

Pot Mum Cultural Information

Pot mums are versatile. They can be grown and marketed in almost any size and type of container. 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 in the container, however, the 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° to 40°F (1° to 4°C), but this is not recommended. Inspect cuttings upon arrival for damage from heating or 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 to 16cm) azalea pots. One to three cuttings are recommended for 4" or 4½" (10 to 11cm) pots. 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 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 of IBA (indole-3-butyric acid) in powder or liquid form to the bottom to ¼ inch of cutting before sticking or spray cuttings after stick (recommended) with 200 ppm IBA. Then 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" (4cm) deep. Allow approximately ¾" to 1" (2 to 2.5cm) 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 cuttings are stuck and watered in, provide mist for approximately 10 to 14 days while the cuttings root. Misting keeps the 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 5 to 10 minutes for the first 3 or 4 days. Then change to every 20 minutes for the next 3 or 4 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 to 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 root 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 media should be 6.2 to 6.8. The pH for soilless root media should be 5.8 to 6.2.

Spacing

Pot mums must be properly spaced at all times or quality suffers. Reduced break count and a stove pipe appearance are two problems that can result from improper or late spacing.

A. Starting Area

Pot mums are usually started pot-to-pot. Some growers may provide an inch (2.5cm) of space between the pots in the starting area. Close spacing in the starting area conserves space, increases humidity levels near the plants, and reduces the area needed for long days.

B. Final spacing

The final spacing of a pot mum crop can impact quality, cost of production, and the head size you wish to produce.

The following guidelines may be used for finished pot mum spacing, depending on the finished head size you require:

POT SIZE	SPACING RANGE
4" to 4½"	6" x 6" to 8" x 8" (15 x 15cm to 20 x 20cm)
5" to 5½"	10" x 10" to 13" x 13" (25 x 25cm to 33 x 33cm)
6" to 6½"	12" x 12" to 15" x 15" (30 x 30cm to 38 x 38cm)
7" to 7½"	14" x 14" to 17" x 17" (36 x 36cm to 43 x 43cm)

C. Multiple-Move Spacing

Pot mums can be moved from the starting area to final spacing in one move. This simplifies labor, but does not provide maximum production per square foot of bench use.

A multiple-move spacing regimen simply calls for an intermediate spacing. For example, 6" to 6½" (15 to 16cm) pots are moved from the starting area to intermediate spacing, then set out at final spacing for the final 3 to 4 weeks of production. Two examples of intermediate spacing could be 10 x 10 (25 x 25) for 3-4 weeks for a 12 x 12 (30 x 30) finished spacing, and 12 x 12 (30 x 30) for 3-4 weeks for a 14 x 14 (36 x 36) finished head size, which would provide a reduced square foot week savings of 13-16% compared to a one-move system to final spacing.

The multiple-move system maximizes production capacity and can allow for the organization of three climates, i.e. the starting area climate, the intermediate climate and the finishing climate, which could be run at 56°F (13°C) night temperature for energy savings. However, there is additional labor involved in moving the pots.

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 Aris sales representatives, published schedules and suppliers can provide this information. Contact Customer Service at any time for assistance at 800.321.9573.

Long days begin immediately upon planting/sticking. Long-day conditions require a minimum of 10 footcandles of light at plant level during the middle of the night. Do not permit more than 7 hours of continuous darkness to occur prior to or during the lighting period. The recommended duration of lighting each night varies according to the time of year as shown in the chart below.

Traditionally, incandescent lights providing a minimum of 10 footcandles at plant level are used for night lighting. To provide a minimum of 10 footcandles, 1¼ 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 feet (1.2m) apart and 2 to 3 feet (61 to 91cm) above the plants on a 4-foot (1.2m) wide bench to achieve 10 footcandles.

MONTH	HOURS PER NIGHT	MONTH	HOURS PER NIGHT	MONTH	HOURS PER NIGHT
January	4	May	3	September	3
February	4	June	2	October	4
March	4	July	2	November	4
April	3	August	3	December	4

Cyclic or Intermittent Lighting

With this system, it is not necessary to continually operate incandescent lights, as indicated in the chart above, to achieve long-day conditions and keep mums vegetative.

There are various cyclic or intermittent lighting programmers on the market which allow you to light only 6 minutes out of every 30 minutes over a 4-hour period for all 12 months, providing considerable energy savings. Some growers use a bit longer lighting period during the 30 minutes to be on the safe side.

Supplemental Lighting

During fall, winter and early spring months, mums benefit greatly from the use of HID (High Intensity Discharge) lamps generating 500 to 800 footcandles of light for 18 hours a day in the starting area. This significantly improves vegetative growth and takeoff which results in better finished quality. And it provides the necessary long-day period for vegetative growth during the months HIDs are in use.

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 as in "Peat-Lite Special" formulations (e.g., 20-10-20, 20-5-19, 21-5-20). A 200 to 300 ppm solution of N (soil root media) or 300 to 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, flooded floors, capillary mats or troughs, the fertilization rate is often 25% to 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 2 to 3 weeks of the crop. Work done at the University of Florida by Dr. Terril Nell has demonstrated that pot mum longevity can be increase by 7 to 14 days if fertilizer applications are terminated at disbudding, or approximately 3 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 0.8 – 1.5 mS/cm
Growing 1.7 – 3.0 mS/cm
Finishing 0.8 – 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 a 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 or side of the pot, and 2) ¾" to 1" (2 to 2.5cm) of new top growth should have occurred. Under proper environmental conditions, pot mums should be ready to pinch 12 to 14 days after planting in spring and summer months and 15 to 18 days after planting in fall and winter months. When pinching, remove the top ½" to 1" (1 to 2.5cm) of new growth, allowing approximately 5 to 7 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, then plants are pinched 3 to 7 days later when ready. This produces shorter plants with fewer leaves. It's commonly used to control height during early spring to midsummer 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 black cloth or black plastic over the crop each day to provide a minimum 12-hour period of darkness. (For example, black cloth 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 black cloth as late in the evening as possible to minimize heat build-up under the cloth. Excessive heat under the black cloth can contribute to heat delay.

Temperature

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

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

During the final 3 to 4 weeks of development, it is beneficial to lower night temperatures to 56°F to 60°F (13° to 16°C), with day temperatures of 61°F to 65°F (16° to 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 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 on this website, the Pot Mum Variety Guide, or your Aris sales representative for recommended bud removal per variety. For additional information on bud removal treatments, refer to the "Pot Mum Bud Removal" technical guide on this website.

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 variety, temperature and light intensity.

Generally, B-Nine is applied about 2 weeks after the pinch, or when new shoots are 1½" to 2" (4 to 5cm) in length. A second application may be needed in 2 or 3 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 to 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 treatment varieties	0 to 1
Medium treatment varieties	1 to 2
Tall treatment 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.

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/Etheryl is not recommended for use on 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 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 and Pesticides

Aphids – Astro, Azatin XL, Decathlon, Duraplex, Dursban, Endeavor, Endosulfan, Enstar II, Flagship, M-Pede/Insecticidal Soap, Marathon, Mavrik, 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, Mavrik, Mesurol, Ovation, Pylon, 1100 Pyrethrum TR, Sanmite.

Thrips – Avid, Azatin XL, Conserve, Decathlon, Duraplex, Dursban, Marathon (foliage only), Mavrik, 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 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. 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 list 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 and 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 Rhizoctonia – 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.



Green Leaf Plants™
A Division of Aris Horticulture, Inc.
2369 Old Philadelphia Pike
Lancaster, PA 17602
p: 800.321.9573 / 717.299.0300
f: 717.299.7162
e: greenleaf@GLplants.com
w: GLplants.com

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