Evaluating production strategies for Ranunculus in the Intermountain West

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Summary of Need

Most national recommendations for ranunculus advise growers in USDA Hardiness Zones 3-7 to plant in spring for a summer bloom 90-110 days later (e.g. July-Aug), though optimal performance is noted during cool, spring conditions. Trials in New York, however, determined ranunculus may be fall-planted in high tunnels for harvest in April-May at USDA Hardiness Zone 5 (Wien, 2009; Wien, 2013). In Utah, most specialty cut flower production occurs along a 150-mile north/south stretch in the valleys of the Wasatch Front, where zones range 4-7 (USDA-ARS, 2012). However, microclimate often dominates growing conditions over the official classifications because of the state's high elevation, semi-arid climate, and geography, making production unique. In particular, long winters, 30-40F daily fluctuations in air temperature (Utah Climate Center, 2019), and prolonged overnight frosts that coincide with intense daytime temperature and solar radiation make planting times for cool-season crops, like ranunculus, difficult to predict, and early market demands challenging to meet.

Around Salt Lake (Zone 6-7), growers independently discovered that not only can ranunculus survive the winter with just mulch and a low tunnel (as urban farm sizes limit space for high tunnels), but production also improves. Fall plantings can result in an early bloom that peaks during cooler, spring conditions. Conversely, spring plantings flower later when sunlight is too intense and daytime temperature too warm. However, production is still temperamental. There is uncertainty regarding planting dates, degree of winter protection, northern limits for fall planting, and use of high tunnels. Understanding and optimizing ranunculus production for Utah will help meet early market demands and increase farm profitability.

Photo courtesy of Fawn Rueckert, Sego Lily

Purpose

The goals of this project are to evaluate Ranunculus plant survival, harvest season length and timing, and stem quality and quantity after planting:

- in fall versus spring
- in a high tunnel versus field
- with the use of varying soil insulation methods during winter

Procedures

The study was located at the Utah Agricultural Experiment Station - Greenville in North Logan, UT (41' 77" N, -111' 8" W) at an elevation of 4,780 ft (USDA Hardiness Zone 4-5). The following conditions were tested:

1) *Field Plantings*: no low tunnel or mulch (-LT -M), planted in Nov. 2019, Mar. 2020, and Apr. 2020
2) *Field Plantings*: under a low tunnel with fabric (AG-50 frost fabric) and mulch (4 inches of straw) (+LT +M), planted in Nov. 2019, Mar. 2020, and Apr. 2020
3) *High Tunnel Plantings*: no low tunnel or mulch (-LT -M), planted in Nov. 2019, Feb. 2020, and Mar. 2020
4) *High Tunnel Plantings*: low tunnel with fabric (AG-50 frost fabric) and no mulch (+LT -M), planted in Nov. 2019, Feb. 2020, and Mar. 2020.

Corms of 'LaBelle' were soaked, but not pre-spouted, and then planted at a two-inch depth, in rows spaced six inches apart, and at a staggered 6-inch in-row spacing. One soil temperature sensor was installed at a two-inch depth in 2-3 replicates of each insulation treatment. To test the efficiency of various low tunnel materials at insulating soil temperature over winter, three additional insulation treatments were monitored for soil temperature, but not planted: mulch and no low tunnel, mulch with a low tunnel covered with only 6-mil plastic, and mulch with a low tunnel covered with both frost fabric and plastic.

Emergence was monitored February to May 2020. In April, the low tunnels within the high tunnel were removed. In May, shade cloth was added to the high tunnel and field low tunnels. Harvest occurred 3-5 times per week, and stems were graded as marketable when lengths were 10 inches or greater, straight, and otherwise unflawed.

Preliminary Results and Discussion

Temperature Conditions

The high tunnel had daily soil temperature fluctuations with lows that remained just above freezing through winter, and gradually increased from January onward. The presence and absence of low tunnels within the high tunnel had minimal difference on soil temperature at a 2-inch depth.

In the field, soil temperature fluctuated less through most of winter in all insulation treatments. A heavy, late-November snowstorm covered the field and snow remained through early February, providing natural insulation. As a result, the soil without a low tunnel or mulch (-LT -M) remained at 32F during the coldest months of winter. At this time, soils with mulch (-LT +M) and soils with low tunnels and mulch (+LT +M) were typically 5 degrees warmer (remaining around 37F for most of winter) because of the added insulation from the straw. By February, freeze-thaw periods melted snow and the uninsulated soil (-LT -M) reached lows of 26.5F. Conversely at this time, the field low tunnels provided modest daytime temperature increases; daytime highs from low tunnels and mulch were 3-6F greater than mulched-only soils. The type of low tunnel coverings had a minor effect on soil temperature: fabric + plastic warmed the most during the day in late winter, followed by low tunnels covered with only plastic, and then low tunnels with only fabric, but differences were near negligible. Overall, mulch was most effective at insulating winter soil temperature and was the most economical insulation method, but ensuring its timely removal was critical to avoid etiolated plants. Low tunnels with plastic required venting starting in March, whereas fabric covers cost less and required less maintenance labor, but were more prone to wind damage.

Table 1. The emergence (%) of ranunculus corms grown in a high tunnel and field, with (+) or without (-) low tunnel (LT) and mulch (M) protection in Logan, UT (USDA Hardiness Zone 5).

Location	Winter Protection		Planting Time	
High Tunnel	+LT -M	93%	Nov	98%
	-LT -M	98%	Feb	96%
			March	93%
Field	+LT +M	96%	Nov	90%
	-LT -M	90%	March	94%
			April	95%

High tunnels (left) and field (right) in North Logan, Utah on 4 Feb. 2020.

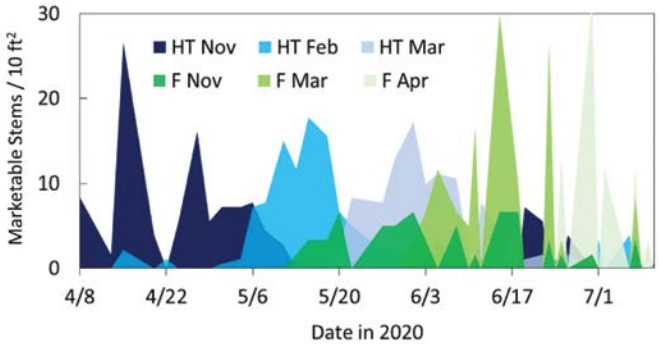

Figure 1: Marketable stems per 10 square feet that were harvested in the high tunnel (HT, blue shades) and field (F, green shades) by planting date (Nov, Feb, Mar, and Apr) in 2020.

Emergence

The high tunnel and field had high emergence rates, regardless of the winter protection method or planting date (Table 1). The lowest spring emergence rates were from planting in November under bare soil conditions (-LT -M) in the field, likely a result of the sub-freezing soil temperatures in Feb. 2020, though winter survival was still relatively high at 90%. In the high tunnel, the emergence rates were lowest from the March 2020 planting at 93%, but this was attributed to rodent damage.

Harvest Season Timing and Length

In the high tunnel, harvest of November plantings began on 8 Apr. 2020, and peaked 15 Apr. (Figure 1). Harvest of February plantings began 15 Apr. and peaked 15 May, and March plantings began 15 May and peaked 01 Jun. In the field, harvest of November plantings began 13 May and peaked 01 Jun., harvest of March plantings began 01 Jun and peaked 15 Jun, and April plantings began 15 Jun. and peaked 30 Jun. Harvest from all plantings tapered by the second week of July. The staggered planting dates in the high tunnel and field allowed for an extended harvest that lasted from April – July with well-timed flushes of marketable stems.

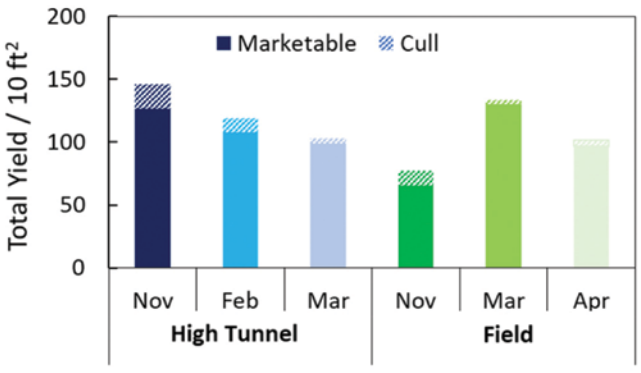

Figure 2: The total yield as marketable (solid bars) + culled (striped bars) stems per 10 square feet in the high tunnel (HT, blue shades) and field (F, green shades) from April – Jul 2020, by planting date (Nov, Feb, Mar, & Apr).

USU Small Farms Lab posing with ranunculus stems on May 6, 2020 (left), and still harvesting on 30 Jun. 2020 (right).

The use of low tunnels within the high tunnel did not advance harvest, indicating high tunnels alone in northern Utah are sufficient for overwintering corms, and harvest can be extended by staggered planting dates. In the field, however, the use of a low tunnel and mulch advanced harvest by two weeks compared to corms planted into bare soil. Low tunnels and mulch in the field may not be necessary for the winter survival of corms (particularly in years with heavy snowfall), but provide the advantage of an earlier harvest in spring.

Yield

Overall yield was greater in the high tunnel than field, but both produced a strong percentage of marketable stems (Figure 2). November plantings produced twice as many total blooms in the high tunnel than field, as peak harvest occurred six weeks earlier during cool, April conditions, yet had overnight protection from adverse weather. March plantings produced the lowest yields in the high tunnel, but also allowed for an extended harvest into late June. In the field, production was greater from March and April plantings, and these helped extend the harvest season later, but also resulted in more narrow windows for harvest. In northern Utah, both fall and spring plantings can produce strong, staggered harvests of marketable stems. Grouped in bunches of 10, ranunculus typically sells for $15, or $12 if stems are shorter than 10 inches and otherwise high quality. Ranunculus is a promising and profitable crop for farms in Northern Utah.

Next Steps

Results from only 'LaBelle' grown in North Logan, Utah (USDA Hardiness Zone 4-5), were reported here, as data analysis is in process. 'Gigi', 'Amandine', and 'Tecolote' were also tested in North Logan. Six farms along the Wasatch Front that represent warmer USDA Hardiness Zones and microclimates also grew 'LaBelle' in the field with November and March plantings under +LT +M and -LT -M conditions and tracked soil temperature. The next steps are to analyze temperature and production across these farms to understand differences in growing conditions on production quantity and quality along the Wasatch Front. North Logan trials will be repeated and expanded through 2023 to capture variability in winter weather, isolate the effects of low tunnels and shade, and test pre-sprouting as a method to further advance harvests.

What's the Take-Home Message?

Though findings are from only one winter season, our research indicates that ranunculus can be overwintered in USDA Hardiness Zones less than Zone 7. Winters in Logan, Utah, are somewhat milder and often receive more snowfall than other Zone 5 areas. Therefore, using some winter protection is recommended to insulate the soil. Planting in high tunnels, or using mulch or mulch and low tunnels is recommended for field production. Planting in fall and spring helps stagger harvests.

References

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Photo courtesy of Heather Griffiths, Wasatch Blooms

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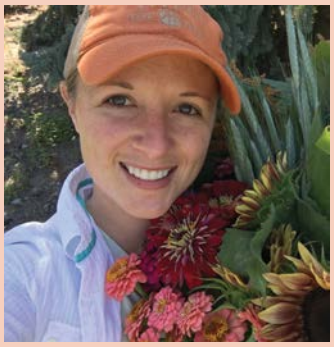

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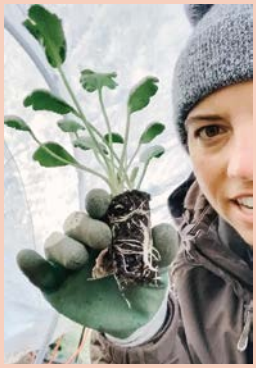

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