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**

1. Choose varieties carefully.
2. Maintain optimum environmental conditions.
3. Do things ON TIME.
4. Use liquid fertilizer at planting and feed heavily during the first part of the crop.
5. Reduce or eliminate fertilizer for the last few weeks of the crop to help optimize keeping quality.
6. Use nitrate-based fertilizers during low-light/winter environments.

**On Receipt of Cuttings**

It is best to plant the 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.

**Planting**

**A. Rooted Cuttings**

Always plant rooted pot mum cuttings in moist media. Planting a cutting into a dry medium reduces 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.

Four or five rooted cuttings are recommended for 6” or 6½”/15.24 or 16.51 cm azalea pots. One to three cuttings for 4” or 4½”/10.16 or 11.43 cm 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.

Immediately after planting, water thoroughly with a fertilizer solution to get the plant off to a vigorous start. A Syngenta Flowers 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.

**B. Unrooted Cuttings**

Planting unrooted pot mum cuttings is typically referred to as “sticking” or “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 ¾” to ¼” 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 after dark or early morning; 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 1½”/3.81 cm deep. Allow approximately ¾”–1”/1.91–2.54 cm 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 low nutrient mediums.

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. The cuttings should be stressed as little as possible during propagation. 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 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.

**Root 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 root medium be free of insects, diseases 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 root 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. See www.syngentaflowersinc.com for more details.
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 can vary by cultivar and pot size. Knowledgeable sales representatives, published schedules and suppliers can provide this information.

Long days begin 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. Traditionally, night interruption lighting is used for four hours at night between 10:00 p.m. and 2:00 a.m. See www.syngentaflowersinc.com for more details.

Traditionally, incandescent lights providing a minimum of 10 foot candles at plant level are used for night lighting. To provide a minimum of 10 foot candles, 1,114 watts of light for each square foot of area, including walks, is required. Use a light meter to confirm lighting requirements are met. Sixty-watt incandescent light bulbs (with reflectors) can be placed 4'/121.92 cm apart and 2–3'60.96–91.44 cm above the plants on a 4'/121.92 cm wide bench to achieve 10 foot candles.

Consult variety listings in this catalog and the variety charts for recommended varieties by season and region.

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. At the least, fertilizer should be eliminated when bud color is showing.

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

- Establishing O.S.–1.5 mS/cm
- Growing 1.7–3.0 mS/cm
- Finishing O.S.–1.5 mS/cm
- Pour through method: 1.5–2.0 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, two requirements must be met: 1) the plants must be established with their root system reaching the bottom of the pot, and 2) ¾”–1”1.91–2.54 cm 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 ½”–1”1.27–2.54 cm 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/-15° to -12°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 in 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. All types of bud removal need to be done on time or finished quality is diminished. Consult variety listings in this catalog and the Pot Mum Variety Guide for recommended bud removal by variety. See bud removal tip sheet at www.syngentaflowersinc.com.

**Growth Regulators**

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

Generally, B-Nine is applied about two weeks after the pinch, or when new shoots are 1½–2½/3.81–5.08 cm in length. A second application may be needed in two or three weeks. The last application of B-Nine is recommended to be no later than the center bud removal stage to avoid negative effects on flower form or color.

B-Nine 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 applications on pot mums.

**Number of B-Nine Applications**

- **Short Vigor Varieties**: 0 to 1
- **Medium Vigor Varieties**: 1 to 2
- **Tall Vigor Varieties**: 2 to 3

Bonzi and Sumagic are registered for height control of pot mums. However, they are not as easy to use as B-Nine. Spraying techniques are much more critical with Bonzi or Sumagic as spray coverage of stems is necessary and leaf application is less effective. Uniform application is critical when using Bonzi or Sumagic. In general, multiple applications of lower rates with thorough stem coverage are necessary with Bonzi or Sumagic.

Spray rates to use on a trial basis are 31–125 ppm for Bonzi and 5–10 ppm (2.5–5 ppm in low light) for Sumagic. Fewer repeat applications may be needed since these chemicals appear to have a greater growth regulating effect than B-Nine. Sumagic may be especially useful to trial in summer when high temperatures diminish B-Nine’s effectiveness. Bonzi has been used by some growers as a 2 ppm drench to hold plants at a given height.

Florel/Ethereyl is not recommended for use on Syngenta Flowers pot mums. Florel and Etheryl can cause reduced growth, slower flowering response and poor flowering uniformity, particularly during the winter months.

**Insects**

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. Below is a listing of some common pests that may be found on pot mums and potential pesticide controls. Use a rotation program for the pesticides to help avoid resistance. In general, wettable powder formulations are less phytotoxic than emulsifiable concentrates; however, they may leave a residue on the plants.

**Pests & Pesticides**

**Aphids**—Astro, Azatin XL, Decathlon, Duraplex, Dursban, Endeavor, Endosulfan, Enstar II, Flagship, M-Pede/Insecticidal Soap, Marathon, Movrik, Mesurol, 1100 Pyrethrum TR, Talstar NF, TriStar

**Fungus Gnats**—Adults: Decathlon, Duraplex, 1100 Pyrethrum TR, Talstar NF, Tame; Larvae: Adept, Azatin XL, Citation, Distance, Enstar II, Gnatrol, Talstar NF, X-Gnat

**Leafminers**—Adults: Astro, Decathlon, Dursban, Talstar NF; Larvae: Avid, Azatin XL, Citation, Conserve

**Spider Mites**—Akari, Avid, Duraplex, Dursban, Floramite, Hexygon, M-Pede/Insecticidal Soap, Movrik, Mesurol, Ovation, Pylon, 1100 Pyrethrum TR, Sanmite

**Thrips**—Avid, Azatin XL, Conserve, Decathlon, Duraplex, Dursban, Marathon (foliage only), Movrik, Mesurol, Talstar NF

**Whiteflies**—Adept, Astro, Azatin XL, Decathlon, Distance, Duraplex, Dursban, Endosulfan, Enstar II, Flagship, 1100 Pyrethrum TR, Sanmite, Talstar NF, Tame, TriStar

Before using any pesticides, be sure that they are registered for use in your state. Check with your local county extension agent.
or state university extension service. See label for use rates and application methods. Always follow label directions. Remember, the label is the only legal document for a pesticide’s use.

**Diseases**

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 root media. Proper environmental control of ventilation, heating, watering, etc., should control or minimize the occurrence of other pathogens, which may infect pot mums. As is readily discernible, disease prevention is more desirable than suppression.

When conditions are favorable, however, some disease organisms may attack pot mums. Following is a listing of some common diseases which can infect pot mums and potential pesticide controls. See label for use rates and application methods. Always follow label directions. Remember, the label is the only legal document for pesticide use.

**Disease & Chemical Control: Root and Stem Rots**

- **Pythium**—Banrot, Chipco, Aliette, Heritage Subdue MAXX, Truban
- **Rhizoctonia**—Banrot, Chipco 26GT, Cleary’s 3336, Compass, Heritage, Medallion, OHP 6672, Sextant, Terraclor
- **Pythium and Rhizoconia**—Banrot, Heritage, Subdue MAXX with Medallion

**Foliar/Flower Pathogens**

- **Powdery Mildew**—Eradicant: Pipron, Systhane, Terraguard; Protectant: Rubigan, Strike, Systhane, Terraguard
- **Botrytis**—Compass, Daconil Ultrex, Daconil Ultrex with Dithane T/O, Decree, Dithane T/O, Exotherm Termil, Heritage Medallion

For additional information on chrysanthemum pest and disease control, refer to “Tips on Chrysanthemum Pest Control” and “Tips on Chrysanthemum Disease Control” at www.syngentaflowersinc.com.