mysotis suffer from chlorosis at high pH. Grow like Primula acaulis. See Grower Facts for details on how to mitigate chlorosis caused by high pH.	10-12 in. (25-30 cm) height; 6-9 in. (15-23 cm) spread		✓
	PENSTEMON <i>P. heterophyllus</i>	Electric Blue	6-8	✓	☀	48,000 S/oz. (1,700 S/g) SED	406-cell or larger	1	No	65-74°F (18-23°C); light not required but beneficial	8-10	65-68°F (18-20°C) Stage 2; 60-64°F (16-18°C) Stage 3	None	4-5		No, but beneficial; cooled plants flower more uniformly and faster than non-cooled plants; duration of 10 weeks at 41°F (5°C)	4 in. (10 cm)	66-70°F (19-21°C) Day; 62-66°F (17-19°C) Night	5.8-6.5 / 1.0-1.5	None	Day neutral but needs high light intensity for complete, rapid and uniform flowering	12-13	—	Bulking prior to vernalization ensures pot-fill and improves flowering uniformity; white flies	18 in. (45 cm) height; 24 in. (60 cm) spread		
	PENSTEMON <i>P. smallii</i>	Violet Dusk	6-8	✓	☀	297,000 S/oz. (10,500 S/g) PRM	406-cell or larger	1	No	65-68°F (18-20°C); light required	6-8	65-68°F (18-20°C) Stage 2; 60-64°F (16-18°C) Stage 3	B-Nine 2500 ppm	4-5		No	6 in. (15 cm)	66-70°F (19-21°C) Day; 62-66°F (17-19°C) Night	5.8-6.5 / 1.0-1.5	B-Nine 5000 ppm	Facultative long day	12-15	—	Many more flowers under high light intensity	24 in. (60 cm) height; 18 in. (45 cm) spread		
Pg 142	PENSTEMON <i>P. hartwegii</i>	Tubular Bells Series	7-10	✓	☀	71,000-94,000 S/oz. (2,500-3,300 S/g) SED	288 to 180-cell	4/288 6/180	No	65-68°F (18-20°C); light not required but beneficial	3-6	65-68°F (18-20°C) Stage 2; 60-64°F (16-18°C) Stage 3	B-Nine 2000 ppm (2g/liter)	6-8	Spray damp-off fungicide	No	Gallon, (1-3 ppp); 2 Gallon, 3-5 ppp	60-72°F (16-22°C) Day; 50-59°F (10-15°C) Night	5.5-6.5 / start 1.1-1.2 to 1.4-1.5	B-Nine 2500 ppm	Long day beneficial	13-16; Sow: January-May; Finish: May-July	—	Needs high light; low RH; grow relatively dry; prevent Mg and Fe deficiency; leafspot, powdery mildew, slugs, snails and leaf eelworm	14-16 in. (35-40 cm) height; 10-14 in. (25-36 cm) spread	✓	
Pg 142	PENSTEMON <i>P. x mexicali</i>	Carillo Series	5-7	✓	☀	51,000-69,000 S/oz. (1,800-2,400 S/g) SED	288-cell or larger	4	No	65-68°F (18-20°C); light not required but beneficial	3-6	65-68°F (18-20°C) Stage 2; 60-64°F (16-18°C) Stage 3	B-Nine 2000 ppm (2g/liter)	6-8	Spray damp-off fungicide	No	4-5 in. (10-13 cm); Quart (10-13cm), 1 ppp	65-75°F (18-24°C) Day; 58-65°F (14-18°C) Night	5.8-6.8 / start 1.1-1.2 to 1.4-1.5	B-Nine 2500 ppm	Day neutral	Purple 12-14; Rose 13-15; Sow: February-May; Finish: May-July	—	Needs high light; low RH; grow relatively dry; prevent Mg and Fe deficiency; leafspot, powdery mildew, slugs, snails and leaf eelworm; also suited for 1 plug and 3 plug gallons	8-10 in. (20-25 cm) height; 10-12 in. (25-30 cm) spread	✓	
	POLEMONIUM <i>P. caeruleum</i>	Bambino Blue	4-8	✓	☀	23,000-26,000 S/oz. (800-900 S/g) SED	288-cell	4	Yes	68-72°F (20-22°C); light not required	5-8	65-68°F (18-20°C)		8-10	Spray damp-off fungicide	No	5 in. (13 cm), 1 ppp; Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night	5.8-6.5 / 1.2-1.4	B-Nine 2500	Long day beneficial	10-14; Sow: March-May; Finish: May-July	—	Use well-drained medium, prevent Mg and Fe; grow relatively dry; keep top soil dry in between waterings; Botrytis, downy mildew and aphids	10-12 in. (25-30 cm) height; 6-8 in. (15-20 cm) spread	✓	

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PERENNIAL CULTURE CHART

Weeks to finished plug

Grower Facts	Class	Series/Variety	Hardiness Zone	First year flower	Exposure	Seed info	Recomm- ended plug size**	Seeds/ cell	Cover seed	Germin- ation conditions	Days to germin- ation	Stage 2-3 temp.	Plug PGRs	Plug crop wks.	Plug tips	Vernalization	Recommended containers (ppp : plugs/pot)	Growing on temps.	Media pH/EC	PGR ppm	Photoperiod response	Annual crop weeks to flower from transplant with recommendations †	Overwinter crop weeks to flower from transplant with recommendations †	Tips, diseases & recommendations	Mature height & spread	Heat tolerant	Cool crop
	POPPY <i>Papaver mihybeanum</i>	Moondance	4-7	✓	☀	200,000-229,000 S/oz. (7,000-8,000 S/g) SED	288-cell	2-3	No	60-65°F (16-18°C); light optional	4-6	60-65°F (16-18°C)		6-8	Spray damp-off fungicide	No	5 in. (13 cm), 1 ppp	60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night	5.8-6.8 / 1.1-1.3	None	Long day beneficial	10-12; Sow: February-April; Finish: May-July	—	Well-drained soil; moderate fertilize; high light and airy; <i>Botrytis</i> , downy mildew and aphids	6-8 in. (15-20 cm) height; 5-7 in. (13-18 cm) spread		✓
	POPPY, ICELAND <i>Papaver nudicaule</i>	Champagne Bubbles F1 Series	3-9	✓	☀	142,000 S/oz. (5,000 S/g) PRM, SED	288-cell or larger	1	Cover lightly	64-68°F (18-20°C); light not required but beneficial	7-12	60-65°F (16-18°C)		4-5	Spray damp-off fungicide	No	4 in. (10 cm), 6 in. (15 cm), 1-3 ppp	50-55°F (10-13°C) Day; 40-45°F (4-7°C) Night			Day neutral	4 in. (10 cm); 5-6; 6 in. (15 cm); 6-7; Sow: February-April; Finish: June-August	—		15 in. (38 cm) height; 6 in. (15 cm) spread		✓
	PRIMULA <i>P. capitata</i>	Noverna Deep Blue	4-7	✓	☀	857,000 S/oz. (30,000 S/g) SED	288-cell	4	No	60-65°F (16-18°C); light not required	8-10	60-65°F (16-18°C)	None	8-10		No	4-5 in. (10-13 cm)	65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night	5.5-6.0 / 1.1-1.3	None	Long day beneficial	10-12; Sow: March-May; Finish: June-August	—	Use well-drained medium, prevent Mg and Fe deficiency; <i>Botrytis</i> , <i>Pythium</i> , <i>Rhizoctonia</i> and aphids	8-10 in. (20-25 cm) height; 6-8 in. (15-20 cm) spread		✓
	RUDBECKIA <i>R. fulgida var. sullivanti</i>	Goldsturm	3-9	✓	☀	29,000-34,000 S/oz. (1,000-1,200 S/g) TUN	288-cell or larger	2	Yes	68-72°F (20-22°C); light required	5-7	65-68°F (18-20°C)		6-8		No	Gallon, 1 ppp; 2 Gallon, 1-3 ppp	65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night	5.8-6.5 / 1.3-1.6	Sumagic 5-10 ppm spray; Bonzi 20-30 ppm spray	Long day required	20-24; Sow: January-May; Finish: July-September	—	High feeder; use long day or night interruption to finish early pottings; prevent Mg and Fe deficiency; <i>Botrytis</i> and downy mildew; high light and good ventilation	16-24 in. (40-60 cm) height; 14-18 in. (36-46 cm) spread		✓
	SALVIA <i>S. lyrata</i>	Purple Volcano	6-8	✓	☀	14,000-17,000 S/oz. (500-600 S/g) SED	288-cell	3-4	Cover lightly	68-72°F (20-22°C); light required	5-7	65-68°F (18-20°C)	None	6-8	Spray damp-off fungicide; grow relatively dry after Stage 1	No	5 in. (13 cm), 1 ppp; 1 Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night	5.8-6.2 / 1.2-1.4	None	Day neutral	8-10; Sow: March-June; Finish: late April-July	32-38; Sow: August-September; Finish: March-May	Use well-drained medium, prevent Mg and Fe; <i>Botrytis</i> , downy mildew, aphids and spidermites	8-10 in. (20-25 cm) height; 6-8 in. (15-20 cm) spread	✓	✓
Pg 143	SALVIA <i>S. nemorosa</i>	New Dimension Series	4-8	✓	☀	Blue: 29,000-31,000 S/oz. (1,000-1,100 S/g); Rose 17,000-21,000 S/oz. (600-750 S/g) COT	288-cell	4	Cover lightly	68-72°F (20-22°C); light optional	3-4	65-68°F (18-20°C)	None	5-6	Spray damp-off fungicide	No	4-5 in./quart (10-13cm), 1 ppp; Gallon, 1-3 ppp	60-72°F (16-22°C) Day; 50-59°F (10-15°C) Night	5.5-6.2 / start 0.8-1.0 to 1.2-1.3	Indoor prod B-Nine 2500	Long day required	Rose 8-10; Blue 9-11; Sow: March-May; Finish: May-July	32-38; Sow: August-September; Finish: April-May	Avoid leaf yellow with high pH (Fe) and/or low N when generative; spray weekly Bittersalt MGSO4 1g/liter; spidermites, <i>Rhizoctonia</i> , leafspot and root rot; wet after transplant with preventive spray <i>Rhizoctonia</i>	8-10 in. (20-25 cm) height; 6-8 in. (15-20 cm) spread	✓	✓
	SALVIA <i>S. Patens</i>	Patio Series	8-10	✓	☀	2,660-3,500 S/oz. (95-125/gr)	288-cell	1	No	65-68°F (18-20°C); light required	4-7	65-68°F (18-20°C)	B-Nine 1500 ppm (1.5g/liter)	5-6		No	5 in., 1 ppp; Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 57-60°F (14-16°C) Night	5.8-6.5 /	B-Nine 2000	Long day beneficial	7-11; Sow: April-May; Finish: May-July	—	Grow relatively dry. Use well-drained medium, prevent Mg and Fe deficiency; <i>Botrytis</i> , downy mildew, aphids and spidermites; high light and good ventilation	10-14 in. (25-36 cm) height; 12-14 in. (30-36 cm) spread		✓
	SALVIA <i>S. roemeriana</i>	Hot Trumpets	7-10	✓	☀	11,000-14,000 S/oz. (400-500 g/oz.) SED	288-cell	3-4	Cover lightly	65-68°F (18-20°C); light required	5-7	65-68°F (18-20°C)	B-Nine 2000	6-8	Spray damp-off fungicide; grow relatively dry after Stage 1	No	5 in., 1 ppp; Gallon, 1-3 ppp	65-68°F (18-20°C) Day; 54-60°F (12-16°C) Night	5.8-6.2 / 1.2-1.4	B-Nine 2000	Day neutral	8-12; Sow: April-May; Finish: June-August	—	Use well-drained medium, prevent Mg and Fe deficiency; <i>Botrytis</i> , downy mildew, aphids and spidermites; high light and good ventilation	8-10 in. (20-25 cm) height; 6-8 in. (15-20 cm) spread		✓

*Find online Grower Facts culture at panamseed.com **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)

†Crop time and scheduling info is based on Northern climate.

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Weeks to finished plug

Grower Facts	Class	Series/Variety	Hardiness Zone	First year flower	Exposure	Seed Info	Recomm- ended plug size**	Seeds/ cell	Cover seed	Germin- ation conditions	Days to germin- ation	Stage 2-3 temp.	Plug PGRs	Plug crop wks.	Plug tips	Vernalization	Recommended containers (ppp : plugs/pot)	Growing on temps.	Media pH/EC	PGR ppm	Photoperiod response	Annual crop weeks to flower from transplant with recommendations †	Overwinter crop weeks to flower from transplant with recommendations †	Tips, diseases & recommendations	Mature height & spread	Heat tolerant	Cool crop
	SAXIFRAGA <i>S. x arendsii</i>	Purple Robe	4-7	☑	☀	543,000-600,000 S/oz. (19,000-21,000 S/g) SED	288-cell	4-6	Cover lightly	65-68°F (18-20°C); light not required	8-10	65-68°F (18-20°C)	None	8-10	Spray damp-off fungicide	Yes; duration of 12 weeks at 41°F (5°C)	4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp	50-54° (10-12°C) Day; 44-50°F (7-10°C) Night	5.8-6.5 / 1.0-1.2	None	Day neutral	—	40-44; Sow: June-July; Finish: late April-June	Very well-drained medium; prevent Mg and Fe deficiency; <i>Botrytis</i> and spidermites	3-5 in. (8-13 cm) height; 4-6 in. (10-15 cm) spread		☑
	SCABIOSA <i>S. col.</i>	Blue Note	5-9	☑	☀☀	11,000-20,000 S/oz. (400-700 S/g) SED	288-cell	2-3	Yes	65-68°F (18-20°C); light not required	8-10	65-68°F (18-20°C)	None	6-8	Spray damp-off fungicide	No	4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp	65-68°F (18-20°C) start Day; 60-65°F (16-18°C) Night	5.8-6.2 / 0.8-1.0 to 1.2-1.3	None	Day neutral	12-14; Sow: January-April; Finish: May-July	30-36; Sow: August-September; Finish: April-May	Needs high light; low RH; grow relatively dry; prevent Mg and Fe deficiency; <i>Botrytis</i> , downy mildew, root rot, aphids and mites; early spring forcing 6 wks 62-65, no long days	8-10 in. (20-25 cm) height; 8-10 in. (20-25 cm) spread		☑
	SCABIOSA <i>S. jap.</i>	Diamonds Series	5-9	☑	☀☀	11,000-20,000 S/oz. (400-700 S/g) SED	288-cell	2-3	Yes	65-68°F (18-20°C); light not required	8-10	65-68°F (18-20°C)	None	6-8	Spray damp-off fungicide	No	4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp	65-68°F (18-20°C) start Day; 60-65°F (16-18°C) Night	5.8-6.2 / 0.8-1.0 to 1.2-1.3	None	Day neutral	13-15; Sow: January-April; Finish: May-July	30-36; Sow: August-September; Finish: April-May	Needs High Light; low RH; grow relatively dry; prevent Mg and Fe deficiency; <i>Botrytis</i> , downy mildew, root rot, aphids and mites; early spring forcing 6 wks 62-65, no long days	8-10 in. (20-25 cm) height; 8-10 in. (20-25 cm) spread		☑
	SILENE <i>S. alpestris</i>	Starry Dreams	5-8	☑	☀☀	171,00-200,000 S/oz. (6,000-7,000 S/g) SED	288-cell	3-4	No	68-72°F (20-22°C); light not required	5-7	65-68°F (18-20°C)	B-Nine 2000 ppm (2g/liter)	5-6		No	4-5 in. (10-13 cm)	65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night	5.8-6.5 / 1.0-1.2	B-Nine 2500	Long day required	10-12; Sow: February-April; Finish: May-July	—	Low-moderate fertilization; grow uniformly moist; prevent Mg and Fe deficiency; aphids, spidermites, slugs and snails	6-8 in. (15-20 cm) height; 8-10 in. (20-25 cm) spread		☑
	SILENE <i>S. maritima</i>	Icecups	4-7	☑	☀☀	29,000-34,000 S/oz. (1,000-1,200 S/g) SED	288-cell	4	No	68-72°F (20-22°C); light not required	5-7	65-68°F (18-20°C)	B-Nine 2000 ppm	6-8		No	4-5 in. (10-13 cm)	60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night	5.8-6.5 / 1.0-1.2	B-Nine 2500	Long day required	9-11 (LD); Sow: February-April; Finish: May-July	32-38; Sow: June-July; Finish: April-May	Low-moderate fertilization; grow uniformly moist; prevent Mg and Fe deficiency; aphids, spidermites, slugs and snails	5-7 in. (13-18 cm) height; 6-8 in. (15-20 cm) spread		☑
	TIARELLA <i>T. wherryi</i>	Silverado	4-8	☑	☀☀	106,000-114,000 S/oz. (3,700-4,000 S/g) TUN	288-cell	4	No	65-68°F (18-20°C); light not required	7-10	60-65°F (16-18°C)		8-10	Do not grow wet	No	4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night	5.5-6.5 / 1.2-1.4		Day neutral	10-12; Sow: February-April; Finish: late April-July	30-36; Sow: June-July; Finish: April-May	Moderate fertilization; keep dry top soil between waterings; avoid winter wet; <i>Botrytis</i> and slugs	10-12 in. (25-30 cm) height; 8-10 in. (20-25 cm) spread		☑
	VERBASCUM <i>V. x hybrida</i>	Southern Charm F1	5-8	☑	☀	28,350 S/oz. (1,000 S/g) SED	200-cell or larger	1	Yes	65-68°F (18-20°C); light not required	3-7	65-68°F (18-20°C)		4-5		No	Gallon (15-18 cm), 1 ppp	64-67°F (18-19°C) Day; 62-65°F (17-18°C) Night	5.8-6.5 / 1.1-1.3		Day neutral	12-13; Sow: February-April; Finish: May-July	—	Flowering more uniform under high light conditions	24-30 in. (60-75 cm) height; 12-18 in. (30-45 cm) spread		☑
	VERBASCUM <i>V. phoeniceum</i>	Tempress Series	5-7	☑	☀	34,000-37,000 S/oz. (1,200-1,300 S/g) PEL	288 or 180-cell	3-4	No	68-72°F (20-22°C); light not required	2-4	65-68°F (18-20°C)		7-8		No	Gallon, 1 ppp	65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night	5.8-6.5 / 1.1-1.3		Long day beneficial	11-13; Sow: February-April; Finish: May-July	—	Moderate fertilization; grow relatively dry; powdery mildew and moth caterpillars	24-28 in. (60-71 cm) height; 12-16 in. (30-41 cm) spread		☑

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	VERBENA <i>V. rigida</i>	Santos	7-10	✓	☀	34,000 S/oz. (1,200 S/g) SED	288-cell	4	Yes	68-72°F (20-22°C); light not required	7-10	65-68°F (18-20°C)		6-7	Spray damp-off fungicide; grow relatively dry after Stage 1	No	5 in. (13 cm), 1 ppp; Gallon, 1-3 ppp	65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night	5.5-6.2 / 1.3-1.5		Long day beneficial	11-13; Sow: February-April; Finish: May-August	—	Grow dry and light; relatively high fertilization; avoid high N; prevent Mg and Fe deficiency; powdery mildew, aphids and thrips	10-14 in. (25-36 cm) height; 12-14 in. (30-36 cm) spread	✓	
	VERBENA <i>V. bonariensis</i>	Buenos Aires	7-9	✓	☀	98,000 - 126,000 S/oz (3,500-4,500 S/g) TUN	288-cell	4	Yes	68-72°F (20-22°C); light not required	7-10	65-68°F (18-20°C)		6-7	Spray damp-off fungicide; grow relatively dry after Stage 1	No	5 in. (13 cm), sold green	65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night	5.5-6.2 / 1.3-1.5		Long day beneficial	16-18; Sow: February-April; Finish: May-August	—	Grow dry and light; relatively high fertilization; avoid high N; prevent Mg and Fe deficiency; powdery mildew, aphids and thrips	40-50 in. (1-1.5 m) x 12-16 in. (30-40 cm)	✓	
	VERONICA <i>V. x hybrida</i>	Blue Bouquet F1	5-8	✓	☀	25,500 S/oz. (900 S/g) PEL	406-cell or larger	1	Yes	65-75°F (18-24°C); light not required	6-9	65-68°F (18-20°C)		5-6		No	Gallon, 1 ppp	65°F (18°C) Day; 55-65°F (13-18°C) Night	5.5-6.2 / 1.3-1.5		Long day beneficial	14-16; Sow: February-April; Finish: May-August	—	See also Cut Flower section for more details (pg 50)	12 in. (30 cm) height; 12 in. (30 cm) spread		
	VERONICA <i>V. prostrata</i>	Nestor	4-7	✓	☀	157,000-185,000 S/oz. (5,500-6,500 S/g) SED	288-cell	4	Cover lightly	65-68°F (18-20°C); light not required	3-6	60-65°F (16-18°C)		6-8		No	5 in. (13 cm), 1 ppp; Gallon, 1-3 ppp	60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night	5.8-6.8 / 1.1-1.3	B-Nine 2000	Long day beneficial	11-13; Sow: February-April; Finish: May-June	36-42; Sow: June-July; Finish: April-May	Finish relatively dry; prevent microelements deficiency; powdery and downy mildew, leaf spot and aphids	5-7 in. (13-18 cm) height; 8-12 in. (15-30 cm) spread		

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