

Cosmos Cut Flower Production in Utah

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Overview

Cosmos are one of the easiest and most productive cut flowers to grow. As a warm-season annual, blooms are prolific and continued, making cosmos a staple, cut-and-come-again flower. The plants tolerate low water conditions, poor soil, and low maintenance, and perform better in fields than high tunnels. Available in shades ranging from whites and blushes to cranberry and orange, cosmos provide popular colors and airy textures for floral design work, particularly in late summer weddings and events.

Cosmos Types

The most common species for cut flowers is *Cosmos bipinnatus*, with 'Cupcake' and 'Double Click' as two of the most popular series (Table 1). 'Cupcake' produces blooms with a single row of fused petals that create a cup-like shape (similar to a poppy), and 'Double Click' produces more elaborate, full-double blooms (Figure 1). Others, such as 'Afternoon White' and 'Rubenza', have a single row of separate petals and resemble daisies

(Figure 2), while 'Sea Shells' produces tubular petals that are less popular in floral design.

Color options for cosmos include whites, blushes, cranberry, and orange, all of which are desirable in arrangements. With recent floral trends featuring earthier tones, soft peach varieties are now available, such as 'Apricotta'. When purchasing seed, color and texture trends should be evaluated for the market, as well as plant height. The minimum stem length for cosmos is 14-inches in most markets. Many new varieties are intended for landscape and decorative purposes, and are too short for cut flowers.

Chocolate Cosmos (*C. atrosanguineus*) is usually grown via tuberous roots and requires different management practices. Production recommendations for this crop will be covered in a separate fact sheet.

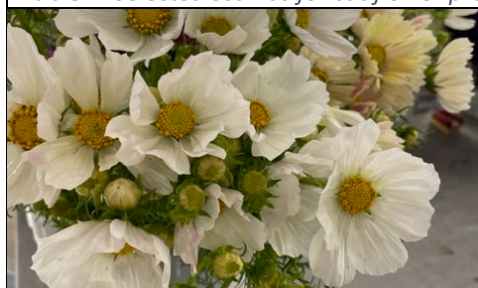










Figure 1. Three bloom types: cup, full double, and single.



Figure 2. 'Afternoon White' at the perfect stage for harvest. Note the bloom is not yet fully open and has a claw-like shape.

Table 1. Selected cosmos for cut flower production.

		
<p>'Afternoon White' Prolific, single-petal, pure-white blooms with long, strong stems. Long-lasting and boasts 3- to 4-inch blooms that are very easy to harvest. Produces an earlier bloom, beginning about one week sooner than other cosmos.</p>	<p>'Apricot Lemonade' Aptly named for its bloom color that has tones of pink to pale orange. Blooms are small and on wispy stems that are both tricky to harvest and underproductive. The lowest yielding in USU Trials, averaging half the stems of 'Cupcake' or 'Double Click'.</p>	<p>'Apricotta' Stunning, blush blooms ranging from pale pink to apricot and salmon on large, 3- to 4-inch blooms. A much-improved version of 'Apricot Lemonade'.</p>
		
<p>'Cupcake' Fused, cup-shaped, single blooms in white and pink. Profuse and continued production of blooms on long stems. The highest yielding in USU Trials.</p>	<p>'Double Click Bi-Color Violet' Dual-tone petals on 2- to 3-inch, semi-double to fully double blooms. The white-to-magenta petals create an ombre effect and stunning visual contrast to floral design. Production is also strong, producing the third greatest yields in USU Trials.</p>	<p>'Double Click Cranberries' A fluffy, fully double bloom. Large, deep-magenta blooms range from 3- to 5-inches in diameter, making it a late-season focal flower that is simply stunning in fall floral design.</p>
		
<p>'Double Click Rose Bon Bon' Bright, rose-pink, semi- and fully-double blooms, ranging from 2- to 4-inches in diameter. Because of its strong stems and long-lasting blooms, this cheerful pink variety is popular with flower shop and market florists.</p>	<p>'Double Click Snowpuff' Frilly and white, semi- and double-blooms with a yellow center. Production was impressive. The second-greatest producer of long, marketable stems in USU Trials, but not as popular as the classic 'Afternoon White' on floral markets.</p>	<p>'Rubenza' An interesting, single-petal variety. After harvest, petals slowly fade from a deep cranberry to a dusky salmon. This variety is popular with event florists, as its earthier tones lend well to late-season wedding palettes.</p>

Site Preparation

Cosmos grow in most soils and thrive in well-drained soils with lower fertility. Overly rich soil can promote heavy foliage on tall, leggy plants with few blooms.

Soil testing and careful use of amendments (i.e., fertilizer, compost, manure) are highly recommended. USU's analytical laboratory performs soil tests with pricing available on their [website](#) and instructions for sampling [here](#). Till the soil to incorporate fertilizer or compost based on routine soil test recommendations. See USU's [Compost and Manure Guidelines](#) for more options. 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 landscape fabric, if desired, before planting.

Field production is highly recommended, as cosmos performs exceptionally well under full sun. High tunnels can be used to advance production up to two weeks earlier and may increase stem lengths. The benefit of using high tunnels, however, is limited, as cosmos is a short-day crop (i.e., season advancement is limited by daylength; bloom increases after the summer solstice).

Germination and Planting

Cosmos are short-day, warm-season annuals, meaning they are not frost-tolerant and bloom best when summer days begin to shorten. Cosmos can be succession-planted in 2-week intervals, and with two to three successions, strong blooms can last until the first frost. With proper harvest, however, growers in the US Intermountain West, as well as USU Trials, found one planting can easily last until frost.

Cosmos may be sown indoors for transplant after the last frost or direct sown. Starting indoors is recommended for an earlier harvest, as well as for ease of pinching young starts. Plugs also readily transplant.

To transplant: Start seeds six weeks before transplanting. Sow one to two seeds per cell in a 288-cell tray using a high-quality peat/perlite soilless media. Cover lightly with media or fine vermiculite to allow light penetration to the seed. Bottom water or mist to avoid seed displacement. Germination occurs within 7-14 days at 68-72°F. Keep the surface moist, but not saturated, until seedlings emerge. After emergence, reduce moisture levels, maintain consistent temperatures between 60 to 70°F, and increase light. When the first true leaves appear, transplant into larger

cell trays or containers, such as 804 inserts. Harden off and transplant outdoors after the last frost, 12 to 18" apart. Wider spacing creates stronger, thicker stems.

To direct seed: Cosmos germinate best when sown in soils that are 60°F or warmer. In prepared beds or rows, plant three seeds every 12 to 18 inches at a ¼" depth and cover lightly. Water well after planting to settle the soil and seeds. Keep the soil surface evenly moist until the seedlings emerge. Drip irrigation is recommended, as overhead watering before emergence can displace the seeds. After a few weeks, thin to one strong seedling per 12- to 18-inches.

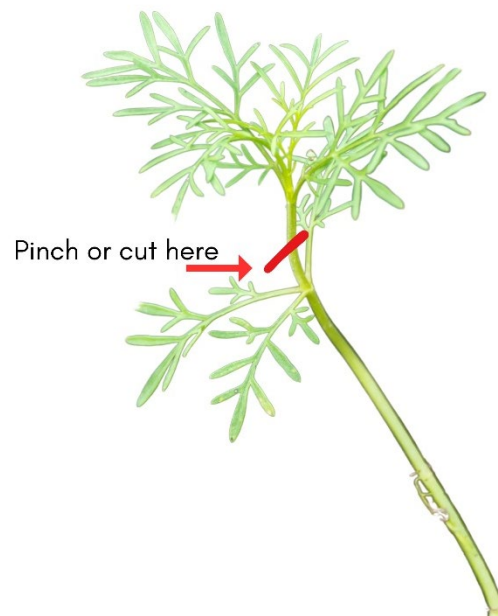


Figure 3. A cosmos seedling. Pinch at the red line, leaving at least three leaves.

Pinching and Trellising

When plants are 8- to 10-inches tall, pinch the tops, leaving two to three true leaves (Figure 3). Pinching is highly recommended to produce long, branching forms instead of one thick, central stalk with short branches. Trellising can be used in high-wind areas to promote straight stems. Use of netting, however, can result in inefficient harvest, while corraling plants with baling twine may be more functional. For small areas, staking individual plants may be an option before large, mature plants become prone to tipping.

Fertilizer

Cosmos has low nutrient requirements. Too much nitrogen (N) may encourage foliage to develop rapidly, and subsequent blooms may be sporadic and weak. From USU trials, apply 0.2 pounds of N per 100 square

feet. For example, 0.2 pounds of N equals 0.43 pounds (about 2/3 cup) of conventional urea fertilizer (46-0-0), or 1.25 pounds (about 4 cups) of organic 16-0-0 fertilizer. Use a slow-release source or apply half of the nitrogen at planting and side dress the other half just before the first buds are visible. Phosphorous and potassium can be added before or at planting, but should only be applied based on a soil test, as these nutrients build up in the soil. [USU's Urban Garden Soils: Testing and Management](#) is a useful tool for calculating applications with test results.

Cosmos can exhibit iron deficiency, particularly in cool and wet years. If visual symptoms develop (Figure 4), very small amounts of chelated iron (6% EDDHA-chelated iron, also known as 138) can be injected through drip irrigation at a rate of 0.6 grams (0.02 ounces) of product per 100 square feet. One to two applications may be required, and the product should be used cautiously to avoid burn.



Figure 4. Cosmos in a high tunnel with other warm-season annuals. Note the light green color of cosmos on the bottom right of the photo. Classic iron deficiency manifests as light green to yellow on the upper (younger) part of the plant.

Irrigation, Pests, and Disease

Keep the soil evenly moist while seedlings are young. After that, 1-inch of water is sufficient for cosmos, with a maximum of 1.5 inches of water per week during intense heat. Allow the soil to dry in between waterings, as cosmos is considered fairly drought-tolerant, and over-watering may lead to excess foliage growth or rot. See Tables 3 and 4 for common production challenges from pests and disease.

Harvest, Storage, and Fall Cleanup

Cosmos is a short-day crop with most flowering occurring well after the summer solstice, in mid-to late summer and fall. Harvesting during the cool parts of the day, in early morning or late evening, is crucial for

cosmos, as the flowers tend to wilt in the heat. The key to ensuring long stems in the next flush and strong, continued production until frost (without staggered planting) is to harvest via deep cuts into the plant (Figure 5). Stems are ready for harvest when the petals are just opening, but not yet flattened (Figures 2 and 6). Harvest the plants frequently and consistently for continuous blooms; deadheading is required if harvest cannot keep up with bloom production. Florist-grade stems should be a minimum of 14-inches long. Place in clean buckets filled with cool water immediately after harvest.

Remove the excess foliage at the base of the harvested stems. Create bunches by carefully lining up the flower heads, cutting the bunch evenly to the shortest stem, and wrapping securely with a rubber band. Gather 10- to 15-stems per bunch, depending on thickness and length. Stems are unmarketable (culls) if they are too short, deformed, or damaged. Store at 36 to 45°F for up to 4 days. Vase life is typically 7 days. Preservative extends storage and vase life by 1 to 2 days.

Note, at the end of the season, remove the flowers from the field before they go to seed. Otherwise, vigorous self-sowing may occur. Removing debris also helps reduce powdery mildew incidence (Figure 7).

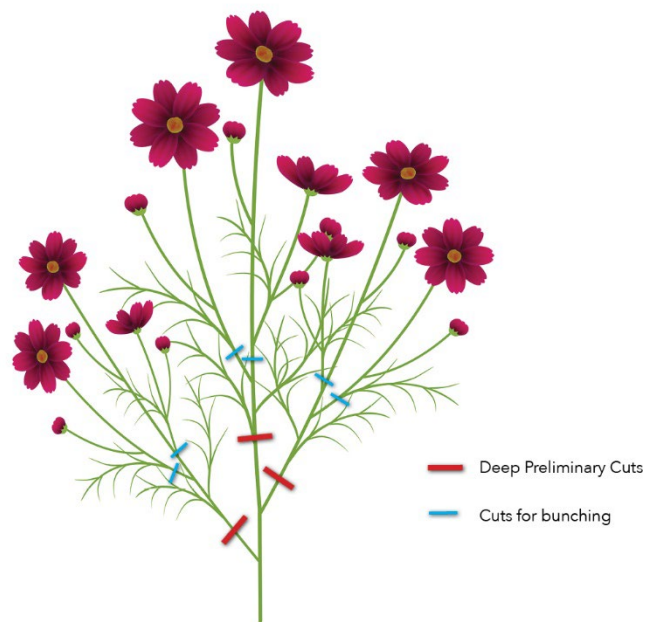


Figure 5. Diagram of recommended cutting locations on the plant. Deep cuts in the field to remove the stems are key for regrowth (designated in red), and depending on the market and use, further trimming during post-harvest may be needed to create bunches (designated in blue).

Economics

The sheer volume of blooms that a single plant can produce makes cosmos worth growing, while the popular color palette, attractive feathery foliage, and long, strong stems are appealing and valuable to florists and enthusiasts alike (Figure 8). Cosmos can be difficult for florists to ship in, thus securing the role of cosmos as a locally sourced flower, and rarely reported by the US Boston Terminal Market for pricing. In wholesale markets along the Wasatch Front, locally-grown cosmos sold for \$1.00-\$1.20 per stem (\$10 to \$12 per bunch) in 2023. The standard, yet elegant, single-petal white

varieties of cosmos will outsell pink and magenta varieties, making it a must-grow for flower farmers.



Figure 6. A sequence of bloom opening of cosmos, relative to harvest stage. Harvest is optimal when the bloom is not fully open, but in the “claw stage” (center panel).

Table 3. Common diseases of cosmos.

Disease	Identification	Control
BOTRYTIS - GRAY MOLD (<i>Botrytis cinerea</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.	Adequately space and vent plants and surroundings. Prune and destroy infected plant material. Regularly disinfect pruners to prevent spread. Spray with fungicide effective against botrytis blights, such as potassium bicarbonate.
PHYTOPLASMA (<i>Candidatus Phytoplasma sp.</i>)	Abnormal growth (leaves instead of flowers, witches’ brooms) and yellowing of leaves. Symptoms can resemble herbicide damage or eriophyid mite infections. Phytoplasma are transmitted by leafhopper including aster leafhopper and beet leafhopper.	Good weed and insect control, and remove infected plants to minimize inoculum that can be moved to flowers. Insects have to acquire phytoplasma from a plant before they can start transmitting them.
POWDERY MILDEW (<i>Golovinomyces ambrosiae</i>)	A fungal disease that produces a white or light gray powder on leaves, stems, and occasionally flowers (Figure 7).	Keep the area weeded and debris free. Control early-season infestations with sulfur-based products, potassium bicarbonate, or some fungicides. For late season, chemical control may not be warranted. Remove and destroy plants after fall freeze.
ROOT, STEM, AND CROWN ROTS (<i>Pythium sp.</i> , <i>Rhizoctonia sp.</i> , <i>Fusarium sp.</i>)	Fungi that infect roots and crowns, producing dull-colored foliage or wilting followed by yellowing. Roots are dark, soft, or decayed. Plants may be stunted and eventually die.	Plugs should be transplanted with well-developed roots that are not root-bound. Plant in well-drained soil and avoid excessive irrigation/moisture. Dig out and destroy infected plants.

Table 4. Pests of cosmos. Note: aphids, caterpillars, slugs and snails, and mice and voles are general classifications and not identified to a species.

Insect	Identification	Control
APHIDS	Green, yellow, or black soft-bodied, sap-sucking insect. Populations can build up rapidly. Sticky honeydew from the aphids can accumulate on leaves and stems.	Encourage natural predators by avoiding broad-spectrum insecticides. Ladybeetles released inside a high tunnel can be effective, but will leave the area over time. Applying insecticidal soaps and oils is often the best choice.
CATERPILLARS	Larval stage of butterflies and moths. Feeding damage primarily occurs in the foliage, and severity is correlated to population numbers.	Control weeds (alternate hosts), handpick larva, and disrupt overwintering with soil tillage. Purchase or encourage natural predators and parasites of caterpillar species. Spray for early instars with insecticides containing zeta-cypermethrin, spinosad, <i>Bacillus thuringiensis</i> , permethrin, or cyfluthrin.

EUROPEAN EARWIGS (<i>Forficula auricularia</i>)	Elongated, brown bodies with a prominent pair of rear pinchers (cerci). Hide in tight and dark spaces on the plant. Feeding damage primarily occurs in the foliage, and severity is correlated to population numbers.	Populations tend to peak in mid-summer, but monitor throughout the season. Scout in the morning when they are often in leaf crevices or blooms. Hand removal or pellets with spinosad are most effective. Containers with bait (soy sauce, oil) and a perforated lid that are buried up to the lid and emptied periodically also work.
GRASSHOPPERS (<i>Melanoplus sp.</i>)	Green to brown, up to a few inches long, and jump with large rear legs. Feed on leaves and flowers, leaving small to large holes and skeletonization of foliage.	Manage over a large area due to their high mobility. Bait (wheat bran with carbaryl or <i>Nosema locustae</i>) used by late May/early June is effective, as are insecticides with acephate, beta-cyfluthrin, or bifenthrin. Often hand-removal works best.
LYGUS BUG (<i>Lygus sp.</i>)	Adults are pale green to brown, with a characteristic upside-down triangle on their back. Feed on the stems, leaves, and blooms. Their toxic saliva can cause general spotting and discoloration.	Populations tend to be greatest mid-summer to fall, but monitor throughout the season. Remove nearby weeds and eliminate plant debris that provides overwintering sites. If damage reaches a threshold, consider insecticides with active ingredients of permethrin, gamma-cyhalothrin, or malathion.
SLUGS AND SNAILS	Soft, slimy bodies with a distinct head and sensory tentacles. Snails have a spiral shell, while slugs lack a shell.	Reduce excess moisture and standing water. Set up copper-based barriers around plants. Place traps or bait containing iron phosphate or metaldehyde.
TWO SPOTTED SPIDER MITES (<i>Tetranychus urticae</i>)	Very small, feed primarily on the underside of leaves, and cause the leaves to turn brown and fall off. Sometimes confused for leaf burn. Form thin webbing that covers leaves.	Avoid water stress. Minimize conditions in and around planting that cause dust to collect on plants (i.e., bare soil). Control surrounding weeds. Avoid or limit broad-spectrum insecticide, as mite outbreaks often follow. Spray plants with water, insecticidal oil, or soap.
MICE AND VOLES	Small, burrowing rodents that can cause early-season damage in protected structures (e.g. high tunnels). Damage includes to gnawing on stems and roots that leads to stunted growth or death.	Populations fluctuate season to season. Monitor for signs of activity in planting areas (e.g. burrows, plant feeding damage, etc.). Trap voles using snap traps or bait stations with pelleted products labeled for vole control.
WESTERN FLOWER THRIPS (<i>Frankliniella occidentalis</i>)	Very small with fringed wings. Transmits viruses and hides in florets, making blooms undesirable.	Chemical control is difficult; Malathion only protects for 2 days and will kill beneficial insects. Keep weeds (often host plants) clear of the area.



Figure 7. Powdery mildew presence on cosmos. Note the lighter color of the stem and leaves.



Figure 8. Cosmos adds a wild, airy, and whimsical accent to floral design.

USU Trials

This trial is ongoing. Preliminary findings are provided for initial trends. Starting in 2023, trials were conducted at the Greenville Research Farm in North Logan, UT (USDA Hardiness Zone 6a, last frost date: May 15) to evaluate restricted irrigation (≤ 1.5 -inches of water per week through two irrigations per week) with potentially water-wise cut flowers in both high tunnel and field systems. In the field, unprocessed wool was also tested as a mulch to determine whether soil moisture may be conserved and plant-water stress decreased, compared to bare soil conditions. Within this trial, 'Cupcake', 'Double Click', and 'Apricot Lemonade' were evaluated.

High tunnel versus field

Shaded high tunnels were planted on May 2, and the open field was planted on May 24, after the soil temperatures warmed. First and initial harvests were advanced by 14 to 26 days with the high tunnel, compared to the field (Figure 9). Peak harvest occurred by mid-August in the high tunnel and late-August to early-September in the field. Production across systems was impressive and prolific. To keep up with the crop, harvest occurred every 1 to 3 days from June through October. On average, each plant produced 96 total stems. 'Cupcake' yielded the greatest, followed by 'Double Click'; 'Apricot Lemonade' underperformed.

Mulch

Raw mulch conserved soil moisture (volumetric water content), which averaged 5% greater than in bare soil in the field. The total yield of cosmos was also greater with mulch, averaging 32 more stems per plant (Figure 9).

Summary

Cosmos is a prolific cut flower crop, well-suited to field production and low-water conditions in Utah. Harvest is optimal during the cool parts of the day, when the blooms are not fully open. Classic single, white blooms are highly marketable, as are warm, fall color tones.

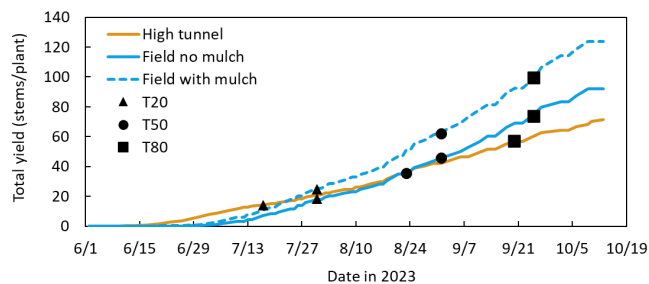


Figure 9. Cosmos production in high tunnel (orange) and field (blue) systems, without (solid line) and with (dashed line) mulch. The timing at which 20%, 50%, and 80% of the yield was harvested is designated with the triangle, circle, and square symbols for T20, T50 and T80, respectively.

References and Further Reading

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- Hansen, S. and D. Drost. [Cosmos in the Garden](#). USU Extension Fact Sheet. Horticulture. Paper 1052.
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