

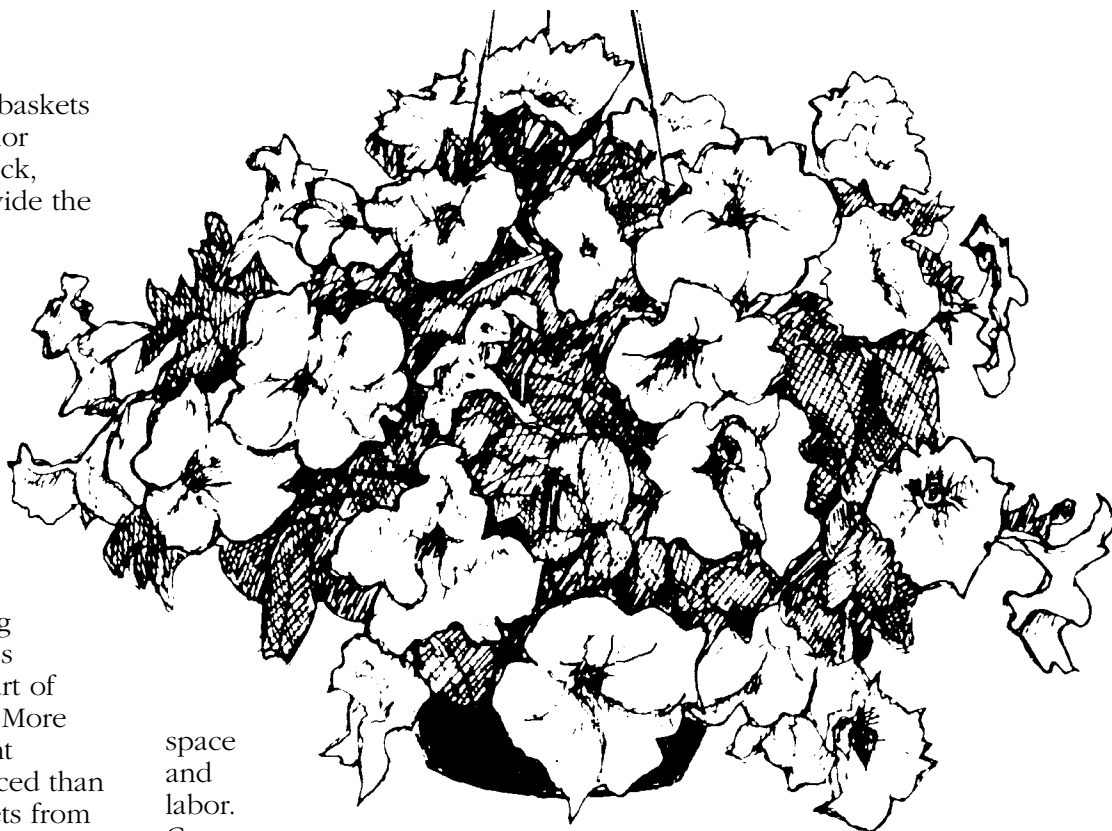
# Greenhouse Production of Flowering Hanging Baskets

## Introduction

Flowering hanging baskets provide instant color for the summer deck, porch, or patio and provide the structural material for vertical gardening. Sales of hanging baskets are currently increasing because customers want instant color and decoration. Also, many newer homes have limited landscaping space.

The production of flowering hanging baskets during the spring bedding plant season has become an important part of greenhouse production. More container types and plant species are being produced than ever before. Large baskets from 14 to 36 inches in diameter are popular in garden centers that cater to more affluent customers. These larger sizes may contain an arrangement of three or five plant species in a mixed basket.

Mixed baskets provide small- and medium-sized growers the opportunity to develop specialty products that will help the growers distinguish themselves in niche markets. Different flower colors, plant heights, and foliage textures can be combined for a wide range of product choices. However, coordinating color, height, and differences in plant vigor can be a challenge both culturally and artistically. In addition, mixed baskets often require a lot of greenhouse



space and labor.

Growers should determine costs carefully to ensure that they make profits. The following are some tips for designing mixed baskets:

- Avoid rampantly growing plants that may take over the container.
- Avoid combining plants that have differences in vigor.
- Avoid plants that may grow too tall and require staking.
- Plant small transplants so they will grow together naturally.
- Combine plants that have similar cultural requirements such as light, water, etc.
- Limit the number of plant types to three to five.

- Plant in a repetitive pattern around the pot for symmetry.
- Plant taller plants in the center of the container and trailing plants around the edge.
- Use climbing vines to cover container hangers.
- Combine pastel flower colors rather than bright primary colors.
- Make sure plant colors do not clash with the container color.
- Use plants that will add height—flat-top baskets look plain.
- Keep records of successful and unsuccessful combinations.

The mass market favors green or white 10- to 12-inch baskets, mainly in monoculture but, at times, with several species per basket. The 10-inch basket size is ideal for monoculture because crop turnover is rapid and costs are low enough to allow a profit. Plastic containers are used for most hanging baskets, but wire baskets lined with peat moss are becoming more popular. Choosing unique basket colors and styles can help growers differentiate their products in the marketplace.

Producing flowering hanging baskets allows growers to utilize areas over aisles and walkways to generate revenue and to make use of areas that must be heated and covered by glazing anyway. However, utilization of overhead areas does not mean growers should not consider dedicating greenhouse areas to the production of hanging baskets. In fact, many businesses have developed whole greenhouses or greenhouse sections that use various staggered basket-hanging schemes. In either case, crop scheduling and careful planning of the production facility are required. The temptation is to overproduce in a given area or to shrink production times to get as much production as possible during the spring market window. Development of and adherence to production schedules and product standards are important in maintaining product quality and uniformity.

## Plant Material

Plant species and cultivars must have suitable growth characteristics for monoculture in hanging baskets. Plant growth habit should be prostrate or mounding, but not too tall, and should round out or cascade over the container rim. Plants should also fill the container with foliage so that no potting

medium shows and should display an even distribution of flowers over the canopy within about 8 to 12 weeks from planting. Consider the shelf life of the plant in the garden center and in the home so that the consumer will enjoy at least 8 weeks of flowering. The numbers and kinds of plants produced in hanging baskets vary with the development of new cultivars by breeders, the introduction of species, and the demands of the marketplace. Table 1 lists plants suitable for monoculture in 10-inch baskets and the cultural requirements for each plant.

**Table 1.** Cultural Requirements for Crops in 10-Inch Hanging Baskets

Crop	Plants per basket	Pinch	Finish time (weeks)
<i>Abutilon</i>	1	1	8
<i>Apentia</i>	4	0	10
<i>Argyranthemum</i>	2 to 4	0	10 to 11
<i>Asteriscus</i>	4	1	9
<i>Bascoja speciosa</i>	3 to 4	0 to 1	5 to 7
<i>Begonia</i> , Hiemalis	3 to 4	1	17
<i>Begonia</i> , fibrous	4	0	7
<i>Begonia</i> , nonstop	4	0	12
<i>Bougainvillea</i>	3	3 to 5	10 to 12
<i>Brachycome</i>	3 to 4	0	10 to 11
<i>Browallia</i>	4 to 6	0	6 to 8
<i>Calibracoa</i>	3 to 4	0	8 to 9
<i>Cuphea</i>	2 to 5	0	6 to 8
<i>Diascia</i>	2 to 4	0	6 to 7
<i>Evolvulus</i>	3 to 4	0 to 1	10 to 11
<i>Fuchsia</i>	3 to 5	2	15 to 20
<i>Helichrysum</i>	3 to 4	0	7 to 8
<i>Impatiens</i> , New Guinea	4	1	13
<i>Impatiens</i> , double	3 to 4	0	6 to 7
<i>Impatiens</i> , bedding	3 to 4	0	6 to 7
<i>Lantana</i>	4	1	13
<i>Lysimachia</i>	3 to 4	0	10
<i>Nemesis fruticens</i>	3 to 4	0 to 1	7 to 10
<i>Nierembergia</i>	4 to 5	0	6 to 7
<i>Pelargonium x hortorum</i>	3 to 4	0	9 to 12
<i>Pelargonium x peltatum</i>	3 to 4	2	15
<i>Petunia</i>	3	1	6 to 9
<i>Portulaca</i>	6	0	9
<i>Purslane</i>	1 to 3	1	8 to 9
<i>Scaevola</i>	1 to 4	0	10 to 13
<i>Streptocarpella</i>	3 to 4	0	7 to 8
<i>Thunbergia</i>	4 to 5	0	6 to 8
<i>Verbena</i>	3 to 4	0	7 to 9
<i>Verbena peruviana</i>	4	0	6 to 7
<i>Verbena pulchella</i>	4	0	6
<i>Vinca</i>	6	0	9

Adapted from Konjoian, 1996; Erwin, 1995; Woods Starman and Williams, 1997; Wood Starman and Faust, 1996.

## Propagation

The decision to propagate plant materials in house or to purchase rooted cuttings or plug-grown seedlings must be made based on time, labor, facilities, and bench space. Growers who currently produce plugs for bedding plant programs can incorporate seedling production for hanging baskets into those programs. However, growers who are not currently set up for plug production should probably order plugs from propagators. It is usually preferable to order rooted cuttings from propagators

to ensure disease- and virus-free material. However, if scheduled carefully, early plantings can serve as sources of cuttings for later crops.

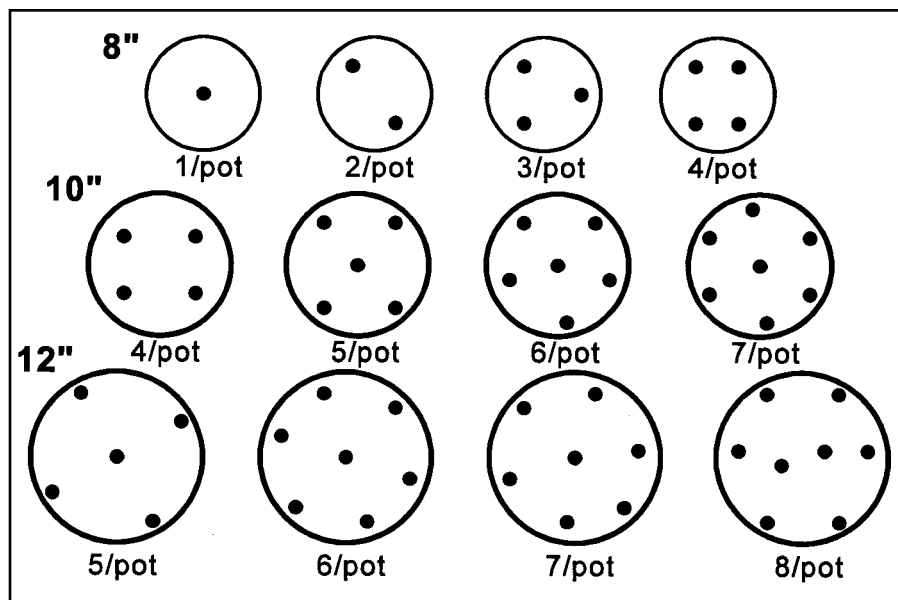
## Containers

Plastic hanging basket containers come in a range of sizes, from 6 to 12 inches, in 2-inch increments based on top diameter. Hangers are either wire or plastic. Many basket designs are available and some even have planting holes in the sides of the containers. When selecting a hanging basket, make sure that the hangers can be quickly and easily attached to the pots and that the hangers are strong enough to support the weight of the container, the plants, and the media when it is wet.

Hanging baskets can be purchased with either external attachable saucers or internal saucerless reservoirs. A saucerless basket comes with a plastic disk that is placed on the bottom of the container before planting and that creates a water reservoir from which water can be reabsorbed by the medium through capillary action. External saucers should snap in place easily and quickly but remain in place. Many growers remove external saucers for production to increase drainage and then reattach them before shipping. If saucers are removed, be careful that water leaching from the baskets overhead does not cause problems for any plants on benches below.

## Potting Medium

The growing medium for hanging baskets must be well drained and well aerated so that young transplants are not over-watered, but must have enough water-holding capacity so that mature plants can go several days between waterings. A



**Figure 1.** Hanging basket planting arrangements

standard hanging basket mix consists of one part sphagnum peat moss, one part composted bark, and one part perlite (volume basis). Most reputable commercial mixes or grower-made mixes with these properties as well as the proper pH and fertility requirements work well.

## Plants per Basket

The number of seedlings or cuttings (transplants) planted per pot depends on the transplant quality and cost, species growth rate, pot size, production time allotted, and greenhouse operation costs. The number of transplants per pot varies from one to four in 8-inch baskets, with three being common, and from three to eight in a 10-inch baskets, with three or four being common (Figure 1). Some plants can fill a basket in a reasonable amount of time from one transplant. Two transplants per basket invariably appears asymmetrical at finish. Fewer transplants can be used when the transplant cost is high (i.e., usually those purchased from propagators), when bench space is available (i.e., early in the season), or when the plant

species grows fast and is naturally self-branching. However, the production time may be longer and labor costs higher if several pinches are required to develop a full basket. More transplants can be used when the species is slow growing, when labor costs or the time required for pinching is high compared to the cost of transplants (i.e., usually grower-produced transplants), or when the production time is limited (i.e., later in the season). Careful scheduling is required to balance these factors to obtain uniform quality for each crop during the season.

The planting depth for the transplants should be shallow or at least no greater than the original depth of the propagating medium. Most growers arrange transplants in a ring around the outside of the pot, with one or more transplants in the center. This arrangement allows plants adequate growing room to develop a uniform basket. Control watering during the first few weeks after planting to allow small transplants to establish in the larger volume of soil.

Some growers hang baskets in their final location immediately after potting. In this case, it is desirable to thoroughly water

the baskets before hanging them. You may also want to use a broad-spectrum fungicide at this time. Other growers place newly planted baskets pot-to-pot on benches for a period of 2 to 6 weeks and then hang them in the final locations. During bench time, transplants can establish under the watchful eye of the grower, and manual pinching can be easily accomplished. Which of the two methods to use depends on a balance between the cultural requirements for a species and the efficient use of space.

## Irrigation Systems

Manual irrigation is not often used for hanging baskets except where an unplanned or one-time crop may be grown for a special purpose or holiday in an unequipped production area. Production areas designed for baskets frequently have automated timing systems and some form of drip emitters. These systems increase basket quality and reduce labor costs. Slow delivery from low-volume emitters allows adequate lateral spread of water or fertilizer to saturate the soil volume of large baskets and, with adequate control, addresses concerns regarding water conservation and groundwater contamination. In fact, application rates that result in excessive dripping on bench crops below are undesirable and may result in diseases that require free water to spread, such as *Botrytis*.

Several types of irrigation systems are commonly used for hanging baskets. Microtube systems carry water to each basket through small-diameter plastic tubes that originate from a larger header pipe (usually  $\frac{1}{2}$  to  $\frac{3}{4}$  inch) attached to the basket support system. Each microtube has a lead or plastic weight that helps disperse the water and that

holds the tube in the container. In some systems, a pressure compensator is attached to each microtube so that water is more uniformly applied to all baskets on the irrigation line. Dimensions of microtubes and headers are based on the number of baskets that will be irrigated on a single irrigation line.

In-line drip systems work in much the same way as microtubes, but the emitter is within or is attached to the header pipe so that water drips down into the basket from above. Spacing of emitters must be planned carefully for either system, depending on the basket size and plant spread.

Automated systems should be designed to deliver an equal amount of water to each basket on a watering station. Each station should be timed carefully to prevent water from dripping on plants below. Various programmable timing devices are available to set the required timing for each station and then cycle through the stations in a section or house. Using automated cycling also places less demand on labor and on water system pressure. In fact, with an additional 24-hour clock, you can set the system to run early in the morning before employees arrive for work. However, automated systems do not eliminate the need for frequent checking and adjustments to water requirements.

Additional irrigation tips:

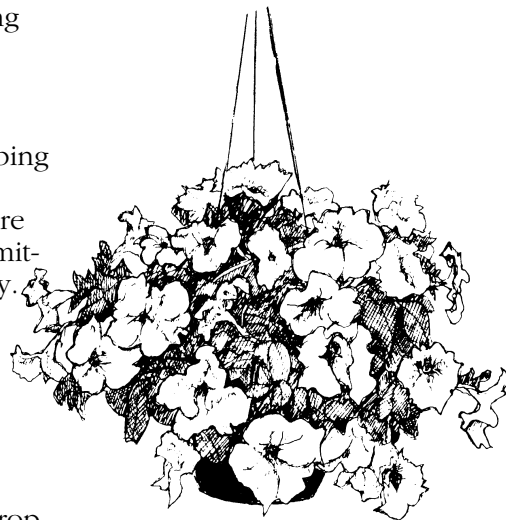
- Design the emitter plumbing carefully. The most common problems are drip lines that are too long or have too many emitters to deliver water uniformly.
- Evaluate water quality, and incorporate in-line water filters if necessary.
- Turn on the irrigation system and check for plugged or slow emitters and leaking pipes before hanging a new crop. Clean the emitters if necessary.

- Check each pot as it is hung and then periodically during the crop to make sure each pot is receiving water from an emitter.

## Hanging Basket Facilities

In greenhouses dedicated to flowering hanging basket production, many growers install two to three tiers of basket supports that run the length of the greenhouse. These tiers often consist of horizontal runs of galvanized pipe either suspended from the greenhouse structure or supported by posts in the ground. If supports are to be suspended from the greenhouse structure, be sure that the structure is designed to support the live load of all the equipment and the containers filled with wet media. The height and between-tier spacing depends on the plant species grown, the light environment in the greenhouse, and the time of year.

In multi-tier systems, suspend plant species that require higher light levels on the top tier, and suspend those that require less light on the lower tiers. Another scheme is to place plants such as New Guinea impatiens on a lower tier during early vegetative growth and then move them to a higher tier several weeks later for flower production.



## Fertilization

Hanging baskets can be grown on the same fertilization schedule as that of bench and bedding plant crops. One program is to alternate between 20-10-20 and 15-0-15 analysis fertilizer, using a constant liquid fertilization program, depending on the electrical conductivity and pH of the media. Apply 100 to 150 ppm nitrogen for the first 2 weeks and then 200 to 250 ppm nitrogen for the remainder of the crop time. Apply clear water every third or fourth watering to help avoid high soluble salts problems. Test the medium pH and soluble salts in house on a weekly basis, and send samples for laboratory soil testing and plant analysis once a month.

Many growers use resin-coated, slow-release fertilizers in flowering hanging basket production. These fertilizers can be applied to the medium surface after potting, or they can be mixed with the medium before potting. Rates depend on the container volume, plant species, product nutrient analysis, and nutrient release rate. Three- to 4-month release rate products are often used for short duration crops, such as impatiens, while 5- to 6-month products are used for longer duration crops, such as ivy geranium. Always follow the manufacturers' recommended rates.

## Temperature

Each species in a hanging basket should be placed in a greenhouse or section where temperatures compatible with that species are maintained. Plants such as petunia and ivy geranium require cooler temperatures; lantana and wax begonia prefer warmer temperatures. Keep in mind that the overhead temperature in the greenhouse may be warmer than that at bench level.

## Light

Each species in a hanging basket should be placed in a greenhouse or section where light levels are compatible with that species. Also consider the light requirements of the crops grown on benches below or on the floor. In areas where baskets are tiered and staggered on multiple levels, hang the species that require less light toward the bottom and those that require more light toward the top. An inexpensive light meter can be used to plan crop locations and diagnose problems if they occur.

## Pinching

Pinching is the process of removing soft growth from a plant to overcome its natural tendency to branch. This tendency, termed **apical dominance**, results from the production of auxin, a natural plant hormone, by the terminal growing point and young leaves. Removing the terminal growing point and one or two uppermost leaves, termed making a **soft pinch**, removes the source of auxin and allows dormant buds below the pinch to grow. A soft pinch is accomplished by pinching off the stem manually, using your thumb and forefinger, or by cutting off the growth mechanically, using a knife, scissors, or clippers. One or more soft pinches are often made to plants in hanging baskets to control their overall size and shape, to increase flower numbers, and to create full, thick growth.

The first pinch should be made when roots have reached the sides and bottom of the container and active shoot growth is present. This usually occurs within the first 2 to 4 weeks after planting. Subsequent pinches can be made at 3- to 6-week intervals, depending on the plant species, geographic

location, and growing conditions. Additional pinches result in fuller growth and add to quality but also add significantly to total crop production time. Consider the selling price and labor costs for the additional pinches and use your experience to decide how many pinches to apply. Refer to Table 1 for pinching requirements for hanging basket crops.

Pinching forces plants to branch and, at the same time, delays flowering because new shoots must reach maturity before flower buds can form. Therefore, the timing of pinches and the resulting flower delay should be included in production schedules. Pinching too early after planting can delay plant establishment, and pinching too late can result in poor branching from hard woody stems below. At times, growers may remove the terminal growing point and two to four leaves as a cutting for propagation to increase production. This **hard pinch** delays flowering more than a soft pinch does. It may also result in less-than-desired branching from the original plant if not enough nodes are left behind.

Unfortunately, tasks often do not get performed on time during the peak production season, and pinching of hanging basket plants may be delayed by more pressing greenhouse tasks. Likewise, crops may not be shipped to market according to schedule, and plants may grow too large for their containers.

**Cutting back** is the process of removing one-half or more of the plant mass to reduce the size of overgrown plants or to remove unacceptable stem elongation. Some plant species respond well to cutting back by producing abundant new growth, but others do not. If the response to cutting back a

particular species is unknown, cut back a few containers to test the species' ability to recover. Cutting back should be reserved as a last measure to reclaim plant quality and is seldom used by meticulous growers.

## Chemical Branching

One disadvantage of pinching is the labor and subsequent cost required to remove every terminal growing point in a hanging basket crop. The first pinch generally requires less time because young transplants have fewer shoots. However, older plants in large baskets may be pinched three or four times, with each successive pinch requiring more and more time.

Ethephon (Florel, Pistil) is a growth regulator that releases ethylene, one of five naturally occurring plant hormones, which limits growth of terminal growing points and stimulates lateral branching. Ethephon is applied as a foliar spray at 500 ppm to actively growing plants at the same time a manual pinch would be performed. If plants are scheduled for two pinches, then two applications of ethephon can be made. Ethephon also inhibits flower bud formation, aborts existing flower buds, and retards internode elongation. All these effects are

beneficial during early stages of production; however, ethephon should not be applied within 6 to 8 weeks of finish. Using ethephon instead of pinching reduces crop time and increases branching, resulting in more flowers on the finished product. Read the product label to determine the concentration to use and to ensure that the chemical is labeled for the particular plant.

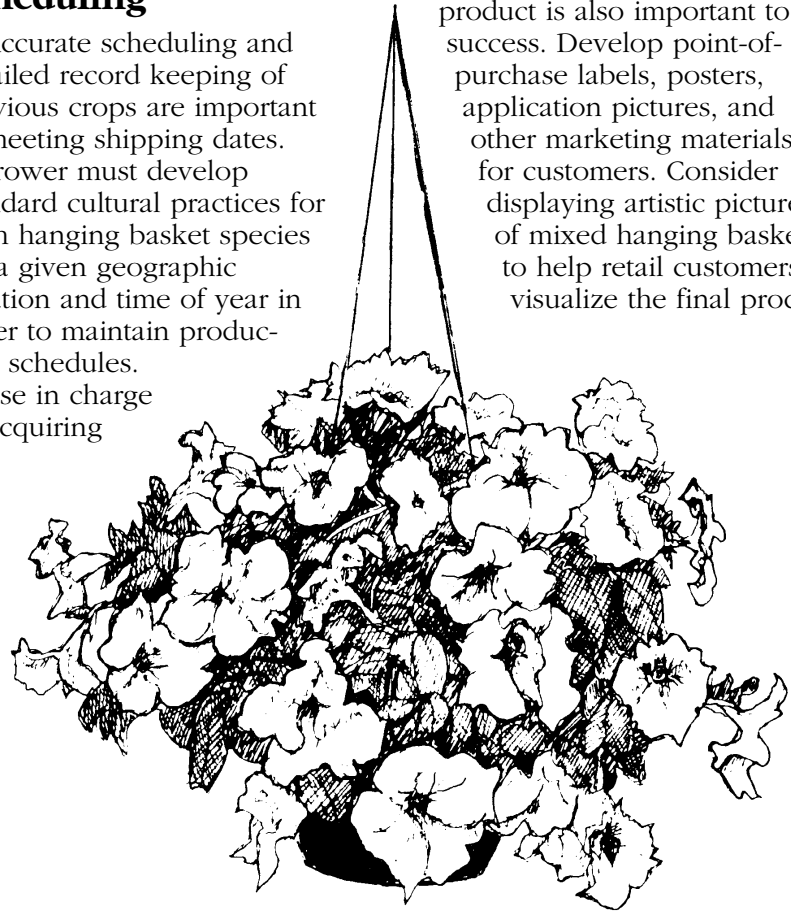
## Scheduling

Accurate scheduling and detailed record keeping of previous crops are important in meeting shipping dates. A grower must develop standard cultural practices for each hanging basket species for a given geographic location and time of year in order to maintain production schedules. Those in charge of acquiring

transplants, baskets, media, etc. must work with suppliers to ensure that the materials arrive on time. Management must make sure that each production step is accomplished according to schedule. Refer to Table 1 for the finish times for a number of hanging basket species.

## Marketing

Producing a quality crop is important, but marketing the product is also important to success. Develop point-of-purchase labels, posters, application pictures, and other marketing materials for customers. Consider displaying artistic pictures of mixed hanging baskets to help retail customers visualize the final product.



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Use pesticides **only** according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

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