

General

Late October through November pot mum plantings for January and February flowerings are the most difficult to finish on time and with top quality. The following tips are primarily directed toward improving pot mum winter quality in the North, but are suitable for improving winter quality in all regions of North America.

Starting Environment Is Crucial

Provide maximum available light. Plant into moist root medium. Soil temperature should be 68° to 70°F and must be well drained. Bottom heat is very beneficial for faster root development. Apply 300 ppm nitrogen and potassium immediately after planting or sticking cuttings. Relative humidity should be high (90%). Cuttings should not be allowed to wilt.

Plants Must Be Ready Before Pinching

Roots must reach the sides or bottom of the pot and 1" to 1½" of new shoot growth should occur prior to pinching. Pinching too soon limits the number of lateral branches that could develop and pots will lack fullness. Extra time may be needed to allow for proper root and shoot development in winter-flowering crops.

Maximize Light

Low light is a major limiting factor affecting quality in winter pot mums. Start plants in the highest light area of the greenhouse. Clean roofs are essential to maximize light transmission. Do not hang crops overhead which will block

light from the pot mums. Allow adequate space during production. Spacing too close early in the crop may reduce the number of breaks after pinching because of excessive shading by foliage. Do not allow foliage to overlap between pots. HID lighting of 500 to 800 footcandles in the North from planting (18 hours daily) until 2 weeks after starting short days (up to 11 hours daily) is beneficial.

Provide Enough Long Days

Adding 5 to 7 more long days after pinching can often improve winter quality; especially if previous winter crops were too short when using less lighting. Short treatment varieties require the extra lighting in this period. Light them a week longer than medium/tall varieties.

Carbon Dioxide Injection

Use of carbon dioxide is beneficial during the heating season, especially in winter when normal ventilation is reduced. It is also extremely critical when using HID lighting, since carbon dioxide must be present in quantities that match the light intensity. With higher light intensities, the normal concentration of carbon dioxide in the air can limit the rate of photosynthesis. Injection of 500 to 1,000 ppm is ideal.

Temperatures Affect Timing and Quality

Crop timing is most affected by temperatures from planting until visible bud. Minimum temperature in this period is 65°F nights. Temperatures lower than that may significantly delay a crop. Lower night temperatures to 63°F from visible bud to disbudding and to

60°F from disbudding to flowering. Another approach is to lower night temperatures to 56°F the last four weeks of the crop if growth and budding are on schedule. **You can not accelerate a mum crop by raising temperatures after visible bud stage.**

During the low light periods of winter, day temperatures should be only 0° to 5°F warmer during cloudy days, and 5° to 10°F higher in sunny periods, for better quality plants. Higher temperatures without higher light, weakens plant growth because carbohydrates stored in the stems can be used up faster than produced in cloudy periods, and are unable to be replaced as rapidly without sun.

Bottom Heat

Bottom heat is helpful because it helps dry out media faster, and allows more frequent feedings.

Less Growth Retardant

Cloudy, cooler days in this period usually cause less variation between day and night temperatures. This results in less internode stretch and thus shorter plants. Also, plant growth is naturally less rapid in this period. Delaying first B-Nine application until new shoots are 3 to 3½" long is suggested. B-Nine rates should not exceed 2,500 ppm in this period. Fewer applications will be needed than in other seasons. Short varieties may not even require any chemical growth regulation. Chemical growth regulation remains more of an art than a science. Walk the crop daily to determine the need for growth regulators by variety.

Improving Keeping Quality

Production under maximum available light and fertilizer termination 2 weeks before harvest will dramatically improve keeping quality for the consumer. Also, allow plants to develop flowers at least 50% open before harvesting for sale. Keep transport and storage temperature at 35° to 40°F. Shipping time should not exceed 7 days. Higher temperatures and extended storage or shipping times decrease interior longevity and increase leaf yellowing.

Select Varieties Carefully

Some varieties are not recommended for winter flowerings. They do not perform satisfactorily under normal winter conditions. Consult the “Pot Mum Variety Selector” for winter-recommended varieties in your region. Winter-recommended varieties for the North are also listed on the next page.

Use Nitrate-Nitrogen

The majority of nitrogen should be provided in the nitrate form. Ammonia or urea-based fertilizers produce softer growth in this low-light growing period. Also, since constant fertilization is less frequent in winter, fertilizer rates should be **increased** 100 to 150 ppm. Growers mixing their own fertilizer should switch to calcium nitrate and potassium nitrate from October 15 through April 15. Complete fertilizers that are formulated to be 50% or more nitrate are preferred for winter use.

Sample Winter Fertilizers

| Fertilizer | PPM N | Oz./Gal. Stock 1:100 Injector |
|--------------------|-------|-------------------------------|
| 21-5-20 | 250 | 15.9 |
| 60% Nitrate | 300 | 19.1 |
| | 350 | 22.2 |
| | 400 | 25.5 |
| 20-10-20 | 250 | 16.7 |
| 60% Nitrate | 300 | 20.0 |
| | 350 | 23.3 |
| | 400 | 26.7 |
| 15-16-17 | 250 | 22.2 |
| 53% Nitrate | 300 | 26.7 |
| | 350 | 31.1 |
| | 400 | 35.6 |
| 15-10-30 | 250 | 22.2 |
| 60% Nitrate | 300 | 26.7 |
| | 350 | 31.1 |
| | 400 | 25.6 |
| 15-0-15* | 250 | 22.2 |
| 80% Nitrate | 300 | 26.7 |
| | 350 | 31.1 |
| | 400 | 35.6 |
| Calcium Nitrate* + | 250 | 13.2 + 9.2 |
| Potassium Nitrate | 300 | 15.9 + 11.0 |
| 100% Nitrate | 350 | 18.6 + 12.8 |
| | 400 | 21.24 + 14.7 |

* A separate source of phosphorus is required with these fertilizers. One option is to inject 1½ ounces of 75% phosphoric acid per 100 gallons of water to give 44 ppm phosphorus. Phosphoric acid must be injected separately from the above fertilizer. **Do not mix phosphoric acid in stock tanks with any fertilizer.**

Most Reliable Pot Mum Varieties for Winter Flowering in the North

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|---------------|---|
| White | 7-week: Juneau, Olympia 8-week: Blush White*, Shasta White Improved* |
| Yellow | 7-week: Hollister 8-week: Blush Sunny*, Blush Yellow*, Chesapeake, Durango Yellow, Golden Pueblo, Honey Durango, Irvine Yellow, Lemon Springs, Manhattan* |
| Pink/Lavender | 7-week: Deep Presidio, LaPorte Improved 7.5-week: Purple Springs 8-week: Blush Dark Pink*, Blush Pink*, Delano, Irvine Regal, Lansing Regal, Pittsburgh Purple, Spring Delano 8.5-week: Hilo Mango 9-week: Dark Pomona, Little Rock, Sonoma, Sonoma Pink Improved |
| Coral/Salmon | 8-week: Blush Apricot*, Irvine Currant |
| Orange/Bronze | 7.5 week: San Francisco Bronze Bicolor 8-week: Auburn, Blush Orange*, Cinnamon Pueblo, Durango Bronze Improved, Irvine Dark Bronze, Reno |
| Red | 8-week: Auburn Red, Baton Rouge*, Delano Red, Encino, Fire Island, Irvine Red, Rage, Santa Cruz, Shanghai Red, Tobago 9-week: Sonoma Red |
| Green | 8-week: Green Valley |

*Short Treatment Varieties



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