

# Garden Mums



A.J. Pertuit, Jr.,  
Department of Horticulture,  
Clemson University

There are between 150 to 200 known species of chrysanthemums. The name “chrysanthemum” is derived from Greek and means “golden flower.”

Chrysanthemums’ family is Asteraceae, changed from Compositae, which was more descriptive, because botanists want all family names to end in “aceae.” Some mums are annuals,<sup>1</sup> some perennials.<sup>2</sup> Most are herbaceous, yet some are woody. Some species (e.g., *Chrysanthemum cinerariaefolium* and *C. coccineum*) are grown commercially for the pyrethrum (an insecticide with high “knock down” properties) obtained from their dried petals, and others are grown for their marketable inflorescences.

Some “mums” respond more the temperature than photoperiod for flower induction<sup>3</sup> [e.g., Marguerite or Paris Daisy (*C. frutescens*)], but the one grown in greenhouses (now *Dendranthema x grandiflora*, formerly *Chrysanthemum x morifolium*) responds more to photoperiod than temperature for flower induction. *Dendranthema x grandiflora* is a perennial hybrid thought to be of Chinese origin.

Chrysanthemums have three primary uses in commercial floriculture today: as cut flowers, as potted plants and in garden plantings. All of these plant uses can be fulfilled by *Dendranthema x grandiflora*, which is a **short day plant**.<sup>4</sup>

The inflorescence of a mum is actually a composite of many flowers. Its family member, the sunflower

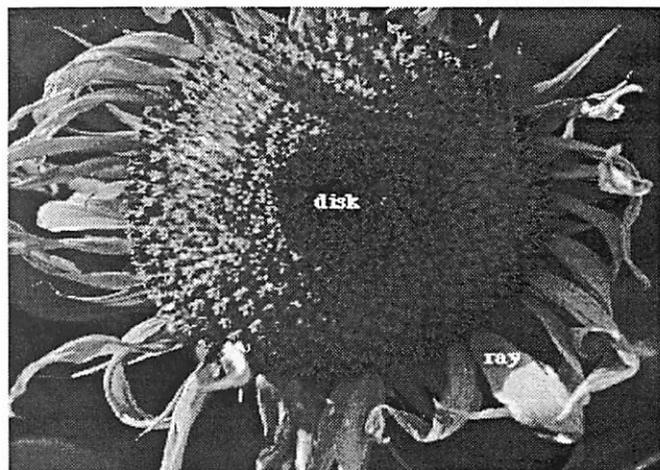


Figure 1. The sunflower exemplifies the arrangement of the ray and disk flowers of mums.

(*Helianthus annuus*) (Fig. 1) is a good example of the inflorescence configuration of mums. The inflorescence is composed of two flower types: (1) **Disk flowers** are at the center. They are tubular, perfect [i.e., with male (stamen) and female (pistil) parts – a stamen and a pistil], and fertile but often have poorly developed petals, like the one pictured. And (2) Imperfect (i.e., pistillate only) but fertile **ray flowers** are at its margin. They have long, well-developed petals. In a mum, we call a similar configuration (i.e., the ray flowers are only a row or two at the inflorescence margin) a “daisy type.” If several outside rows of the inflorescence are composed of ray flowers, it is called an “anemone type.” In a “pom-pom” type, the ray flowers dominate the entire florescence, hiding the central disk flowers. This latter configuration is common in many of the mums grown today – some garden types (called “decoratives”), standard cut, pot, spider and Fuji.

Chrysanthemums were first brought under cultivation in China about the time of Christ. They were introduced into the United States from England just prior to 1800. For the past quarter century, until the mid 1980s, pot mums had been the No. 1 floriculture pot crop in the United States, but the poinsettia is not king. In a recent conversation, referring to consumer demand for garden mums, Stuart Babb of Martin’s Nursery, Gray Court, SC (near Greenville), declared “Mums have come back!”

Make no mistake about it – mums are big business. Yoder Brothers in Pendleton, SC (Fig. 2) alone sells more than 52 million cuttings annually. Because of the

<sup>1</sup>A plant grown from seed and dies after flowering, all in less than a year

<sup>2</sup>A plant that continues to live year after year, growing vegetatively and flowering each year

<sup>3</sup>Environmental conditions which eventually result in flower initiation [i.e., the change growing point (apex) from a vegetative (leaf producing) shoot to a reproductive shoot (flower)]

<sup>4</sup>A plant that initiates flowers only if the night is (gets) longer than the critical length for flower initiation of that plant species



Figure 2. Rootings of chrysanthemum cuttings at Yoder Brothers, Pendleton, SC. Yoder's roots 52 million mum cuttings annually at this location along.

demand for cuttings for fall gardens, the highest demand for mum cuttings is in May, while the lowest demand in Sept./Oct., when growers are more into poinsettia production.

What are the differences among varieties grown as garden mums, as potted plants and as cut flowers? It would be a good idea to look first at how they are alike.

All have about the same critical **night length** requirement for floral initiation – it's 9½ hours. This means that they will change from the vegetative stage to the reproductive stage if the nights are at or exceed this point. Why talk about the length of the nights and not the length of the days? After all, they are called "short day plants" aren't they? The term "short day" is a misnomer. As long as they receive 9½ hours of non-interrupted darkness, they will eventually initiate flowers, regardless (within reason) of the length of the days (*i.e.*, light periods) that they receive. For example, if they receive 20-hour days (which would stop them from initiating flowers if it were the light length that controls flowering), they will still initiate flowers if the nights they receive are  $\geq 9\frac{1}{2}$  hours. If the nights aren't  $\geq 9\frac{1}{2}$  hours, they will remain vegetative. So, mums should really be called "long night plants." Mums (garden and greenhouse types) also require non-interrupted dark periods of  $\geq 10\frac{1}{2}$  hours for flower development. In other words, although flower buds will be initiated with nights of 9½ hours, these flower buds will just sit there and not fully develop unless (until) the nights are  $\geq 10\frac{1}{2}$  hours. That's why we recommend giving greenhouse mums 12-hour nights – the 12 hours exceed both of these requirements.

Exactly what mechanism within mums controls whether the plants produce vegetative or reproductive growth, and how does this mechanism work? The plants contain a blue, proteinaceous pigment called

phytochrome. This pigment has two forms, each existing within the plant simultaneously and each form convertible to the other form. The quality of light the plant receives regulates which of these two forms is dominant (*i.e.*, in the higher concentration). One form absorbs red light and is commonly designated  $P_R$ . The other absorbs far red light and is designated  $P_{FR}$ .  $P_{FR}$  inhibits the reaction that triggers the plant to initiate flowers – it's, therefore, called the "active form" of phytochrome. Because the plant reacts similarly to sunlight and red light,  $P_{FR}$  is the form dominant in the plant at the end of the day. It has been found that the reaction that

triggers the plant to change from the vegetative to the reproductive state occurs about 7½ hours after the beginning of darkness. So,  $P_{FR}$  must be the dominant form of phytochrome at that time in order for it to prevent the plant from initiating flowers (*i.e.*, for the plant to remain vegetative).  $P_{FR}$ , however, is unstable and begins to revert to  $P_R$  after only 4 hours of darkness. After 7½ hours of darkness, there is not enough  $P_{FR}$  remaining to prevent floral initiation. If we want the mums not to initiate flowers, we must do something to get the  $P_{FR}$  up again (before 7½ hours



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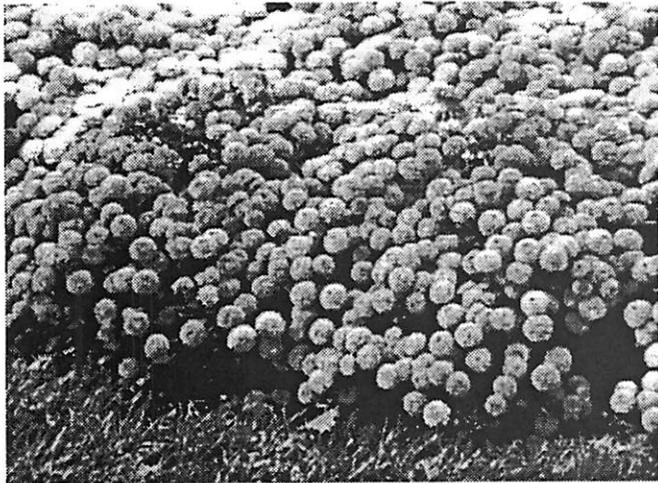


Figure 3. The garden mum 'Robin' in flower in mid-October at The South Carolina Botanical Garden at Clemson, SC.

darkness). This is easily accomplished in the greenhouse by night lighting.

Very little light energy can control the phytochrome system. For example, with poinsettia, 0.01 (one-hundredth) of a ft-c applied continuously will prevent floral initiation, as will 10 ft-c applied 3 seconds/minute for 3 hours in the middle of the dark period. How much light is a ft-c? It's about the minimum required by a person with 20/20 vision to read newspaper print -- not much!

At what time should the artificial lighting begin, and how long should it remain on? Because there is money invested in a greenhouse crop, one doesn't want to play a game to see how long one can wait before turning on the lights (*i.e.*, how close one can get to 7½ hours before turning lights on and still prevent floral initiation). Beginning the light period about 5 hours after the beginning of the dark period and continuing it until a time that will allow only 5 hours of darkness after light termination is sufficient. Other lighting schemes also can preclude floral initiation.

Certain questions come to mind. Under our naturally occurring night lengths, could greenhouse types (*i.e.*, cut and pot types) be successfully grown outside in Georgia and South Carolina, and could garden types be grown successfully inside the greenhouse? The primary difference with respect to a variety's classification as a garden or a greenhouse type is how long it takes the variety to flower after it first receives long nights. This may vary from 7 to 15 weeks, depending on the variety. In other words, a "9-week variety" flowers 9 weeks after the first day it receives long nights. During this 9 weeks, it changes from the vegetative to the reproductive state (*i.e.*, initiates flowers) and the flowers "open."

Garden mums are the shorter response varieties (*e.g.*, about 7 or 8 weeks). During the summer, their terminals initiate flowers (the nights are 9 ½ hours), causing lateral growth below the begin growth. This lateral growth also initiates flowers, causing lateral growth on its shoots to begin growth – the cycle continues, in many cases resulting in plants with an attractive, mound-like appearance (Fig. 3), which in the past led to the term "cushion mums" as a synonym for garden mums. The plants, then, contain visible flower buds of different ages. These buds just sit there and don't develop beyond the same point during summer. Why? They must all receive the same environmental stimulation before flower development can occur. All of them (regardless of age) do, however, develop simultaneously in the fall – before freezing temperatures occur. This is because all of the flower buds receive the 10½ hour nights required for their further development at the same time.

If a "10-week variety" (*i.e.*, a greenhouse type) were planted outside, it would likely freeze before flowering, because it requires too much time (weeks) to "flower" compared to a "7-week variety." Because garden types develop flowers in a shorter period of time than greenhouse types, their flowers are smaller than many greenhouse types and, therefore, of a lower quality than the greenhouse varieties, which typically require 8 to 11 weeks of long nights.

Garden mums also may be produced for early spring sales, but this requires lighting at night to achieve the desired amount of vegetative growth for a particular variety. When this is done, the garden mums are subjected to "short, medium or tall treatments," similar to those employed for greenhouse pot mum production. Most growers in this area simply grow garden mums for fall production under naturally occurring nights (natural season mums). Sales begin in mid-August. By the way, some garden varieties make beautiful hanging baskets.

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Foliar sprays with B-Nine (about 2500 ppm applied when new vegetative shoots are just under an inch long) can keep plants more compact; however, careful variety selection and full sun culture should preclude the need for growth retardant applications.

Because mums are perennials, with little protection in winter, they will "come back" the following year. Those in large pots (*e.g.*, 8-inch bulb pans) planted in summer are more likely than those in small pots (3¼ in<sup>2</sup>) to survive the winter, because those in large pots become well-established (rooted in their beds) before the cold weather.

During production (before sales), a completely soluble complete fertilizer solution of 200 ppm N at each watering is sufficient. They grow well in various combinations of peat, perlite, pine bark, vermiculite, etc. The pH should be 6 to 6.5. Many growers purchase begged media. If a large volume of bark is included in the growing medium, up the rate to 250 ppm N at each watering. Full sunlight will result in a more compact plant loaded with flower buds.

At Clemson, rooted cuttings of garden mums planted two feet apart (some a little more) directly in beds about the Fourth of July have performed excellently. Before planting, a 10-10-10 granular fertilizer was applied at 4 lbs/100 ft<sup>2</sup>. Recommended planting dates and varieties will vary with location.

Stuart Babb (Martin's Nursery) has generously supplied me with this list of those garden mum varieties chosen because of their performance and popularity in this area:

#### DAISY TYPES

White – 'Lisa'

Yellow – 'Allure,' 'Anna,' 'Donna,' 'Jessica'

#### DECORATIVE TYPES

White – 'Frolic,' 'Nicole White,' 'Tolima'

Cream – 'Nicole Cream'

Yellow – 'Nicole Yellow'

Orange – 'Dark Triumph,' 'Harvest Emily' and 'Radiant Lynn,' 'Serenade' (two corals)

Lavender – 'Lynn,' 'Royal Lynn' (a lavender pink)

Purple – 'Debonair'

Pink – 'Soft Lynn' (light pink), 'Emily' (deep pink)

Red – 'Bravo,' 'Raquel'

Bronze – 'Triumph'

A "pasteurized" growing medium<sup>1</sup> with perlite and at least a quarter peat by volume is ideal, if possible. Chemical "pasteurization" also can be accomplished.

<sup>1</sup>Steaming the medium to 180°F (minimum) at its coolest location for half an hour (minimum)

Disease and insect problems may be encountered during mum production. Some of the most prevalent ones are noted. Recommendations for their control are constantly changing. Please carefully follow the latest edition of your state's agricultural pesticide recommendations when applying pesticides. These are usually published annually in a handbook format.

The primary year-round insect pests are aphids, white flies and perhaps mealy bugs, all of which are easily controlled. Spider mites (not insects) and thrips are more likely to be problems in the warmer seasons, but they, too, may be controlled. To combat mites, one must remember to switch from one miticide to another. Mites have the ability to produce populations resistant to miticides.

Many disease problems can be precluded by using a "pasteurized" growing medium, disease-free cuttings and prudent watering.

Rhizoctonia stem rot and Pythium stem and root rot can usually be prevented by using a "pasteurized" growing medium. Recommended fungicide drenches during production also help.

Septoria leaf spot, which produced irregular black areas on the foliage, is spread by careless watering.

Botrytis (gray mold) can become a problem during periods of low temperatures and high humidity. It is

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the same fungus that may grow on strawberries in a refrigerator, where low temperatures and high humidity also occur. It first appears as a water soaked area on the "petals," which later turn brown. Recommended fungicide applications should be made.

Ascochyta (ray blight) results in deformed flowers. It develops only in the presence of water, usually first infecting the outer, ray "petals," then spreading inwardly. It can, however, infect the foliage before it infects the inflorescence. Its development is promoted by high temperatures and high humidity. Careful watering and prudent fungicide applications help prevent its development.

**RECOMMENDATION:** As with any crop, never water so late in the day that the water that gets on plant foliage, flowers, etc., doesn't have time to evaporate completely before nightfall. Moisture on leaves during cool night conditions can enhance disease infection/development.

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**NOTE:** A more complete mum publication, *Understanding and Producing Chrysanthemums*, may be obtained from the Clemson University Extension Service (Horticulture Leaflet 65). It also includes cut and pot mums.

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