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Ranunculus Cut Flower Production in Utah

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Ranunculus (*Ranunculus asiaticus*) is grown as a cool-season annual for cut flower production in Utah. Tuberous roots can be planted as early as November in a high tunnel for blooms beginning in April. For field production, plant in November with insulation or as early as possible in spring for blooms beginning in May. Flower production ceases when temperatures reach approximately 80°F, usually by early July in northern Utah. In North Logan, UT, high tunnels produced an average of 3 to 7 marketable stems per plant, compared to 1 to 2 stems per plant in the field. Ranunculus is popular in weddings and spring arrangements. Profit potential is high when grown in a high tunnel and sold wholesale compared to other Utah-grown cut flowers.

Figure 1. Aim to harvest at or soon after the bloom stage of the stem in the center, as the bloom on the bottom left is too tightly closed and the bloom on the top right is too open.

Tuberous Root Preparation

Order tuberous roots (also often called corms) in spring to summer for fall delivery. Purchase the largest tuberous root size available (usually 5-7 cm), as size is directly linked to yield. Yields typically range from 3 to 6 stems per plant but up to 12 stems per plant may be possible with proper management. Tuberous roots that are not immediately planted should be stored in cool (35-50°F), dry conditions to reduce the risk of rot.

Site Preparation

For ranunculus grown in high tunnels (Figure 1), planning and preparation begin the previous fall by installing the plastic high tunnel covering before heavy rain or snowfall. This ensures the soil will have the right moisture content for workability early the following spring and decreases the risk of disease.

Careful use of soil amendments (i.e., fertilizer, compost, manure) is necessary because ranunculus is sensitive to soil salinity, with stress occurring by 2.5 dS per m. Soil test to determine nutrient needs in new planting areas and repeat every two years. USU's analytical laboratory performs soil tests and instructions for sampling can be found here. Incorporate fertilizer or compost based on routine soil test recommendations. Tilling one inch of low-salt compost into the soil before planting increases organic matter and fertility, with minimal pH or salinity risk. See USU's Compost and Manure Guidelines for 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.

Soaking and Pre-sprouting

Before planting, tuberous roots benefit from soaking in room temperature water (60 to 77°F) for 3 hours.

Aerating the water by using a fish tank aerator or letting the water trickle is recommended but not necessary when only soaking up to 3 hours. Drain the tuberous roots and then soak for an additional 20 minutes in a commercial fungicide, such as a solution of 0.3% Captan-50% W.P (0.8 oz Captan per 1 gallon of water). By the end of soaking, the tuberous roots should swell to about double their original size (Figure 2A).

After soaking, tuberous roots can be directly planted or pre-sprouted. In USU Trials, pre-sprouting for 2 weeks advanced bloom by 1 week and improved marketable yield by up to 58% compared to direct planting. Pre-sprouting for more than 2 weeks has potential to further advance bloom but may be limited by cold temperatures in the early season. To pre-sprout, fill a flat-bottom seed tray with drainage holes half full of moist potting mix. Place the soaked tuberous roots about 1/2-inch apart in the tray (this fits 40 in a standard tray) and completely cover them with potting mix. Store the trays in a cool (35 to 50°F) location for 2 to 3 weeks. Check the trays occasionally and add water if needed to maintain moist media but avoid saturated conditions that increase the risk of rot. Tuberous roots are ready to plant once they have rootlets that are 1/8- to 1/2-inch long (Figure 2B).

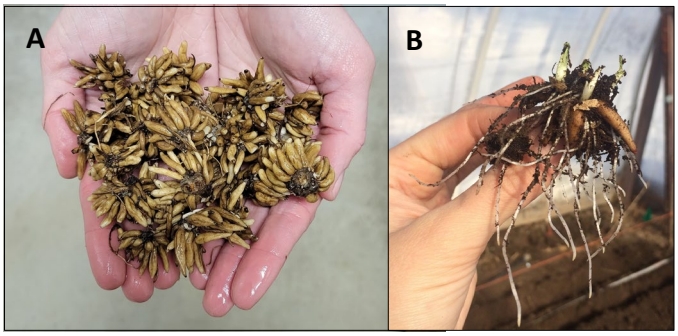

Figure 2. Ranunculus tuberous roots after soaking (A) and pre-sprouting (B).

Planting

Ranunculus is especially sensitive to warm temperatures, and therefore, planting as early as possible is important to maximize bloom time before temperatures are too warm. Their optimal temperature range for growth and flowering is 57 to 64°F during the day and 40 to 50°F at night, with a minimum survival temperature of 26°F. Above 80°F, flower production declines as the foliage dies back and the plants go dormant. Visit the Utah Climate Center website to find historical temperature data and freeze dates at a weather station near you.

For high tunnel production, plant between November and February. For field production, plant in November and provide some type of insulation (e.g., straw mulch or a low tunnel) or wait until the ground is workable in the spring (usually early March). Note, if insulating fall plantings with mulch, make sure to remove the mulch promptly in the spring to avoid etiolated stems and rot. Planting later than recommended decreases yield potential by 1 stem per plant. When planting, tuberous roots should be spaced 6 inches apart, with 6 inches between rows, at a depth of 2 inches. It is important to plant the tuberous roots with the “claws” facing down (Figure 3). Ranunculus bloom approximately 3 to 5 months later, depending on the planting date.


Figure 3. Planting pre-sprouted ranunculus: 2 inches deep, 6 inches apart, and "claws" facing down.

Irrigation, Pests, and Disease

A freeze-protected culinary water source may be needed for high tunnel plantings, as most secondary irrigation is not available until later in the spring. Drip irrigation is ideal, as it keeps moisture off the foliage and blooms, and conserves water. Field plantings typically do not require irrigation until the spring unless the soil is extremely dry during fall planting; in this case, water the soil immediately after planting to be moist but not saturated. For optimal growth, ranunculus need moist soil that is allowed to dry in between watering. Apply 0.5 to 2 inches of water per week (1/4 to 1 gallon of water per square foot), depending on temperature, growth stage, and soil texture. The frequency of irrigation events is low in the early season (about once every 2 weeks from November to February) and increases as the season progresses (1 to 3 times per week after February). See Tables 1 and 2 for common production challenges from disease and pests.

TABLE 1. COMMON DISEASES OF RANUNCULUS.

Disease	Identification	Control
BOTRYTIS (GRAY MOLD)	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.
TOMATO SPOTTED WILT VIRUS (TSWV)	Viral disease with wide host range. Causes yellow ringspots on leaves that can turn brown/black. Can be spread by thrips and introduced on infected plant stock.	Prevent introduction by purchasing clean plant material, eliminating weeds (hosts) from the area, and immediately removing infected plants. Chemical control of thrips (Table 2) early in the season can help minimize disease spread.
POWDERY MILDEW	Fungus growing on leaves, stems, and occasionally flowers. The leaves appear covered in white flour (the fungal spores).	Use a fungicide registered for ranunculus with myclobutanil and sulfur active ingredients (do not apply sulfur above 90°F). If late in the season, chemical control may not be warranted. Remove and destroy plant stems at the end of the season.
ROOT, STEM, AND CROWN ROTS	Fungi that infect roots and crowns of plants. Dull-colored foliage or wilting followed by yellowing of plants. Plants may be stunted and then die. Roots are dark, soft, or decayed.	Avoid excessive irrigation/moisture, especially before the tuberous roots sprout. Plant in well-drained soil. Dig out and destroy infected plants. Clean and disinfect tools with 70% ethanol or disinfecting wipes.
STEM TOPPLE DISORDER	A translucent, water-soaked area appears on the upper part of stems during flowering, followed by the stem collapsing under the weight of the bloom. Caused by difficulty of the plant to supply calcium to areas of rapid growth.	Excessive application of N and K have been shown to increase the occurrence of stem topple disorder, so taking care not to overfertilize is an important proactive measure against stem topple.

TABLE 2. PESTS OF RANUNCULUS.

Insect	Identification	Control
APHIDS	Green, yellow, or black soft-bodied, very small insect that can transmit virus (Table 1). Feeds on buds, stems, and leaves, leaving a sticky "honeydew" that can accumulate on the plant.	Populations grow rapidly. Encourage natural predators, such as ladybeetles, by providing habitat and avoiding broad-spectrum insecticides. Spraying a strong stream of water directly on aphids can remove them. If populations reach a threshold, consider organic insecticidal soaps and horticultural oils.
MICE/VOLES	Chew stems at base; can fully kill plants.	Control rodents with rodenticide bait or traps under the low tunnels and within the high tunnels.
SPIDER MITES	Microscopic insects that feed primarily on the underside of leaves and cause stippling (light dots) on the leaves that can turn bronze then brown and fall off. This is sometimes confused for leaf burn. They also form thin webbing on leaves.	Avoid drought stress with adequate irrigation. Remove nearby weeds and minimize dust (avoid rototilling nearby). Encourage natural predators (e.g., predatory mites, minute pirate bugs) by avoiding broad-spectrum insecticides. Spraying a strong stream of water directly on spider mites can remove them. Consider organic insecticidal soaps or horticultural oils.
THRIPS	Brown-yellow, very small, with fringed wings. Causes stippling or irregular white blotches on foliage and flowers. More notably, they transmit viruses and often hide in blooms, making them undesirable for use. Monitor with blue or yellow sticky traps.	Remove nearby weeds and eliminate plant debris that provides overwintering sites. Encourage natural predators by providing habitat and avoiding broad-spectrum insecticides. Thrips build resistance to many insecticides; chemical control is difficult and not recommended. Spraying a strong stream of water directly on thrips can remove them. If populations are at threshold, consider organic insecticidal soaps or horticultural oils.

Fertilizer

Ranunculus has moderate nutrient requirements. In general, add 0.34 pounds of nitrogen (N) per 100 square feet each year. For example, 0.75 pounds (about 1 cup) of conventional urea fertilizer (46-0-0), or 2.1 pounds (about 6.5 cups) of organic 16-0-0 fertilizer equals 0.34 pounds of N. Use a slow-release source or apply half of the nitrogen at planting and side-dress or fertigate in the other half once the first buds are visible. 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 test results.

Shade and Trellising

During early summer production, 30% shade is used to cool the environment, encourage stem elongation, and reduce flower scorch. Shade should cover an entire high tunnel after the plastic has been removed or individual rows in the field (Figure 4). Reference USU's Low Tunnels for Field Cut Flower Production fact sheet for tips on shading small growing areas. Some growers trellis with plastic mesh (6 x 6 inches) to encourage long, straight stem growth, particularly in areas with high wind. Others find it unnecessary, as plants are relatively short compared to other cut flower crops, such as snapdragons, dahlias, or lisianthus.

Figure 4. Shaded high tunnel (A) and field (B) ranunculus production.

Harvest and Storage

Blooms will typically begin once average daily temperatures are warm enough for growth (about 50°F) and last for up to ten weeks in the high tunnel and six weeks in the field. Pre-sprouting hastens the onset of harvest by roughly one week. Harvest during the cool parts of the day when the buds are in the 'marshmallow' stage – colored and squishy, but not fully open (Figure 1). Test the bud stage by gently grasping and pressing on the top of the bud. The bud should 'give' slightly, feeling like a marshmallow, and should have opened and closed for up to three days.

During harvest, cut stems as close to the base of the plant as possible and place the cut stems directly into water to avoid wilting. After harvest, strip leaves from the bottom half of the stem, trim cut ends, and place in fresh water with floral preservative. Move the cut stems into cool storage (40°F) and store upright to prevent stem curvature. Cool storage is effective for up to five days, and quality decreases with longer storage. Vase life can be up to 12 days with the use of floral preservatives, frequent water changes, and fresh stem cuts. Sort stems by length and color and use rubber bands to assemble bunches of ten stems. Wrap bunches in clear plastic or brown paper sleeves before marketing wholesale to florists to prevent damage during transport and increase visual appeal (Figure 5).

Figure 5. Sleeved ranunculus bunches ready for wholesale markets.

Economics

High-quality, locally grown ranunculus is a florist staple and consistently in demand when 10 inches or longer and a popular color. In Northern Utah, florist-grade stems were a minimum of 10 inches long, with a preferred length of 16 to 24 inches. Stems that were 8- to 10-inches long were sometimes marketable, but at a reduced price. In 2021, the wholesale import price ranged from $1.25 to $2.60 per stem (AMS, 2022). From 2019-22, USU-grown ranunculus sold in bunches of 10 for $12.50 to $15.00 ($1.25 to $1.50 per stem) in Cache Valley and Wasatch Front markets. High tunnel production can be highly profitable, with net projected returns up to $5 per square foot. To sell at wholesale pricing and break even with field production, 2 marketable stems per plant are needed, which can be difficult. Reference USU's Ranunculus High Tunnel Budget and Field Budget for more detailed cost and return estimates of production.

USU Ranunculus Trials

In 2019-2022, trials were conducted at the Greenville Research Farm in North Logan, UT (USDA Hardiness Zone 5, last frost date: May 15) to evaluate bloom timing, yield, and quality. We tested cultivars ('Amandine,' 'Gigi,' 'LaBelle,' and 'Tecolote'), pre-sprouting, the use of low tunnels within high tunnels, and combinations of low tunnels and mulch in the field. We also trialed mid-month planting dates in November, January, February, and March in a high tunnel and November, March, and April in a field. These planting dates were selected for Cache Valley, UT. For the Wasatch Front, plant up to two weeks earlier than Cache Valley. Locations with a higher elevation or a cooler climate should plant later in the year.

High Tunnel vs. Field Production

High tunnels allow for earlier growth and production during more optimal, cool temperatures, as well as more control. High tunnel production began in April, one month earlier than the field, and resulted in an average of 3 to 7 marketable (longer than 8 inches) stems per plant (Figure 6), compared to 1 to 2 marketable stems per plant when field-grown (Figure 7). Extremely wet or cold spring conditions can postpone field plantings that further delay and reduce field production compared to high tunnels.

Planting Dates and Pre-sprouting

Planting high tunnels in November results in the earliest and greatest yield. All November and January plantings, as well as pre-sprouted February plantings, resulted in marketable yields of 3.5 to 6.5 stems per plant, while yields were fewer than 3 stems per plant for non-pre-sprouted February and all March plantings (Figure 6). In the field, November plantings with insulation had high survival (95%) and yielded similarly to March plantings (1 to 2 marketable stems per plant; Figure 7). Planting dates after mid-February in the high tunnel and mid-March in the field are not recommended for Utah production as high temperatures during bloom reduce marketable yield by up to 71%.

In most cases, pre-sprouting advanced harvest by up to 1 week and increased yield for high tunnel and spring field plantings by 0.5 to 1 stems per plant. Additionally, pre-sprouting increased average net returns for high tunnel November plantings from $4.23 to $4.81 per square foot. Pre-sprouting is not recommended for fall field plantings as it may make tuberous roots more prone to cold injury.

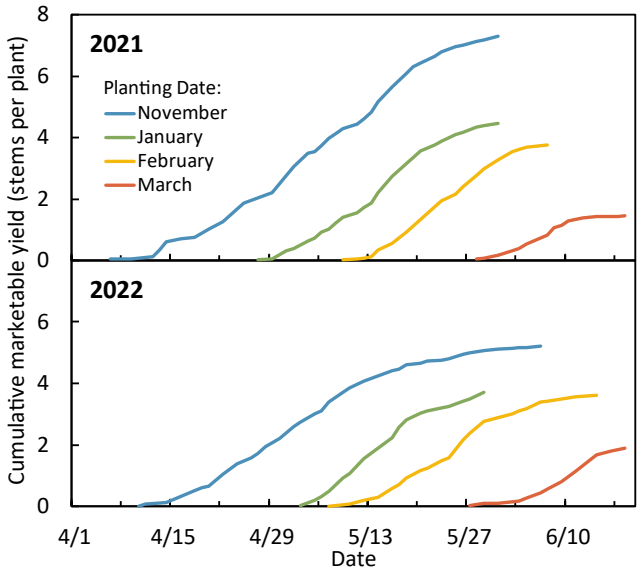

Figure 6. Cumulative marketable high tunnel yield (stems per plant) of 'LaBelle' by planting month: Nov (blue lines), Jan (green lines), Feb (yellow lines), and Mar (red lines) in 2021 (top) and 2022 (bottom).

Insulation

Using low tunnels within high tunnels reduces the risk of cold injury during especially cold winters, advances harvest by about 1 week, and increases stem length, but does not impact emergence or total yield. For fall plantings in a field, any type of insulation (straw mulch, a fabric low tunnel, or straw mulch under a fabric low tunnel) improved emergence, total yield, and marketable yield by maintaining warmer soils compared to uninsulated plantings (Figure 8). Emergence of uninsulated November field plantings was 46%, compared to 91% with insulation. From mid-November to mid-March, soil temperature at a 2-inch depth was an average of 4.2°F warmer with insulation compared to bare soil. Insulation also advanced harvest by approximately 2 weeks compared to uninsulated fall plantings, but was unnecessary for spring plantings.

Cultivar Evaluation

'Amandine,' 'Gigi,' and 'LaBelle' had long, sturdy stems with full double blooms, while 'Tecolote' stems were shorter and less sturdy with single blooms. In the high tunnel, 'LaBelle' had the greatest average marketable yield (3.6 stems per plant), followed by 'Amandine' (3.0 stems per plant), 'Gigi' (2.6 stems per plant), and 'Tecolote' (1.6 stems per plant). While 'Amandine' was marketed as more heat-tolerant and 'LaBelle' as more cold-tolerant, they showed no differences in timing, winter survival, or appearance for field or high tunnel plantings. 'Amandine,' 'Gigi,' and 'LaBelle' represent strong choices for Utah cut flower production, but 'LaBelle' is preferred when available.

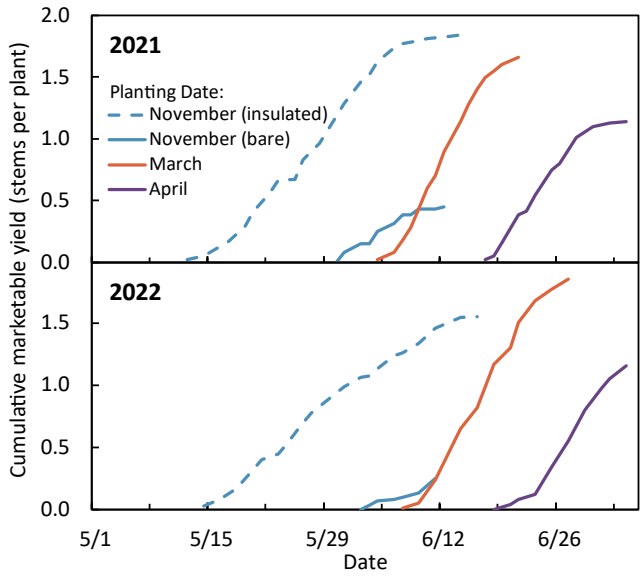

Figure 7. Cumulative marketable field yield (in stems per plant) of 'LaBelle' by planting date: November with no insulation (solid blue lines), November with insulation (dashed blue lines), March (average of bare and insulated; red lines), and April (average of bare and insulated; purple lines) in 2021 (top panel) and 2022 (bottom panel).

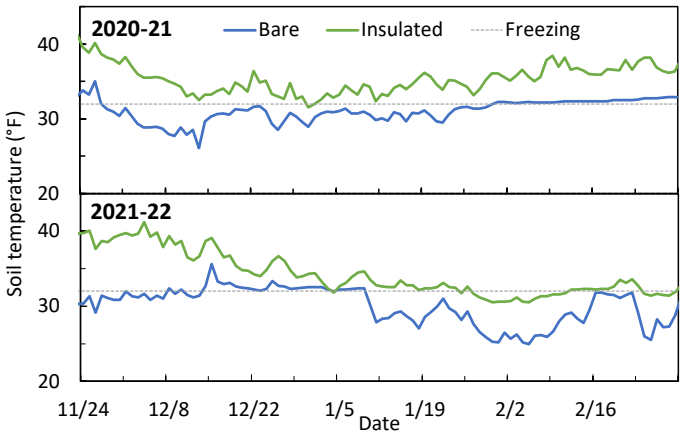

Figure 8. Daily average field soil temperature (2-inch depth) left bare (blue lines) or insulated (green lines) during winter 2020-21 (top panel) and 2021-22 (bottom panel).

Conclusions

Ranunculus is a florist staple and excellent crop for local farms, based on its high tunnel profit potential of up to $5 per square foot. Management practices that concentrate bloom during optimal temperatures (40 to 64°F) are critical for high-quality stems and maximizing yield. Succession plant in high tunnels from November through January to produce a consistent supply of blooms for wholesale markets from the beginning of April to the end of May. For ranunculus grown in the field, plant in November or March. November plantings should be non-pre-sprouted and insulated to avoid cold injury, while March plantings benefit from pre-sprouting. Smaller yields of ranunculus can be expected in the field from early May until the end of June.

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