

ORNAMENTAL PLANT PLUGS GROWING RECOMMENDATIONS

CROP	STAGE 1*					STAGE 2**					STAGE 3***					STAGE 4****					Total Plug Crop Time (weeks) ⁵	CULTURAL COMMENTS
	Cover ¹	Soil Temp.	Moisture	Light ²	Days	Soil Temp.	Moisture	Fertilizer (ppm) ⁴	Soil EC ⁵	Days	Soil Temp.	Moisture	Fertilizer (ppm) ⁴	Soil EC ⁵	Days	Soil Temp.	Moisture	Fertilizer (ppm)	Soil EC ⁵	Days		
Alyssum	Yes Lightly	65-72°F (18-22°C)	4		2-3	65-72°F (18-22°C)	3-4	50-75 1/wk	<0.75	3-7	68-75°F (20-24°C)	3-4	100-150 1/wk	<1.0	21	62-68°F (16-20°C)	2-3	100-150 1/wk	<0.75	7	5-6	Susceptible to damping-off. Control with less seeds per cell, moisture and fungicides. Control growth with DIF or daminozide. High light (500 µmol m ⁻² s ⁻¹ approx. 2,500 f.c.) and low feed will cause yellowing of lower leaves and downy mildew. If using multi-seed pellets, do not cover, and mist/water thoroughly after sowing to assure the pellet dissolves.
Aster (<i>Callistephus chinensis</i>)	Yes	65-72°F (18-22°C)	3-4		4-5	68-75°F (20-24°C)	3	50-75 1/wk	<0.75	7	62-68°F (16-20°C)	2-3	100-150 1/wk	<1.0	14	62-68°F (16-20°C)	2-3	100-150 1/wk	<0.75	5-7	4-5	To prevent premature flowering, minimize stress due to high light and low moisture and fertilizer. Do not hold plugs. To prevent premature flowering, minimize stress due to high light and low moisture and fertilizer. Control height with DIF, paclobutrazol or uniconazole-P. Do not hold plugs. Reduce crop time if needed to keep culture. Control damping-off with no cover, moisture and a preventative fungicide.
Celosia	Yes Lightly	72-78°F (22-25°C)	4		5-7	65-72°F (18-22°C)	4	50-75 1/wk	<0.75	7-10	62-68°F (16-20°C)	3-4	100-150 1-2/wk	<1.0	14-21	62-68°F (16-20°C)	3-4	100-150 1/wk	0.7-1.2	7	5-6	Keep plants vegetative with night interruption (from incandescent lights) of 10 µmol m ⁻² s ⁻¹ (approx. 50 f.c.) for 4 hours in the middle of the night.
Dianthus (<i>Dianthus chinensis</i> , <i>D. hybridus</i> , <i>D. barbatus</i>)	Yes Lightly	65-72°F (18-22°C)	4		3-5	68-75°F (20-24°C)	3-4	50-75 1/wk	<0.75	7	62-68°F (16-20°C)	2-3	100-150 1/wk	<1.0	14-21	55-62°F (12-16°C)	2-3	100-150 1/wk	0.7-1.2	7	5-6	Very sensitive to high salts during Stages 1 and 2. To promote early flowering, increase total light energy to the crop. Control growth with DIF, ancymidol, paclobutrazol, chlormequat chloride or uniconazole-P.
Dichondra (<i>Dichondra argentea</i>)	Yes	72-78°F (22-25°C)	4		4-6	68-75°F (20-24°C)	3-4	50-75 1/wk	<0.75	7-10	62-68°F (16-20°C)	2-3	100-150 1/wk	0.7-1.2	14-21	62-68°F (16-20°C)	2-3	100-175 1/wk	0.7-1.2	7	5-6	Plug development is faster with drier culture, but do not let seedlings wilt. Daminozide at 2,500 ppm a week before transplant promotes branching.
Helenium (<i>Helenium amarum</i>)	Yes	65-72°F (18-22°C)	5		3-5	68-75°F (20-24°C)	4	50-75 1/wk	<0.75	7-10	68-75°F (20-24°C)	3-4	100-150 1/wk	<1.0	10-14	62-68°F (16-20°C)	3-4	100-160 1/wk	1.0-1.5	7	3-4	Plug tray sizes 288 to 128 are recommended.
Hypoestes	Yes Lightly	72-78°F (22-25°C)	4		3-4	68-75°F (20-24°C)	3-4	50-75 1/wk	0.7-1.2	7	62-68°F (16-20°C)	3	100-150 1/wk	0.7-1.2	14-21	62-68°F (16-20°C)	3	100-150 1/wk	<0.75	7	5-6	Provide long days with HID lights for best growth. New varieties are genetically more compact. Use chlormequat chloride or DIF to control growth. Under low light, use low-ammonium fertilizer for best color.
Pansy (<i>Viola x wittrockiana</i>)	Yes Lightly	65-72°F (18-22°C)	4		3-7	62-68°F (16-20°C)	3-4	50-75 1/wk	<0.75	7	62-68°F (16-20°C)	3-4	100-150 1/wk	<1.0	14-21	55-62°F (12-16°C)	2-4	100-150 1/wk	<0.75	7	4-5	Reduce moisture in Stage 2 for best germination. Control root rot with moisture, pH and fungicides. Control growth in warm weather with moisture, light and feed, plus daminozide, ancymidol, paclobutrazol or daminozide.
Poppy – Arctic, Icelandic (<i>Papaver nudicaule</i>)	Yes Lightly	65-72°F (18-22°C)	4		5-7	62-68°F (16-20°C)	3-4	50-75 1/wk	0.7-1.2	7	62-68°F (16-20°C)	2-4	100-175 1/wk	0.7-1.2	21-28	62-68°F (16-20°C)	2-3	100-175 1/wk	0.7-1.2	7	6-7	Shoot growth will be floppy and root growth very fine. Dialdage plugs when transplanting.
Snapdragon (<i>Antirrhinum majus</i>)	Yes Lightly	65-72°F (18-22°C)	4		3-8	62-68°F (16-20°C)	3-4		<0.7	7	62-68°F (16-20°C)	3-4	100-150 1/wk	0.7-1.2	14-21	62-68°F (16-20°C)	3	100-150 1/wk	0.7-1.2	7	5-6	Control early stretch with low starter charge, moisture, fertilizer low in phosphorus and ammonium nitrogen, DIF, daminozide, ancymidol, paclobutrazol or uniconazole-P. Sensitive to high salts during early stages. Control disease with moisture, air movement and fungicides. Watch for leaf burn on sunny days.
Bellis	Yes Lightly	72-78°F (22-25°C)	4		6-5	65-72°F (18-22°C)	3-4	None	<0.7	7-10	62-68°F (16-20°C)	2-3	100-150 1/wk	<1.2		62-68°F (16-20°C)	2-3	100-150 1/wk	<1.2		13-15	Leaf damage can occur with high concentration of propiconazole. Due to leaf sensitivity, it is best to buy in plugs from commercial propagators as opposed to sowing in summer for late southern summer sales.
Hollyhock	Yes	65-72°F (18-22°C)	4		8-10	65-72°F (18-22°C)	3-4	75-100 1/wk	<0.75	7-10	68-75°F (20-24°C)	3-4	75-100 1/wk	0.7-1.3	28-35	65-72°F (18-22°C)	2-3	75-100 1/wk	0.7-1.2		10-12	Alcea should be germinated at 40°F or below.
Delphinium	Yes Lightly	65-72°F (18-22°C)	4		10-12	65-72°F (18-22°C)	3-4	75-100 1/wk	<0.75	7-10	65-72°F (18-22°C)	2-3	150-175 1/wk	1.2-1.5	7	62-68°F (16-20°C)	2-3	150-175 1/wk	1.2-1.5	7	10-12	There is a more uniform germination when using temperatures under 75°F. Temperatures of 65-68°F are ideal.
Euphorbia	Optional	65-72°F (18-22°C)	4	Optional	3-6	65-72°F (18-22°C)	4	50-100 1/wk	<0.75	7-10	65-72°F (18-22°C)	3-4	100-175 1/wk	0.7-1.2	42-56	65-72°F (18-22°C)	3-4	100-175 1/wk	0.7-1.2	7-14	14-17	Can apply daminozide spray for height control, with first application at true leaf stage, followed by a second application 7 days later. An alternative would be an application of paclobutrazol srench at 2.5 ppm or drench at 0.25 to 0.5 ppm at radicle emergence. This should be followed by a single daminozide spray of 2,500 to 5,000 ppm in Stage 3.
Heuchera	No	65-72°F (18-22°C)	4-5		7-10	65-72°F (18-22°C)	3-4	50-100 1/wk	<0.75	5-9	65-72°F (18-22°C)	3	100-175 1/wk	0.7-1.2	21-28	62-68°F (16-20°C)	2	<100 1/wk	<0.75	7	6-8	During Stage 1, maintain media moisture at level 4 and RH at 80%. Saturated level 5 media moisture and reduced or fluctuating humidity in Stage 1 can decrease germination and uniformity.
Limonium	Yes	65-72°F (18-22°C)	4		5-12	65-72°F (18-22°C)	3-4	50-100 1/wk	<0.75	5-9	62-68°F (16-20°C)	3	100-175 1/wk	0.7-1.2	28-35	55-62°F (12-16°C)	3	100-175 1/wk	0.7-1.2	7	12-14	Upon removal from germination chamber, place in propagation with bottom heat at 65-68°F (8-20°C) media temperature.
Lupine	Yes	65-72°F (18-22°C)	4		6-12	65-72°F (18-22°C)	3-4	50-100 1/wk	<0.75	5-9	62-68°F (16-20°C)	3-4	100-175 1/wk	0.7-1.2	10-14	62-68°F (16-20°C)	3	100-175 1/wk	0.7-1.2	7	4-5	For large cell packs such as 18 cells per flat, the plants will require 12-14 weeks from a February sowing. This is only for producing green plants. Once planted in the garden, it will be another 6-8 weeks until flowering.
Marigold – French, American, Triploid (<i>Tagetes</i> spp.)	Yes Lightly	72-78°F (22-25°C)	4	Optional	2-5	68-75°F (20-24°C)	3-4	50-75 1/wk	<0.75	7	68-75°F (20-24°C)	3	100-150 1/wk	<1.0	14	62-68°F (16-20°C)	3	100-150 1/wk	<0.75	7	4-5	Keep soil pH 6.0 to 6.2 to avoid micronutrient toxicities. Control growth, especially in triploids, with DIF, daminozide, ancymidol, paclobutrazol or uniconazole-P. Provide 2 weeks of short days to African marigolds after germination if sown after February 15 to promote flowering. Use iprodione to control Alternaria on African marigolds.
Petunia	No	72-78°F (22-25°C)	4-5	Yes	3-5	68-75°F (20-24°C)	3-4	50-75 2/wk	<0.75	7-10	65-72°F (18-22°C)	2-4	100-150 2/wk	<1.2	14-21	62-68°F (16-20°C)	2-4	100-150 1/wk	<0.75	7	5-6	Provide long days (>14 hours) to promote early flowering. Feed more frequently, but control growth with DIF, moisture, light, daminozide, paclobutrazol or uniconazole-P. Watch for boron or iron deficiency and high pH.
Zinnia (<i>Catharanthus roseus</i>)	Yes	75-80°F (24-26°C)	4-5	No	4-6	68-75°F (20-24°C)	3-4	50-75 1/wk	<0.75	7-10	68-75°F (20-24°C)	2-4	100-175 1/wk	0.7-1.2	14-21	65-72°F (18-22°C)	2-4	100-175 1/wk	0.7-1.2	7	5-6	Best germination if warm, moist and dark. Best growth if warm, dry and low salts. Control growth with DIF, high light, daminozide, ancymidol or uniconazole-P. Control disease with moisture, pH and fungicides.
Vinca	Yes	65-72°F (18-22°C)	3-4	Optional	2-3	68-75°F (20-24°C)	3-4	50-75 1/wk	<0.75	5-7	68-75°F (20-24°C)	3-4	100-150 1/wk	<1.0	10-14	62-68°F (16-20°C)	3-4	100-150 1/wk	<0.75	3-5	3-4	Best germination if cool and dry. Control stretch with low temperature and fertilizer low in phosphorus and ammonium nitrogen, high light, DIF, daminozide or ancymidol. Control Alternaria with moisture, air movement and iprodione or thiophanate-methyl. Do not hold plugs.
Alternanthera (<i>Alternanthera dentata</i>)	Yes Lightly	72-78°F (22-25°C)	4-5	Beneficial	3-5	65-72°F (18-22°C)	3-4	50-75 1/wk	<0.75	5-7	65-72°F (18-22°C)	3-4	100-150 1/wk	<1.0	10-20	62-68°F (16-20°C)	3-4	100-150 1/wk	<1.0	7	4-5	Chlormequat chloride may cause phytotoxicity. A light covering with coarse vermiculite is helpful for moisture control, but light is beneficial for uniform germination.
Cabbage/Kale, Flowering (<i>Brassica oleracea</i>)	Yes	65-72°F (18-22°C)	4		3-4	62-68°F (16-20°C)	3-4	50-75 1/wk	<0.75	4-7	62-68°F (16-20°C)	2-4	100-150 1/wk	<0.75	10-14	62-68°F (16-20°C)	2-4	100-150 1/wk	<0.75	7	4-5	Control early stretch with low starter charge, moisture, fertilizer low in phosphorus and ammonium nitrogen, and DIF. Use daminozide or paclobutrazol if needed. Avoid lower leaf chlorosis and mildew with adequate feed.
Carnation (<i>Dianthus caryophyllus</i>)	Yes	65-72°F (18-22°C)	4		5-7	65-72°F (18-22°C)	3-4	50-75 1/wk	<0.75	7-10	65-72°F (18-22°C)	2-4	100-150 1-2/wk	<1.0	10-14	62-68°F (16-20°C)	2-4	100-150 1/wk	<0.75	7	5-6	Best growth with cool temperature, low feed (<0.75 EC), low ammonium (<10 ppm) and high light (max 600 µmol m ⁻² s ⁻¹ approx. 3,000 f.c.).
Dahlia	Yes	65-72°F (18-22°C)	3		3-4	68-75°F (20-24°C)	3	50-75 1/wk	<0.75	5-7	65-72°F (18-22°C)	2-3	100-150 1/wk	<1.0	12-14	65-72°F (18-22°C)	2-3	100-150 1/wk	<0.75	7	3-5	Control growth with moisture management and fertilizers low in phosphorus and ammonium nitrogen.
Lisianthus (<i>Eustoma grandiflorum</i>)	No	72-78°F (22-25°C)	4	Yes	10-12	68-75°F (20-24°C)	3-4	50-75 1/wk	<0.75	14-21	65-72°F (18-22°C)	3-4	100-150 2/wk	<1.2	28-35	62-68°F (16-20°C)	3	100-150 2/wk	1.0-1.5	7	9-11	Best germination if cool and dry with covering. Control growth with DIF, daminozide, ancymidol or paclobutrazol.
Gomphrena	Yes	72-78°F (22-25°C)	4	Yes	4-7	68-75°F (20-24°C)	3-4	50-75 1-2/wk	<0.75	7-10	68-75°F (20-24°C)	2-3	100-150 1/wk	<1.2	14-21	62-68°F (16-20°C)	2-3	100-150 1/wk	<1.2	7	5-6	Keep temperature below 78°F (25°C), but above 60°F (15°C) to avoid rosetting. Provide long days to improve flowering. Keep soil pH >6.0. Reduce moisture after cotyledon expansion to control algae. Do not hold plugs until rootbound. Provide 40 µmol m ⁻² s ⁻¹ (approx. 200 f.c.) of light for best germination.
Lobelia (<i>Lobelia erinus</i>)	No	72-78°F (22-25°C)	4	Yes	4-6	68-75°F (20-24°C)	3-4	50-75 1/wk	<0.75	7	62-68°F (16-20°C)	3-4	100-150 1-2/wk	<1.0	14-21	62-68°F (16-20°C)	3	100-150 1/wk	<1.0	7	4-6	Avoid overwatering for best germination, root growth and control of disease. Control growth with DIF, moisture, fertilizer low in phosphorus and ammonium nitrogen, low starter charge and high light. Low temperature may slow growth. Very sensitive to most pesticides – use caution when spraying.
Nicotiana	No	72-78°F (22-25°C)	4	Yes	3-5	68-75°F (20-24°C)	3-4	50-75 2/wk	<0.75	7-10	65-72°F (18-22°C)	2-4	100-150 2/wk	<1.2	14-21	62-68°F (16-20°C)	2-4	100-150 2/wk	<0.75	7	4-6	Control damping-off with moisture, fungicides and fewer seeds per cell. Control growth with DIF or daminozide. High light (>500 µmol m ⁻² s ⁻¹ approx. 2,500 f.c.) may burn leaves. Keep EC low. Flowering is enhanced with longer days.
Plectranthus (<i>Plectranthus argentatus</i>)	No	65-72°F (18-22°C)	4	Yes	5-7	65-72°F (18-22°C)	3-4	50-75 1/wk	<0.75	7-10	65-72°F (18-22°C)	2-3	100-175 1/wk	0.7-1.2	14-21	62-68°F (16-20°C)	2-3	100-175 1/wk	0.7-1.2	7	5-7	Grow same as petunias. Provide long days (>14 hours) to promote early flowering. Feed more frequently, but control growth with DIF, moisture and light management or daminozide.
Ranunculus	Yes Lightly	50-55°F (10-13°C)	5		7-21	55-62°F (12-16°C)	4-5	50-75 1/wk	<0.75	7-14	55-62°F (12-16°C)	3-4	100-150 1/wk	<1.0	21-28	55-62°F (12-16°C)	3-4	100-150 1/wk	<0.75	7	8-10	<i>Plectranthus argentatus</i> may require daminozide at 2,500 ppm at Stage 3.
Sunflower (<i>Helianthus annuus</i>)	Yes Lightly	65-72°F (18-22°C)	4	Optional	3-5	68-75°F (20-24°C)	3-4	50-75 1/wk	<0.75	5-7	65-72°F (18-22°C)	2-3	100-150 1/wk	<1.0	5-7	65-72°F (18-22°C)	2-3	100-175 1/wk	0.7-1.2	7	2-3	Best germination if cool and moist. For best root growth, allow soil to dry between waterings.
Viola (<i>Viola cornuta</i>)	Yes	65-72°F (18-22°C)	4	Optional	3-5	62-68°F (16-20°C)	3-4	50-75 1/wk	<0.75	7	62-68°F (16-20°C)	2-3	100-150 1/wk	<1.0	14-21	55-62°F (12-16°C)	2-4	100-150 1/wk	<0.75	7	5-6	Keep light levels <300 µmol m ⁻² s ⁻¹ (approx. 1,500 f.c.) in Stage 2 and <600 µmol m ⁻² s ⁻¹ (approx. 3,000 f.c.) in Stages 3 and 4 to prevent burn and stunted growth.
Osteospermum	Yes	65-72°F (18-22°C)	4	Optional	5-9	68-75°F (20-24°C)	3-4	50-100 1/wk	<0.75	5-7	68-75°F (20-24°C)	2-3	100-175 1/wk	0.7-1.2	10-14	65-72°F (18-22°C)	2-3	100-175 1/wk	0.7-1.2	7	4-5	Can be sown directly into final container. Do not allow seedlings to wilt.
Amaranthus	Yes	72-78°F (22-25°C)	4	No	6-10	65-72°F (18-22°C)	3-4	50-75 1/wk	<0.75	5-7	65-72°F (18-22°C)	2-3	100-175 1/wk	0.7-1.2	10-14	55-62°F (12-16°C)	2-3	<100 1/wk	<0.75	3-5	4-5	Same culture as pansies, but takes 1 week longer crop time. Use less chemical growth regulators to avoid stunting.
Coreopsis	Yes Lightly	65-72°F (18-22°C)	4	Optional	3-5	65-72°F (18-22°C)	3-4	50-100 1/wk	<0.75	5-9	62-68°F (16-20°C)	2-3	100-175 1/wk	0.7-1.2	18-24	62-68°F (16-20						