



Irvine™ Regal

syngenta flowers

Pot Mum

Culture Guide

Pot mums are versatile. They can be grown and marketed in almost any size and container type. There are different procedures for starting a pot mum crop, depending upon the type of cutting (rooted or unrooted) used. Once the crop is established, cultural practices are identical.

KEYS TO SUCCESS

- Choose varieties carefully. Consult variety listings in the mum catalog and the variety charts for recommended varieties by season and region.
- Maintain optimum environmental conditions.
- Do things on time.
- Use liquid fertilizer at planting and continue feed during the first part of the crop.
- Reduce or eliminate fertilizer for the last few weeks of the crop to help optimize keeping quality.
- Use nitrate-based fertilizers during low-light/winter environments.

ON RECEIPT OF CUTTINGS

It is best to stick or plant cuttings upon arrival. Cuttings may be stored for no longer than three days in a cooler at 33°–40°F / 1°–4°C, but this is not recommended. Inspect cuttings upon arrival for damage from heating, freezing, breakage or dehydration. Report any problems immediately; pictures are recommended.

STARTING CUTTINGS

Unrooted Cuttings

Sticking unrooted pot mum cuttings is typically referred to as “direct sticking”. Fill containers to the top with media and moisten thoroughly. Rooting hormone increases rooting uniformity. Apply 1,200–1,500 ppm IBA (indole-3-butyric acid) in powder or liquid form to the bottom .125”–.25” of cutting before sticking or spray cuttings after stick (recommended) with 200 ppm IBA. When using a spray rooting hormone, use a wetting agent and spray in the early morning or after dark; resume mist after cuttings begin to wilt. Please note: hormone-treated cuttings are available at a nominal charge for your convenience.

Unrooted cuttings should be stuck into moist media approximately 1.5” deep. Allow approximately .75”–1” of growth exposed above the media. After sticking, cuttings must be watered in.

A complete N-P-K fertilizer such as 20-10-20 at 250-300 ppm nitrogen is recommended for media that does not contain a fertilizer charge.

Once the cuttings are stuck and watered in, provide mist for approximately 10–14 days while the cuttings root. Misting keeps cuttings turgid and provides moisture during rooting. The duration and frequency of the misting is dependent on light intensity, temperature, humidity, etc. As a general guideline, mist for 10 seconds every five to 10 minutes for the first three to four days. Then change to every 20 minutes for the next three or four days. Reduce the frequency to every 30 minutes as the cuttings root. While cuttings should be stressed as little as possible during propagation, there is no need to mist a turgid cutting. Do not overmist, especially once the cuttings are rooted. Cuttings may stretch from too much moisture if plants are kept too wet or under mist for too many days.

To reduce stretch in propagation during the warm months, an application of B-Nine® plant growth regulator at 1,000–1,500 ppm can be combined with the rooting hormone spray or applied separately at a later stage during the propagation phase.

Rooted Cuttings

Always plant rooted pot mum cuttings in moist media. Planting a cutting into a dry medium may delay its establishment and therefore reduce its initial and future growth.

Plant the rooted cuttings deep enough to cover the roots. In a loose, well-drained media, rooted cuttings can be planted about an inch deeper. This deeper planting can anchor the plant more securely and promote better branching with only the softer growth above the soil line.

Immediately after planting, water thoroughly with a fertilizer solution to get the plant off to a vigorous start. A pot mum cutting uses liquid fertilizer from the moment it is planted. A complete N-P-K fertilizer such as 20-10-20 at 200–300 ppm nitrogen is recommended at the time of planting. It is beneficial to mist or syringe the plants frequently for the first few days or until the plants are fully turgid and the roots are absorbing water.

CUTTINGS PER POT

Four or five rooted cuttings are recommended for 6” or 6.5” azalea pots. One to three cuttings for 4” or 4.5” pot. Plant cuttings near the outside edge of the pot at a slight angle and space equally apart. This allows more light to reach the plants later and encourages increased branching action for fuller pots. No cutting is needed in the center of the pot.

ROOTING MEDIA

Pot mums require well-drained, well-aerated media, with good moisture-holding capacity to firmly anchor the root system. Pot mums are adaptable to both soil-based and soilless mixes. It is important that the rooting media be free of insects, disease causing agents, and weed seeds. Soil-based mixes should be pasteurized (steamed) before use at 160°F / 71°C for 30 minutes. The pH for soil-based rooting media should be 6.2–6.8. The pH for soilless root media should be 5.8–6.2.

SPACING

Pot mums must be properly spaced at all times or quality suffers. Spacing is generally determined by the desired finish plant size. Ideal spacing would have the plants just touching when the desired finish height is reached.

PHOTOPERIODIC LIGHTING

Pot mums generally require night lighting during the initial portion of their growing schedule. This is the long-day portion of a pot mum crop. Long days are used to maintain vegetative growth and help determine overall finished plant size. The number of long days required will vary by cultivar and pot size. Long days are needed immediately upon planting/sticking. Long-day conditions require a minimum of 10 foot candles of light at plant level during the middle of the night. Do not permit more than seven hours of continuous darkness to occur prior to or during the lighting period. Artificial long days can be supplied by lighting plants from 10:00 p.m.–2:00 a.m. with 10–15 foot candles or 1.5–2.0 w/m². This can be obtained with 100 watt incandescent bulbs or 33 watt corkscrew-type compact fluorescent bulbs. A typical set up would be to have light lines ten feet apart and incandescent bulbs placed every ten feet down the light line. When using compact fluorescent bulbs, additional bulbs are necessary and should be spaced every five feet down the light line. Even with the additional bulbs, there should be a 33% energy savings using the compact fluorescent bulbs. For either bulb, a reflector (pie pan) is recommended to be sure the light is directed down toward the plants. Use a light meter to confirm lighting requirements are met.

WATERING

Pot mums require a plentiful amount of water and fertilizer. For a strong root system, allow media to dry somewhat between irrigations, but do not allow the plants to wilt. Irrigate thoroughly, allowing for some leaching.

Various methods of irrigation are used on pot mums including drip irrigation, ebb and flow benches, troughs and capillary mats. The majority of pot mums are watered with drip irrigation or sub-irrigation techniques. The use of automated irrigation systems is recommended. Automated systems tend to promote more uniform growth and reduce labor costs.

FERTILIZATION

Pot mums are heavy feeders, especially during their initial stages of growth. A pot mum fertilization program should begin as soon as the cuttings are planted or stuck.

Constant liquid fertilization is recommended for pot mum production. Use a complete N-P-K fertilizer that has the majority of N in the nitrate form and contains extra micronutrients such as a “Peat-Lite Special” formulations, (e.g., 20-10-20, 20-5-19, 21-5-20). A 200–300 ppm solution of N (soil root media) or 300–400 ppm solution of N (soilless root media) will produce high-quality pot mums. If nonleaching fertilizer delivery systems are used, such as ebb and flow, flood floors, capillary mats, or troughs, the fertilization rate is often 25–50% lower to reduce soluble salt accumulation. Soil and foliar tests at regular intervals are recommended. Adjust fertilizer rate as needed to maintain recommended fertility levels.

Pot mums are heavy feeders for much of the crop time, so it is very important to note that fertilization should be reduced or eliminated during the final two to three weeks of the crop. Work done at the University of Florida by Dr. Terril Nell has demonstrated that pot mum longevity can be increased by seven to 14 days when fertilizer applications are terminated at disbudding, or approximately three weeks before marketing the crop. If not done at the time of disbud, fertilizer should be eliminated when bud color is showing.

Target EC (saturated media extract; mS/cm = millisiemens/cm = mmhos/cm):

Establishing 0.8–1.5 mS/cm

Growing 1.7–3.0 mS/cm

Finishing 0.8–1.5 mS/cm

PINCHING

Pot mum cuttings are pinched to encourage lateral branching to produce fuller plants with high flower count. Before a pot mum is pinched, no matter what size pot, these requirements must be met:

- The plants must be established with their root system reaching the bottom of the pot
- .75"–1" of new top growth should have occurred.

Under proper environmental conditions, pot mums should be ready to pinch 12–14 days after planting in spring and summer months and 15–18 days after planting in fall and winter months. When pinching, remove the top .5"–1" of new growth, allowing approximately five to seven leaves to remain on the cutting. Delayed pinching refers to the practice of pinching after short days have started.

Short days are started one week after planting and then plants are pinched three to seven days later when ready. This produces shorter plants with fewer leaves. It's commonly used to control height during early spring to mid-summer production when the environment is conducive to vigorous growth.

SHORT DAYS

Pot mums initiate and develop flowers when exposed to short days. Pot mums need a minimum of 12 hours of uninterrupted, total darkness in order to initiate and develop their flowers. From approximately September 20 until March 20, the days are naturally short enough to induce flowering. Pot mum crops scheduled to flower from mid-November until late April only require natural short days.

Pot mum crops scheduled to flower from early May until early November need artificial short days in order to flower. This is accomplished by pulling blackcloth or black plastic over the crop each day to provide a minimum 12-hour period of darkness. (For example, blackcloth is pulled at 7:30 p.m. and removed at 7:30 a.m. each day.) A Mother's Day crop needs short-day treatment to ensure an on-time, uniform flowering response.

The short-day treatment must be done each day from the start of short days until flower color shows in the flower buds. Missing a day means delaying the crop by a day. During summer months, it is wise to pull the blackcloth as late in the evening as possible to minimize heat build-up under the cloth. Excessive heat under the blackcloth can contribute to heat delay and reduce plant quality.

TEMPERATURE

In the propagation area, night air temperatures of 65°–68°F / 18°–20°C with soil temperatures of 68°–70°F / 20°–21°C are recommended. Day temperatures can run 5°–10°F / 2° to 6°C warmer.

As pot mums move to the finishing environment, night temperatures of 62°–65°F / 17°–18°C, and day temperatures 67°F / 19°C if cloudy and 72°F / 22°C if sunny, are recommended.

During the final three to four weeks of development, it is beneficial to lower the night temperatures to 56°–60°F / 13°–16°C, with day temperatures of 61°F–65°F / 16°–18°C to enhance flower color and strengthen stems.

A large, positive difference (DIF) between day and night temperatures, with the day temperature warmer than the night, promotes longer internodes and taller plants. Plant height can be reduced if a less positive or zero DIF is practiced. A negative DIF (warmer night than day) is not recommended as leaf chlorosis, clubbiness and reduced vigor may occur.

BUD REMOVAL

There are three types of bud removal practiced on pot mums today. These include disbud (DB) or removing the side laterals to create one larger flower, center bud removal (CBR) or removing only the center bud to create a smooth canopy with many flowers, and zero bud removal (ZBR) which has a similar look as CBR on certain varieties but no disbudding is required. All types of bud removal need to be done on time or finished quality is diminished. Consult variety listings in the most current Syngenta mum catalog for recommended bud removal by variety. See bud removal tip sheet at www.syngentafhg.com.

CROP SCHEDULING

An easy general guideline for the number of weeks of long days required for standard 6" or 6.5" pots is as follows:

For pot mums to be finished in November through April:

Four weeks of long days from sticking URC until blackcloth for short vigor varieties

Three weeks of long days from sticking URC until blackcloth for medium or tall vigor varieties

Two weeks of long days from sticking URC until blackcloth for single stem varieties or any variety in a smaller 4" or 4.5" pot

(An additional week of long days may be required in cold regions or when warm rooting temperatures cannot be maintained in the winter months).

For pot mums to be finished in May through October:

Three weeks of long days from sticking URC until blackcloth for short vigor varieties

Two weeks of long days from sticking URC until blackcloth for medium or tall vigor varieties

Two weeks of long days from sticking URC until blackcloth for single stem varieties or any variety in a smaller 4" or 4.5" pot

As noted in the section above on pinching, the number of days from stick to pinch will be greater for crops finishing November through April than finishing May through October. Remember to pinch cuttings when ready not just based on a certain number of days after stick.

The number of weeks of short days require before the plants are flowering will vary by variety. Variety response is listed as seven, seven and a half, eight, eight and a half, and nine weeks. This is the number of weeks from the start of short days (natural or artificial as described above) until the plants will be in flower.

As an example, to schedule a variety such as Emporia™ Orange (eight week response, medium vigor) to flower for the end of September (week 39):

Need two weeks of long days from stick until short days – medium vigor finishing between May and October.

Need eight weeks of short days and they will need to be provided artificially with blackcloth – eight week variety flowering between May and early November.

Flower – week 39

Blackcloth – week 31

Pinch – when ready, approximately week 31

Direct stick – week 29

If we wanted to finish Limerick™ Lime (eight week response, medium vigor) to flower for the middle of March (week 11)

Need three weeks of long days from stick until short days – medium vigor finishing between November and April.

Need eight weeks of short days and natural daylength will be short enough – eight week variety flowering between mid-November and late April.

Flower – week 11

Lights Off/Natural daylength – week 3

Pinch – when ready, approximately week 2.5

Direct stick – week 52

Lights On – week 52

GROWTH REGULATORS

B-Nine plant growth regulator is the most commonly used growth regulator for height control in pot mum production. The amount and timing of B-Nine plant growth regulator applications depends on the cultivar, temperatures and light intensity.

Generally, B-Nine plant growth regulator is applied about two weeks after the pinch, or when new shoots are 1.5"–2" long. A second application may be needed in two or three weeks. The last application of B-Nine plant growth regulator is recommended to be no later than the center bud removal stage to avoid negative effects on flower form or color.

B-Nine plant growth regulator rates range from 2,500–5,000 ppm depending on the variety and time of year. Higher rates are used for tall-growing varieties and during the warmest, brightest growing seasons.

The following guidelines are a suggested starting point for B-Nine plant growth regulator applications on pot mums.

Number of B-Nine plant growth regulator applications:

Short Vigor Varieties – zero to one

Medium Vigor Varieties – one to two

Tall Vigor Varieties – two to three

Bonzi® and Sumagic® plant growth regulators can also be used to control growth and height of pot mums. When applying these growth regulators as a spray, uniform application techniques are much more critical than applying B-Nine, which is absorbed and moved into the plant through the foliage. The active ingredients in Bonzi and Sumagic move into the plant tissue via plant stems or roots, so thorough and uniform coverage of the stems is important for absorption and good control when applied as a spray.

Spray rates to use on a trial basis are 30–125 ppm for Bonzi and 5–10 ppm (2.5–5 ppm in low light) for Sumagic. In general, multiple spray applications at lower use rates will give the best results. Fewer repeat applications may be needed since these products appear to have a longer lasting growth regulator effect than B-Nine. These products may be especially useful to trial in summer when high temperatures diminish the effectiveness of B-Nine. Drench applications of Bonzi at 2 ppm can be used to hold plants at the desired height prior to shipping. In general, uniform application is important with all plant growth regulation treatments.

Florel™ plant growth regulator and Etheryl is NOT recommended for use on Syngenta Flowers pot mums. Florel plant growth regulator and Etheryl can reduce growth, delay flowering, and reduce flowering uniformity, particularly during the winter months.

PEST CONTROL

Several insects and related pests may be attracted to pot mum crops. Maintaining a clean, weed-free greenhouse is important to help minimize insect populations and eliminate hiding places. Early detection is an important factor in reducing the severity of an infestation. At times, chemical spray applications are necessary to eradicate insect populations. Some common pests for pot mums are aphids, fungus gnats, leafminers, spider mites, thrips and whiteflies. More specific information for leafminer and thrips is listed below. It is important to use a rotation program for the insecticides to help avoid resistance. In general, wettable powder formulations are less phytotoxic than emulsifiable concentrates; however, they may leave a residue on the plants. For additional information on products for insect management, refer to the mum pest control tip sheet at www.syngentaafh.com.

Leafminer pressure can vary from year to year and if not recognized in time, this pest can cause serious damage on mums. It is important to inspect plants upon arrival and note any active mines. Monitor the growing areas with yellow sticky cards so you can check for adult activity. Good scouting and proper use of effective controls is the best way to protect crops that are prone to leafminer. A preventive approach is best, as once leafminer gain a foothold in the crop, it is often difficult to get them under control. This is due to the unsynchronized timing of the different life stages and the difficulty of getting good spray coverage once the crop has gained some size. Leafminer control is best achieved when products are applied in block rotations targeting the lifecycle of the pest, then rotating to another product with a different mode of action. This approach provides good control and helps minimize the chance of resistance. Systemic insecticides like Flagship® and Mainspring® can be applied as either a foliar spray or as a drench application if extended protection for four to six weeks is needed. Drench applications should be applied once the crop has rooted in well in order to maximize uptake. A block rotation of Avid®, Citation®, Mainspring and/or Flagship insecticides, with Conserve® SC insecticide saved till the end of the crop if needed for Thrips control, should provide good control throughout the crop cycle. Products containing Azadiractin can be applied at the end of the week (or four to five days after a treatment of Avid, Citation or Conserve insecticides) if pressure is high and/or during the third week prior to rotating to the next product.

Thrips can be a problem in mum crops, particularly when the plants are beginning to bloom. It is important to inspect plants upon arrival and monitor the growing areas with blue or yellow sticky cards to assess and track populations. Good scouting and proper use of effective controls before high populations develop are the best way to protect crops. Below are two chemical control strategies based on the Thrips pressure in the greenhouse.

Thrips Rotation for Low–Moderate Populations

1. Avid insecticide (one to two applications)
2. Mainspring insecticide (two applications on a 14-day interval)
Overture® insecticide (14-day application restriction—two applications/crop)
—Need to make two applications of another MOA group before rotating back—limit to two applications/crop
3. Mainspring (two applications on a 14-day interval if needed)
4. Avid insecticide + Azadiractin

NOTE: These suggestions are only guidelines and may have to be altered to meet individual growers needs.

Thrips Rotation for Moderate–High Populations

1. Pylon® insecticide (GH use only) (one to two applications/crop—limited to three applications/crop) or Mesuro® pesticide (one application)
2. Orthene® insecticide + Pyrethroid
3. Conserve insecticide (one to two applications—rotate off for four weeks before reapplying—six applications/season)
4. Avid insecticide + Azadiractin (one application)

****Check labels for plant use safety and use limits**

Syngenta Bioline™ also has some key biological control products to help control Thrips in the greenhouse. They include:

- *Amblyseius swirskii*—Swirskiline™ as
- *Amblyseius cucumeris*—Amblyline™ cu
- *Orius insidiosus*—Oriline™ I
- *Steinemema feltiae*—Exhibitline™ sf

In addition, Thripline can be a helpful tool for monitoring and control of western flower thrips (WFT). Designed to improve early detection in flowering crops, Thripline utilizes a pheromone which excites WFT, bringing them out of the flowers and plant canopy where they hide. This helps enhance detection on sticky cards and through scouting and improves their exposure to management treatments.

DISEASE CONTROL

The most severe diseases of pot mums, such as verticillium wilt, fusarium wilt and chrysanthemum stunt, are controlled through culture-indexing programs conducted by large, specialized commercial propagators, such as Syngenta Flowers. Clean, vigorous, disease-free cuttings should be planted into pasteurized, well-drained rooting media. Proper environmental control of ventilation, heating, watering, etc., should control or minimize the occurrence of other pathogens, which may infect pot mums. Disease prevention is more desirable than suppression. When conditions are favorable, however, some disease organisms may attack pot mums.

Some common diseases which can infect pot mums are Pythium, Rhizoctonia, powdery mildew and Botrytis. For additional information on products for insect management, refer to the mum disease control tip sheet at www.syngentaafh.com.



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