



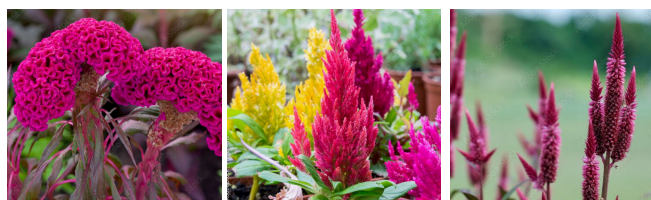
## Celosia Cut Flower Production in Utah

Anna Collins, Melanie Stock, Maegen Lewis, and Sheriden Hansen

Celosia is a warm-season annual that can be grown in a field or high tunnel in Utah. Transplant plugs after last frost in the field and 6 to 8 weeks before last frost in a high tunnel. Celosia benefit from trellising to promote straight stems and do best with moderate soil fertility and frequent harvesting. Peak harvest occurs from July – September in the field and begins nearly one month earlier in a high tunnel. Once established, celosia thrive in Utah’s hot summers and can be used in fresh or dried arrangements.

### Celosia types

There are three varieties of celosia, which have different bloom shapes and harvest recommendations (Figure 1). *Celosia argentea* var. *cristata* produces cockscomb- and crested-type blooms that look brain- or coral-shaped. *C. a.* var. *plumosa* produces a flame- or plume-shaped bloom, while *C. a.* var. *spicata* is spiked-, feather-, or wheat-shaped.



*C. a.* var. *cristata*    *C. a.* var. *plumosa*    *C. a.* var. *spicata*

**Figure 1.** Varieties of celosia and associated bloom shapes.

### Site Preparation

For optimal growth, plant in full sun and well-drained soil. Till the soil to incorporate fertilizer or compost based on routine soil test recommendations. Incorporating one inch of low-salt compost into the soil prior to planting increases organic matter and soil fertility, with minimal pH or salinity risk. Reference USU’s [Compost and Manure Guidelines](#) for options. A soil nutrient test is recommended in new planting areas

or where soil testing has not occurred in two years. USU’s analytical laboratory performs soil tests with pricing and information available on their [website](#). Rake the tilled soil smooth and form beds that are 3 to 4 feet wide. Wider beds make it difficult to reach the center rows. Install drip irrigation and plastic mulch, if desired, before planting.

For celosia grown in a high tunnel (Figure 2), planning and preparation begins the previous fall by installing the plastic high tunnel covering prior to heavy rain or snowfall. This ensures the soil will be the right moisture level for workability the following spring and decreases the risk of disease.



**Figure 2.** *Celosia Delhi*™ in a high tunnel in North Logan, UT.

## Germination

Celosia is a warm-season annual that is not frost-tolerant. Start seeds indoors to improve the emergence rate and give the plants a jumpstart on the season. Sow one to two seeds per cell in a 128-cell tray 6 to 8 weeks before the last frost for field production and 12 to 16 weeks before last frost for high tunnel production (find your local frost date [here](#)). Cover very lightly with soil or vermiculite and gently water overhead or in the tray. Germination will occur within 8 to 14 days at the optimal temperature range of 70–80°F. Bottom heating with a seedling heat mat is a good option for achieving these warm temperatures. After germination, reduce heat to about 65°F and thin to one seedling per cell. Avoid allowing plants to become root bound by seeding no more than eight weeks before the intended transplant date.

## Transplanting

After 4-6 sets of true leaves develop and roots appear well-developed, harden off the plants by moving them outside to a protected area for a few days before transplanting. Celosia roots are fragile at a young stage, and it is essential to be gentle while transplanting. Reference USU's [Transplant Production](#) for more information on growing and hardening off transplants.

## Spacing and pinching

Though industry recommendations for spacing range from 9 to 12 inches in and between rows, USU Trials found 9" spacing maximized production across most celosia types. Smaller series, such as Dwarf™, are especially well-suited to close spacing. Larger plants like Chief™, Cramer™, and 'Crystal Beauty' may benefit from more room, but typically do not reach full size potential in Utah, thus 9" spacing can increase production efficiency. Feather types and 'Supercrest' tend to grow larger and benefit from 12" spacing.

Pinching is highly recommended to force side branching that produces greater yields and longer stems. Out-of-state recommendations range from pinching when plants are 6" to 12" tall, but USU Trials consistently found pinching at 10" to 12" tall and removing the top 5 to 6 nodes on each plant optimized production.

## Trellising

A horizontal trellis is recommended to promote straight, marketable stems. Celosia is highly gravitropic, meaning stems will curve upwards if they begin to bend, and are also susceptible to breakage. Mesh trellis

(6" x 6") pulled taut across the bed is most effective (Figure 3). Trellis is easiest to install before planting and can also serve as a planting grid. Installing after planting, and particularly when plants are taller, can damage stems. Install wooden stakes or tall rebar at 3- to 5-foot intervals along the bed edge. The trellis should be moved upwards as the plants grow to match ½ the height of the tallest stems. Because celosia tolerate high temperatures and perform well in our high-elevation environment, shade is not needed for this crop.



*Figure 3. Horizontal trellising (white netting) pulled tight and suspended between stakes over planting bed.*

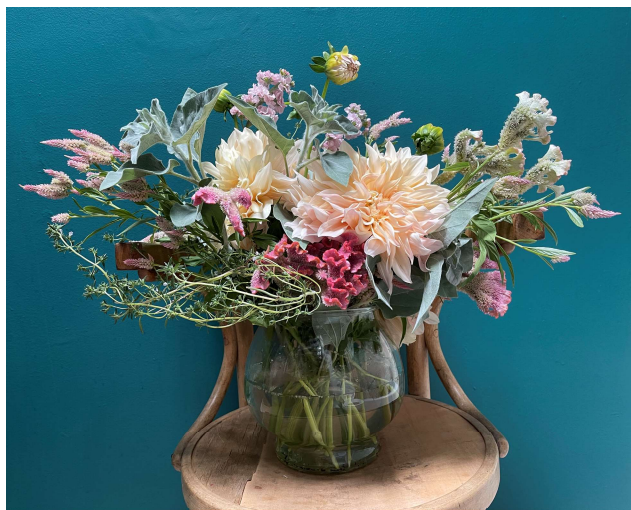
## Fertilizer

Celosia has moderate nutrient requirements. In general, add 0.25 pounds of nitrogen (N) per 100 square feet each year. For example, 0.5 lbs (about 1 cup) of conventional urea fertilizer (46-0-0), or 1.6 lbs (about 5 cups) of organic 16-0-0 fertilizer equals 0.25 lbs of N. Use a slow-release source or apply half of the N at planting and side-dress the other half six weeks after planting. Phosphorous and potassium should be added before or at planting, but should only be applied based on a soil test, as these nutrients can build up in the soil. USU's [Calculating Fertilizer for Small Areas](#) is a useful tool for calculating applications with soil test results.



## Irrigation and Pests & Disease

During establishment, irrigate 3 to 4 times per week to ensure the new transplants stay hydrated. Once established, celosia is fairly drought-tolerant and irrigation events may be reduced to 1 to 2 times per week depending on soil type and location. Apply 1" to 1.5" of water when watering deeply and less frequently (1-2 times per week) and 0.75" to 1.0" when watering more often (2-3 times per week). See Tables 1 and 2 for common pest and disease challenges and management.



**Figure 4.** Celosia, a traditional filler, adds interest in this fresh arrangement. Photo courtesy of Amanda Pratt, owner of A Lavender Garden.

## Harvest and Storage

Harvest during the cool parts of the day just before the blooms are completely open, as blooms tend to wilt when harvested in the heat. Knowing exactly when to harvest celosia is important for extending vase life. As celosia mature, the blooms continue to expand and grow larger, but must be harvested before the lower florets start to produce seed, which decreases the aesthetic appeal and quality. *C. a. var. cristata*, the crested and cockscomb type flowers, should be harvested when fully expanded. *C. a. var. plumosa* and

*C. a. var. spicata* types should be harvested just before blooms fully open, and when the stems are stiff and do not bend easily. Though larger blooms are more marketable, smaller flower heads tend to have a longer vase life and are easier to work into arrangements. Dryness at the base indicates blooms are past their prime and not appropriate for cutting. Harvest regularly and deadhead unharvested blooms to prolong production. Check for earwigs in the blooms, which can be prolific.

Florist-grade stems should be a minimum of 16" long with a preferred length of 18 to 24 inches, diameters 1/3" or thinner, and flowers with good shape development. Unmarketable stems for wholesale (culls) include short stem lengths, thick stem diameters, or blooms that are deformed or have insect damage. Remove 75% of the lower leaves, trim the ends, and place in clean buckets filled with cool water immediately after harvest. Adding 1 tablespoon of chlorine bleach per 1 gallon of water will help keep the water clean and avoid bacterial growth in storage water. Move the cut stems into cool storage (36 to 38°F is ideal) as soon as possible and store upright to prevent stem curvature. Cool storage is effective for one week, and quality decreases with longer storage. Vase life is typically 14 days, and regular water changes help keep the blooms fresh longer. Most varieties do not benefit from floral preservative (Ahmad and Dole, 2014).

## Economics

Celosia is an excellent addition to mixed bouquets and sales are typically high at farmer's markets. As a wholesale crop, celosia is fairly common and commanded modest pricing from florists along the Wasatch Front in 2019. USU-grown celosia sold in bunches of 10 (larger bloom types were bundled in fives) for \$10 (\$1 per stem) in Cache Valley and Wasatch Front markets.

**Table 1.** Insect pests of celosia.

Insect	Identification	Control
Aphids	Soft-bodied, sap-sucking insect. Can be green, yellow, or black. Populations can build up very rapidly. Sticky honeydew from the aphids can accumulate on leaves and stems.	Encourage natural predators by avoiding broad-spectrum insecticide applications. Ladybeetle releases inside a high tunnel can be effective, but they will leave the area over time. Apply insecticidal soaps and oils are the best choice for most situations.
Earwigs	Omnivorous pest that can feed on aphids and other small pests. Detrimental to ornamental plants as they will also chew on petals and young leaves. Earwigs also	Earwig traps are an effective means of control. A jar or plastic container can be filled with soy sauce and vegetable oil, then capped with holes punched in the lid. Bury the container up to the lid. Earwigs will be attracted

	hide in the blooms and crawl out after being sold.	to the soy sauce, and the oil will prevent the earwigs from leaving the trap. Empty and replace periodically.
<i>Two-spotted Spider Mites</i>	Very small (0.02”), feed primarily on the underside of leaves and cause stippling (light dots) on the leaves that turn bronze then brown and fall off. Sometimes confused for leaf burn. Form webbing that covers leaves.	Provide adequate irrigation to avoid stress. Control surrounding weeds. Keep dust to a minimum (avoid rototilling between rows) as dust increases mite activity. Avoid/limit broad-spectrum insecticide treatments as mite outbreaks often follow. Spray plants with water, insecticidal oils, or soaps.
<i>Western Flower Thrips</i>	Very small insect with fringed wings feed on flower buds and leaves. Leaves will develop a stippled appearance and petals deformed or discolored.	Chemical control is difficult, Malathion only protects for two days and kills beneficial insects. Rotate chemical insecticides used to avoid population resistance. Keep weeds (often host plants) clear of the area.

**Table 2. Common diseases of celosia.**

<b>Disease</b>	<b>Identification</b>	<b>Control</b>
<i>Botrytis (gray mold)</i>	A fungal disease that appears as brown, dead areas and may have a gray fuzzy appearance. Affected areas are buds, flowers, leaves, and stems.	Space plants adequately. Prune off infected parts of plant, clear surrounding area, and destroy infected plants. Disinfect pruners between plants to prevent spreading the disease. Spray a fungicide effective against botrytis blights, such as potassium bicarbonate.
<i>Leaf spot</i>	A fungal disease that causes spots and discoloration on foliage. Spots will vary in size. Most often will be brown, but can sometimes appear as tan or black. Concentric rings or dark margins sometimes present.	Remove infected and dead areas of the plant. Avoid overhead watering to keep the foliage dry. If infestation is severe, the use of a copper-based fungicide may help.
<i>Root and stem rot</i>	Fungi that infect roots and crowns of plants, creating dull-colored foliage or wilting followed by yellowing of plants. Plants may be stunted and then eventually die. Roots are dark, soft, or decayed.	Avoid excessive irrigation/moisture. Plant in well-drained soil. Where soil is heavy, use raised beds to improve drainage. Dig out and destroy infected plants.

## USU Celosia Trials (2018–2021)





Small trials of select series were conducted at the Utah Agricultural Experiment Station (UAES) - Greenville Research Farm in North Logan, UT (USDA Hardiness Zone 5) in 2018 and 2019, as well as at the UAES - Kaysville Research Farm in Kaysville, UT (USDA Hardiness Zone 6) in 2019-21. Bombay™, Chief™, Cramer’s Hi-Z™, Delhi™, and Pampas Plume™ were tested in high tunnels and field conditions in North Logan, and ‘Supercrest’ was field-grown in Kaysville.

In North Logan, Chief™, Cramer’s Hi-Z™, and Delhi™ produced the highest yields, while Pampas Plume™ produced medium yields, and Bombay™ produced the lowest. Early April transplants into high tunnels advanced

harvest by three weeks compared to the field that was transplanted after last frost (late-May in Cache Valley). Transplanting in March for earlier harvest in high tunnels has strong potential, but was not tested in USU Trials. Cramer’s Hi-Z™ and Pampas Plume™ had the earliest timing (mid- to late-July peak in the field), while Bombay™ was consistently the latest (mid-August peak in the field). This confirms industry guides that crested types generally mature later (90–120 days) than plume (85–90 days) and feather (90–95 days) celosia.

In Kaysville, ‘Supercrest’ produced medium yields that peaked in early August. Blooms tended to be yellow, though seeds were marketed as a color mix. In 2020, Kaysville experienced a complete crop failure due to earwig pressure. A summary of each series is in Table 3.

**Table 3.** *Celosia* series descriptions based on USU trial observations.

Series Descriptions			
	<p><b>Bombay™</b> <i>Crested type</i> Broad color range. Plants become stunted if overly stressed, resulting in thin stems and small</p>		<p><b>Chief™</b> <i>Brain type</i> Large and uniform, broad color range, well adapted for Utah. Tolerant of high daytime temperatures.</p>
<p>blooms that were more comb- than brain-shaped. Overall poor flower development, marketability, and yields. <i>Image by USU Small Farms.</i></p>	<p>Highly desirable, even underdeveloped and misshapen blooms sold well. Culls had thick stems or poorly formed heads. <i>Image courtesy of Fawn Rueckert of Sego Lily Flower Farm.</i></p>		<p><b>Cramer's Hi-Z™</b> <i>Feather type</i> Long, red to magenta, high yields: our go-to feather. Pinch at 10-12" tall. Earlier pinching results in few,</p>
<p>very tall stems with short, unusable side shoots. Harvest before blooms go to seed, become long, or more difficult to work into arrangements. <i>Image courtesy of Andi Thatcher of Rimrock Flower Farm.</i></p>		<p><b>Delhi™</b> <i>Crested type</i> Beautiful magenta to light pink with green or orange edging, well-formed, high yields, well</p>	
<p>adapted to Utah. Tolerant of high daytime temperatures. Must pinch or stems become too long, with unusable short side shoots. <i>Image by USU Small Farms.</i></p>	<p>often dwarfing and covering the stunted and less productive plumes. Pinch at 10-12" tall. Excellent for bouquets. <i>Image courtesy of Kellie Webb of North Ogden Flower Farm.</i></p>		<p><b>'Supercrest'</b> <i>Crested type</i> Light pink to yellow and magenta, but mostly yellow in trials. Space 12" apart, as plants grow large.</p>
<p>Pinch at 10" tall to promote side shoots. First blooms are often culls from fasciation, but regrowth through side shoots is well-developed. <i>Image courtesy of Amanda Pratt of A Lavender Garden.</i></p>			<p>Pinch at 10" tall to promote side shoots. First blooms are often culls from fasciation, but regrowth through side shoots is well-developed. <i>Image courtesy of Amanda Pratt of A Lavender Garden.</i></p>

## Additional Resources

- Ahmad, I. and J. Dole. 2014. [Optimal postharvest handling protocols for \*Celosia argentea\* var. \*cristata\* L. 'Fire Chief' and \*Antirrhinum majus\* L. 'Chantilly Yellow'](#). *Sci Hort* 172: 308-16.
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- Stock, M., T. Maughan, and R. Miller. 2019. [Sustainable Manure and Compost Application: Garden and Micro Farm Guidelines](#). USU Extension. Horticulture/Soils/2019-01pr. Paper 3063.
- Utah Climate Center. 2022. [Utah Freeze Dates](#). 2/1/2021.

## Disclaimers and Acknowledgements

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