

garden mum cultural information

Garden mums are easy to grow when basic guidelines are followed. Simply plant rooted cuttings and feed. Today's varieties do all the work when you provide the appropriate feed. Following is a list of the points for successfully growing any garden mum crop.

- 1) Stick or plant your cuttings as soon as they arrive and always stick or plant into moist media.

For natural season east coast and mid-west crops, planting rooted cuttings outside in mid- to late June, or even early July, saves growing time and reduces premature budding caused by the cool nights of late May and early June.

- 2) Start the liquid feed program in the first three days after stick for unrooted cuttings and at the time of planting for rooted cuttings.
- 3) Use high rates of feed (300–400 ppm N) during the first 40–50% of the crop when your irrigation frequency is the lowest but the plant is going through its most rapid growth period.

Fertilizer concentration should be reduced as the plant develops and/or when irrigation frequency increases to more than once a day.

- 4) Pinches are not required for most crops.

One pinch may be beneficial if your cuttings have stretched due to delayed planting, if large propagation cells were used, or if you are in a low humidity growing area.

- 5) Space your pots so plants do not touch when they reach the desired finished size.
- 6) Monitor the feed levels in the pot and in the irrigation line to prevent problems before they show up in the plant.
- 7) Take notes on what you have done, problems seen and weather conditions to allow you to plan and adjust for a better crop next year.

Recommended Cultural Practices

On Receipt of Cuttings

Plant (rooted) or stick (unrooted) garden mum cuttings immediately. If the cuttings cannot be planted immediately, they may be stored for one or two days in a cooler at 33°–40°F/0.5°–4.4°C, but this is not recommended.

Rooting Unrooted Cuttings

Rooting hormone increases uniformity. The easiest way to

apply hormone is to spray cuttings after stick with 200 ppm IBA. If spraying IBA, spray after dark or early morning the next day to allow the mist program to be turned off and then resume mist after cuttings begin to wilt. An alternate method is to apply 1,000–1,500 ppm IBA (indole-3-butyric acid) in powder or liquid form to the bottom 1/8"–1/4" of cuttings before sticking.

Always stick cuttings into moist root media. Sticking a garden mum cutting into dry media reduces initial growth and future potential. The longer you plan to hold the cutting in the cell tray before planting, the bigger the cell should be. Unrooted cuttings can also be stuck directly into the finishing container, which requires more propagation space.

Allowing plants to become over-rooted, dried out, crowded and/or under-fertilized serves to check plant growth and set the stage for severe budding very early in the crop. Proper care initially is crucial for easy, high-quality finished crops. Plant cuttings as soon as possible after rooting so quality is not compromised.

Misting guidelines: Use of an environmental controller to vary the mist based on weather and the stage of root development is ideal. More traditional mist time clocks can also be used. In most cases, mist can be off 10 days after stick and with a 100-cell tray, cuttings can be ready to plant in 14 days. Overall, less mist is better at all stages of development since water-logged media slows the rooting process. Mist during daylight hours throughout the rooting process and during the night for the first three to four days to help keep cuttings turgid.

Ideal light levels are 3,200–3,800 foot candles. Rooting medium temperature should be 70°–74°F/21°–24°C. Maintain air temperature of 70°–85°F/21°–29°C. Use long-day lighting year round to reduce budding during rooting. (See Photoperiod Control section.) Fertilization during propagation also reduces rooting time. Apply a complete N-P-K fertilizer containing 200–300 ppm of nitrogen approximately two or three times a week starting on the third day after stick or when callus starts to form.

Planting

Always plant the cuttings into moist growing media. Planting a garden mum cutting into dry media reduces initial growth and future potential. Plant cuttings to just cover the root ball, as deep planting of cuttings is neither required nor recommended and can lead to disease problems.

Liquid fertilization at planting time gets the plant off to a vigorous start. Always water-in freshly planted cuttings with a complete N-P-K fertilizer containing 300–400 ppm of nitrogen immediately

after planting. Allowing garden mum cuttings to wilt inhibits their takeoff, future branching and overall growth. It may be beneficial to mist or syringe the plants for the first few days, or until the plants are fully turgid and the roots are absorbing water.

Growing Media

Many types of good soilless growing media exist. Garden mum growing media should be loose, well-drained and provide a solid anchor for the root system. The growing media must retain sufficient moisture and nutrients for plant growth and have sufficient pore space to drain away excess moisture after irrigation. The pH for soilless media should be 5.8–6.2 (soil-based media should be higher: 6.2–6.8). The use of redwood in the mix is not recommended, as it appears to affect plant growth. Many growers have tried rice hulls in their soilless mix. Based on what we have seen, adding rice hulls requires adjustments in the irrigation/fertilization program to get plants of a similar size and shape.

Containers

There are a variety of container sizes used in garden mum production. Cell packs, handle baskets and 3"–6"/7.62–15.24 cm pots are widely used for spring sales. For summer and fall sales 6"–8"/15.24–20.32 cm plastic and fiber pots are used, along with one to two-gallon nursery containers. Many growers find demand for large pot sizes such as 10"/25.4 cm, 12"/30.48 cm and 14"/35.56 cm pots as well as different pot colors and styles. As a general rule, the larger the container, the larger the finished plant. We recommend using new containers each year. Leftover containers must be properly cleaned and sanitized to prevent possible crop disease issues.

There is also the potential to "upgrade" traditional pots with pot covers put on at the time of retail delivery. Seasonal themes such as Jack-o-Lanterns or bushel baskets are available. Pot covers add market value at a low cost and do not require any adjustments to your current growing process.

Spacing

Proper spacing is important for producing garden mums with beautiful round shapes. Pots grown too close together have an upright appearance, even when the right varieties have been selected and proper fertilization is given. Space pots to allow plants to reach the desired head size without touching the adjacent plants.

Finished plant head size and sale price are the main factors used to determine proper spacing.

Fertilization

Fertilization is the key to success with any garden mum crop. Mums demand fertilizer and providing this early solves headaches that could occur later in the crop.

Fertilization rates vary depending upon the type of media, fertilizer used and application frequency. A constant fertilization program (fertilization with every watering) using 300–400 ppm

from a complete N-P-K fertilizer is a good basic program to use from day one for producing quality garden mums. Rates may need to be adjusted up or down depending on the media and the weather.

The best feed program uses liquid feed and allows you to control and react to what the plants are doing. Many successful growers use a fertilizer schedule similar to the outline below. Because growing time and plant development varies depending on how the crop is being grown (blackcloth, natural season or West Coast), we have broken the crop down by percentages.

- Constant liquid feed from a complete fertilizer solution that starts with watering in the cuttings after planting.
- Ammonium-based nitrogen to start (two to four weeks) and then switching to a more nitrate-based nitrogen fertilizer.
- High level of feed (300–400 ppm) for the first 40–50% of the growing time to build the body of the plant.

This may be the first four to five weeks for natural season crops, three weeks for a blackcloth crop, or three to four weeks for a West Coast natural crop.

During this stage of the crop, the plants receive less irrigation and therefore less fertilizer, so high rates are needed to feed the rapid plant growth.

- A reduction in fertilizer concentration (200–250 ppm) for the next 20–25% of the growing period to build plant size.

This may be two to three weeks for a natural season crop and two weeks on a blackcloth or West Coast crop.

- Change to a twice a week feed program at a lower concentration (50–100 ppm) for the next 20–25% of the crop time to maintain foliage color while preventing overgrowth or a delay in flowering response.
- Clear water can be used for the last 10% to finish the crop and while the plants are being shipped.

If you are in an area where you need to irrigate the pots more than once a day, reduce the fertilizer concentration but continue with constant feed for best results. For example, if you are at 200 ppm with a once a day irrigation but need to water more, try two applications a day at 100 ppm instead of one at 200 ppm and one clear water each day.

If controlled release fertilizers are used, multiple applications during the growing season are required and finished plant size will likely be smaller than what can be obtained with a constant liquid feed program. Be sure to use liquid fertilizer to "water in" your cuttings and controlled release fertilizer at the time of planting to help give the cuttings their best start. Use the high rate of a control release fertilizer with a short release period, such as a three to four month formulation, to supply as much feed as possible as quickly as possible. Follow up every three

to four weeks with additional top dress applications. A total of three applications will likely be needed. Use formulations that include micronutrients when growing in soilless media.

Because the rate of release of a controlled-release fertilizer is primarily driven by soil temperature and frequency of irrigation, supplemental liquid feedings at the start of the crop may be necessary to get the plant moving and create vegetative growth. This is important for outdoor plantings where the night temperatures are cold and cool temperature stress can kick the plant into severe budding.

Any fertilizer program should be developed in conjunction with an analysis of the water being used for irrigation. In some cases, adjustments to the water source (alkalinity, total salts, etc.) will be required in order to have a successful feed program.

Irrigation

Proper irrigation is critical to produce high-quality garden mums. Always apply enough fertilizer solution so it soaks through the pot and up to 10% of the solution drains out of the pot to prevent soluble salts build-up.

Garden mums should never be allowed to wilt during the early stages of growth. Wilting can restrict branching and overall growth as well as contribute to premature budding. Slight wilting can be beneficial late in the crop to help harden the plant off, control height and promote more uniform flowering.

Drip irrigation is better than overhead irrigation because overhead irrigation can promote the development of leaf spotting foliar diseases. If using overhead irrigation, be sure the foliage is dry before evening hours. When using drip irrigation, place drip emitters close to the center of the pot to ensure uniform irrigation throughout the pot.

During extremely hot periods, do not apply extra water to the pots in an attempt to lower temperatures. This leads to overwatering, root loss and chlorosis. Syringing plants reduces heat stress without overwatering. With greenhouse grown crops, 25–30% shade can be used to reduce temperatures, but the reduction in light will slow response.

Pinching

In most cases, garden mums no longer require pinching, and certainly do not require multiple pinches to obtain beautiful round plants.

Cuttings rooted in large plugs and cuttings held in small plugs too long before planting may require a pinch. Crops grown in low humidity environments may also require a single pinch.

On crops that require a pinch, pinching should be done when the plants are ready, not based on a calendar date. Plants are ready to pinch when they achieve 1"–1½"/2.54–3.81 cm of new growth. This is generally 10–14 days after planting. The top ½" of growth should be pinched out. When pinching, the last pinch

should be given sometime in July—early in the month for crops in cool areas, and as late as August in warm regions.

Remember, with today's improved varieties there is no reason to plant a cutting in May or early June and pinch it multiple times. Excellent fall crops can be grown by planting in mid-June and not pinching. Some growers find it more economical to plant two to four weeks later with two cuttings per pot and no pinch.

No-pinch Crops

In 2000, we started a new variety trialing process for fall garden mums. We take rooted cuttings from a 100-cell size tray, plant them as a single cutting in an 8"/20.32 cm or 9"/22.86 cm pot in mid- to late June, and start a liquid feed program of approximately 300 ppm N from a complete fertilizer on the day of planting. We do not pinch, nor do we spray Florel. We are then able to select varieties that require less effort for you to grow and still provide the high consumer value Yoder mums are known for. We think this creates the best of both worlds and hope you are able to incorporate this labor-saving program into your growing schedule. As with all new procedures, we suggest you trial this method before making a complete change to your standard production.

Budded Cuttings

Garden mums are very reproductive. At times, some buds may be present when cuttings are received. When producing garden mums, this must be expected. Keep in mind, the development of a small terminal bud is the basis of the no-pinch program.

To prevent garden mum cuttings from becoming prematurely reproductive, it is necessary to keep them actively growing. Therefore, it is essential to provide the plant with optimum moisture and fertility levels. Use night interruption lighting during propagation and before the start of short days with shaded crops to help prevent premature bud initiation (see Photoperiod Control section). This should be done even during natural long-day periods.

Many areas of North America experience very cool nights in June, which may cause cuttings to initiate buds prematurely. This may seem serious, but by simply pushing the fertilizer concentration, plants almost always continue to grow and become a quality fall crop. This is true for no-pinch crops or if the buds are picked off after they develop.

Growth Regulators

Some garden mum varieties tend to get too big. If these varieties are needed, they can be controlled with the use of growth regulators. Effective use of all growth regulators is more of an art than a science. Stage of the crop, concentration used, uniformity of application and the weather after the application all factor in to the level of control seen. Growers need to learn how to adjust applications to fit their own needs. Therefore, accurate records are needed to learn from crop to crop and year to year.

If most of the varieties in your crop require growth regulators, consider a later plant date to reduce growing time and, therefore, plant size. Proper use of fertilizer and irrigation can also help control plant size later in the crop (see the Fertilizer and Irrigation sections).

B-Nine is the traditional growth regulator for garden mums. Typical rates are 1,000–5,000 ppm with 2,500 ppm as a traditional starting point. Rates vary depending on a variety's vigor, temperature and growth stage of the crop. Usually no B-Nine is applied after the buds reach pea size to avoid flower discoloration and delay.

Bonzi is quite effective in height control, but must be used carefully to avoid excessive stunting. Some growers use a 2 ppm Bonzi drench or a 30–50 ppm Bonzi spray to hold their crop at a given height. Bonzi is taken up by stems and roots rather than leaves. Late applications do not appear to delay flowering.

Sumagic is also very effective, but results have been quite variable. Spray rates are 2.5–10 ppm and drenches of only 0.1–1 ppm are used. Uptake of Sumagic is similar to Bonzi.

Florel has been promoted for several uses on garden mums: to increase branching, to prevent premature budding and to delay flower dates of the same variety. More recently, Florel is being used by some growers to replace night interruption lighting during the long-day period of the crop schedule.

We have not found Florel to increase the branching of garden mums as has been seen in other crops, and Florel is not required with the free branching garden mums now available. Growers have been successful in using Florel as insurance against budding by spraying the cuttings while in propagation and/or shortly thereafter. Florel by itself will not solve a budded cutting issue after buds are seen on the cuttings. Premature budding is best prevented with the use of long-day lighting and optimal temperatures, and best overcome with a strong fertilization program to push growth around the buds.

Florel can be successful in delaying flowering and may even work as a long-day lighting substitute. Unfortunately, flowering uniformity will be adversely affected on some varieties when Florel is applied, as all of the stems do not respond the same.

Greenhouse vs. Outdoor Growing

A better quality fall garden mum is produced outdoors versus indoors. Temperature and humidity levels are often too high in a greenhouse. Outdoor-grown mums are tougher, more compact and generally perform better for the consumer. Very warm summer night temperatures can delay flowering. Fall garden mums grown indoors under natural day length may flower approximately two weeks later than those grown outdoors, when high summer night temperatures are encountered. With proper variety selection, high quality “summer shaded” garden

mums can be produced indoors before the fall season.

Photoperiod Control

Long days are needed to generate vegetative growth. Sufficient long days must be provided to obtain the proper finished plant size for a given container. Artificial long days should always be provided during mum propagation, with spring-lighted/shaded crops and summer-shaded garden mum programs. Artificial long days can be supplied by lighting plants from 10:00 p.m.–2:00 a.m. with 10–15 foot candles of incandescent light. This can be obtained by stringing 60–100 watt bulbs three feet apart and three feet above plant growing tips. Use a timer to control when the lights go on and off. Use of artificial “mum lighting” should be done even when the natural daylength is greater than 12 hours, to ensure the cuttings do not initiate flower buds early.

Short days are needed for flowering. Artificial short days are provided by covering plants with an impermeable light barrier like blackcloth or four to six mil black plastic for at least 12 hours daily. Accomplish this by pulling blackcloth before the sun sets and opening after sunrise (7:00 p.m.–7:00 a.m.), or by pulling blackcloth early in the morning before the sun rises and opening mid- to late morning (5:00 a.m.–10:00 a.m.) to help reduce the temperature under the cloth during the night. Light intensity under the blackout must be less than two foot candles to be effective. For the most predictable timing, we recommend covering every night for at least four weeks to initiate flowers.

When using blackcloth outside of the greenhouse, some growers use weed barrier cloth since it allows the passage of air and water. Blackcloth can be laid directly atop plants, but most often a support structure is used to prevent damage from windy or rainy conditions. The covering is pulled over the structure at the end of each day from either the sides or ends of beds, and then rolled and stored in the aisles in the morning.

Insects

Among the insect pests that attack garden mums are aphids, mites, various caterpillars, leafminers, whiteflies and thrips. Fortunately, insects are not usually a significant problem. A preventive spray program can guard against outbreaks of insects. For more details on chrysanthemum insect control, see the Chrysanthemum Pest Control tip sheet at www.syngentaflowersinc.com.

Diseases

It is important to properly sanitize any components of the production system that are re-used the following year, such as irrigation lines and tubes, weed mats or containers.

The most common diseases found on garden mums are *Pythium*, *Fusarium*, *Rhizoctonia*, bacterial leaf spot (*Pseudomonas cichorii*), *Alternaria*, *Botrytis* and *Septoria*. The first defense for any disease is using clean cuttings, soil, equipment and good cultural practices that create an unsuitable environment for disease organisms. See the pesticide table in Chrysanthemum Disease Control at www.syngentaflowersinc.com for specific chemical

controls. There is no chemical control for bacterial leaf spot. Copper compounds may provide some protection, but they can be phytotoxic if applied too often.

Weed Control

Weed control in outdoor garden mum production areas is primarily accomplished with solid or woven plastic ground cover. Using clean media in containers should prevent any weeds in the pots. Other manual methods or mulches can be used in field cultivation. There are several pre- and post-emergence chemicals available for use with mums. Remember that both

pre-emergence and post-emergence herbicides only control certain weeds. Read the label for weeds controlled and for use rates and application methods. Also keep in mind that damage can occur with drift or vaporization when using weed killers near growing plants.

Before using any of these pesticides and herbicides, 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 rate and application methods. Always follow label directions. The label is the law.



camille apricot



alexis white



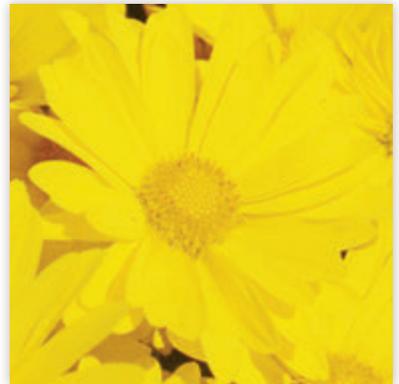
tabitha scarlet



victoria pink



wilma white



hankie yellow

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