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A COMMERCIAL GROWERS GUIDE

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Producing Salvia

By Mark P. Kaczperski, William H. Carlson,
Department of Horticulture

I. History

A. Salvia is a popular bedding plant, especially in the eastern and midwestern areas of the United States and Canada.

B. Salvia can be used in ground beds, backgrounds, borders, and individual and combination pots.

C. Two salvia species are sold: *Salvia splendens* and *Salvia farinacea.* Both are native to Brazil and are members of the mint family (Labiatae).

D. In the southern United States, salvia performs well in partial shade, but it grows best in full sun in the northern areas of the country.

II. Cultivars

A. For best results, purchase fresh F1 hybrid seed each year from a reputable supplier. If you must store seeds from one year to the next, place them in a cool, dry place away from insects and rodents.

B. The use of F1 hybrid seed has many advantages. Among these are high rate of seed germination, increased vigor and prolific flowering.

C. By far the most popular flower color is red. However, new varieties with orange, white, salmon, violet and pink flowers have been introduced that produce very well in packs and pots.

D. Cultivars are normally grouped by height into three categories: short (8-12 inches), medium (12-20 inches) and tall (20-36 inches). Short and medium cultivars usually bloom in the packs. Tall cultivars are normally sold green and bloom in the consumer's garden by August.

E. An important consideration when selecting salvia cultivars is their response to photoperiod. Short-day cultivars should be grown early in the season for fastest blooming, while long-day cultivars should be selected for growing later in the season. Response to photoperiod can vary within an individual series of cultivars (Table 1).

III. Propagation

A. Salvia is commonly propagated by seed. There are 7,500 to 8,500 seeds per ounce of Salvia splendens, while Salvia farinacea contains approximately 23,500 seeds per ounce. Seeds per ounce varies by variety. Check the seeds per ounce for the particular variety to be grown.

B. Seeds require a moist, light, sterile medium for germination. Peat-lite mixes work very well because these mixes are generally free of pathogens, provide adequate aeration, and are able to maintain moisture levels necessary for good germination.

C. The pH of the medium is very important for good germination. It should be between 5.5 and 6.0. Germination can be inhibited by 20 to 25 percent if the soil pH is not within this range.

D. Soil-based mixes are not recommended. However, if one is to be used, it must be properly pasteurized before the seed is sown.

1. Salvia is extremely sensitive to methyl bromide. Do not plant salvia in soil treated with methyl bromide.

E. Salvia is sensitive to high salts. Monitor salts regularly to prevent damage to the seedlings.

F. Sow seed accurately to minimize waste.

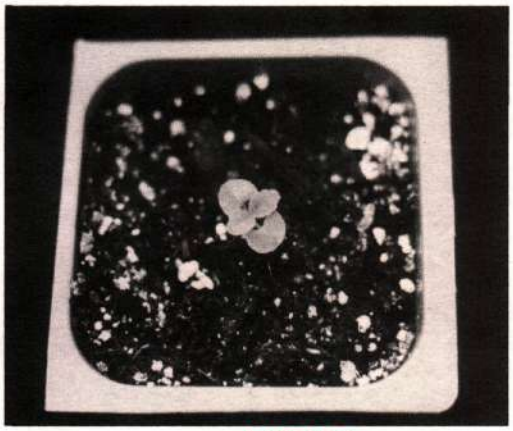
1. The easiest way to sow seed efficiently is with an automatic seeder.
   a. Thoroughly moisten plug trays before planting to eliminate the possibility of washing away the seeds after they have been sown.
   b. A No. 406 size tray is small enough to produce the seedlings economically but large enough to allow the plants ample room for growth until transplanting.
2. Seed can also be sown by hand. Preformed seed trays with rows are preferred over open bottom flats to help reduce the spread of disease through the flat.

Table 1. Effect of photoperiod on flowering in salvia.

Cultivar	Days to flower SD	Days to flower LD	Suggested production daylength[1]
American (Globe of Fire)	59	77	SD
Baby Salvia	56	90+	SD
Blaze of Fire	57	52	LD
Blue Bedder	86	82	LD
Bonfire	64	67	E
Bonfire (Early)	63	72	SD
Bonfire Elite	63	78	SD
Carabiniere Red	62	62	E
Carabiniere Blue	61	56	LD
Carabiniere Orange	68	53	LD
Carabiniere White	58	56	E
Caramba	49	50	E
Catima	90	75	LD
Evening Glow	52	69	SD
Fireball	59	59	E
Firebrand	77	60	LD
Fuego	45	46	E
Fusalier	68	62	LD
Grenadier	51	70	SD
Hot Jazz (Red Pillar)	65	83	SD
Hot Pants	58	66	SD
Lavender Love	54	90+	SD
Park's Special Bedding	60	77	SD
Patens	64	58	LD
Purple Blaze	64	68	LD
Red Baron	60	57	E
Red Devil	60	78	SD
Red Head	65	61	LD
Red Hot Sally	49	51	E
Red Hussar (Bravissimo)	66	77	SD
Red Pillar (Dwarf)	68	82	SD
Red Pillar (Hot Jazz)	65	83	SD
Red Pompeii	66	82	SD
Rose Flame	57	90+	SD
Royal Blue	86	87	E
Royal Mountie	54	70	SD
St. John's Fire	67	58	LD
Scarlet Pygmy	58	57	E
Scarlet Sage	57	63	SD
Sight Delight	54	64	SD
Splendens Tall	55	69	SD
Tally Ho	59	49	LD
Titani	56	52	LD
Torch	52	61	SD
Trail Blazer	58	60	E
Vanguard	62	60	E
Violet Flame	62	57	LD
White Fire	64	52	LD

[1]SD=Short days, LD=Long days, E=Either short or long days.

Weekly stages in development of salvia.



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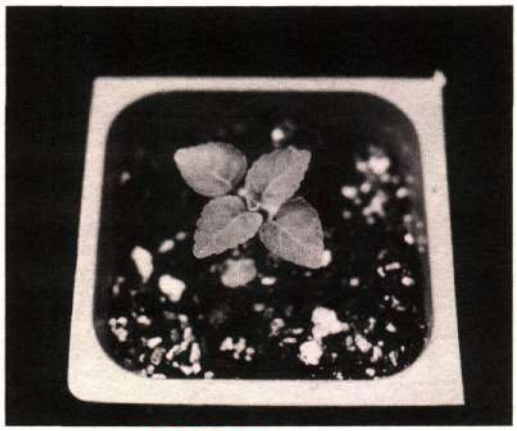

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3. Sow the seeds directly on the soil surface and cover with a thin layer of fine vermiculite. Salvia seed requires light to germinate. Vermiculite will maintain adequate moisture around the seeds while allowing sufficient light to pass through.

G. Adequate moisture levels must be maintained for successful germination. The medium should be thoroughly moistened before sowing.
   1. Water temperature should be 70 to 78 degrees F to ensure that the soil temperature is warm enough for good germination.
   2. After sowing, you can cover the trays with clear polyethylene to maintain high humidity levels. Humidity must be held close to 100 percent. Take care, however, to keep the temperature from reaching excessive levels (above 90 degrees F) under the plastic on warm, sunny days. Also, support the plastic above the seed trays to prevent the seedlings from sticking to the condensate that will collect on the plastic. Covered flats should not require watering until after the seedlings have emerged.
   3. Capillary mats can be used to help maintain an even moisture level across the flat and provide a means of subirrigation when the flats require water.

H. Temperature is critical for good germination. Keep soil temperature between 70 and 75 degrees F. Higher or lower temperatures will delay or reduce germination. After germination is complete, you can reduce the temperature to 65 degrees F until transplanting.

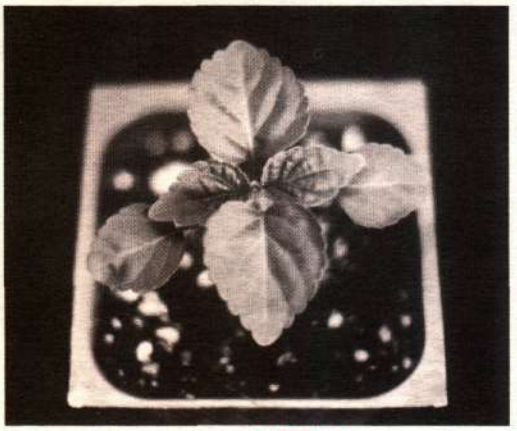
I. Light aids salvia germination. The seeds should be lit 24 hours a day to increase germination and accelerate early growth.
   1. Lighting the crop, especially in the early stages of growth following germination, may reduce total crop time by 1 to 2 weeks.
   2. High-pressure sodium lights or a mixture of warm and cool fluorescent lights will encourage growth without excessive stretching.

J. Seeds germinate in about 10 days, although complete germination may not be achieved for up to 17 days. Maintain warm temperatures and high humidity until germination is complete.

K. The use of growth rooms is becoming more prevalent in the industry because they offer good control over the environment. Seeds are sown in an enclosed room under lights where temperature and humidity are easy to regulate. Seedlings are moved out to the greenhouse after they pass the crucial stages of germination and early growth.

IV. Transplanting

A. Transplant salvia as soon as plants are large enough to handle. Seedlings can be successfully transplanted when they have formed the first set of true leaves.
   1. Unless they're grown in plugs, larger plants will suffer transplant shock when removed from the seed tray. This will delay growth or kill the seedlings.
   2. Plug-grown seedlings do not normally suffer from transplant shock, so these plants can be held longer before transplanting. Transplant from plugs before the seedlings begin to crowd each other and stretch. The larger the plug size used when the seeds are sown, the longer they can be held before transplanting.



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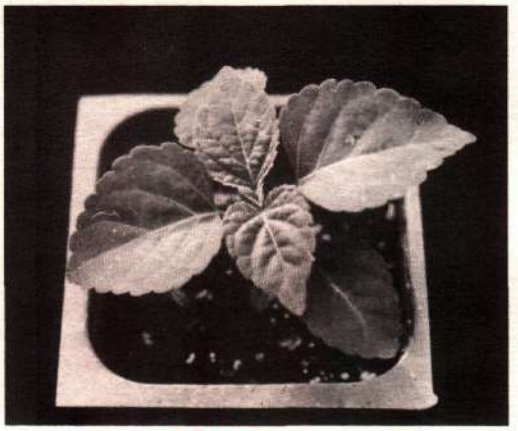

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B. Take care to prevent damage to the seedlings from rough handling. Handle them by the leaves and not the stem when transplanting. If a leaf is damaged, new ones will grow, but if the stem is crushed, the seedling will usually die. Take care not to damage the roots during transplanting. Damaged roots will slow seedling growth and possibly lead to disease problems.

C. Use a light, sterile medium to grow the plants to flower.
   1. A good medium will be free of pests, provide good aeration and be able to hold adequate amounts of moisture.
   2. Do not use soil that has been treated with methyl bromide. Salvia is sensitive to methyl bromide and will be damaged if planted in treated soil.

D. Do a soil test before planting. It is easier to make adjustments to the soil before the seedlings are planted. Adjust the pH to between 5.5 and 6.2.

E. Moisten the medium thoroughly before transplanting so that the young roots do not dry out before the plants are watered in.

F. The plants can be grown in various types of containers. Salvia are most often grown in flats, but they do equally well in 3½-inch pots, combination pots with other annuals and hanging baskets.

G. Keep seedlings at 65 degrees F for a few days after transplanting to allow them to get a good start. Afterwards, the temperature can be dropped to 55 to 60 degrees F, if desired, for a harder plant.
   1. Do not grow salvia at less than 50 degrees F—lower temperatures slow growth and reduce vigor.

H. Adequate water is important to establish the seedlings. Immediately after transplanting, water in the seedlings to prevent drying out. If the plants suffer moisture stress at this stage, permanent damage—such as poor, stunted growth—will result.

V. Growing on

A. Salvia can be spaced flat to flat in the greenhouse. Be sure to keep flats off the floor of the greenhouse to prevent the plants from rooting into the ground. Use saran cloth or plastic risers under the flats to prevent rooting in.

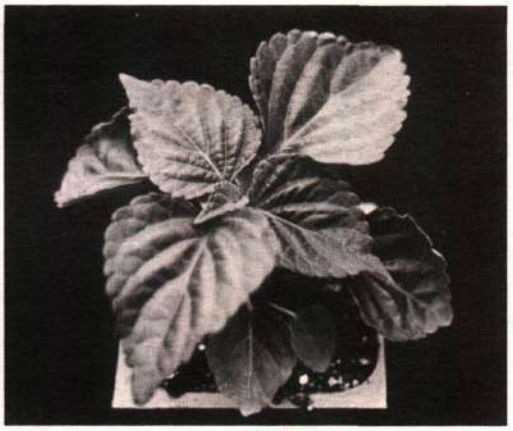
B. Keep temperatures at 55 to 65 degrees F at night and 70 to 75 degrees F during the day. (Or, to keep plants short, use a night temperature warmer than the day temperature—e.g., 65 degrees F days and 68 degrees nights.) Plants will flower about one week sooner at 65 degrees than at 55.

C. Provide full sun for optimum growth. If light levels are too low, the plants may stretch or have reduced flowering.

D. Salvia responds very well to CO_2. Optimal concentration is 1,000 to 1,500 ppm.

E. Grow salvia on the dry side. Too much water will result in lush, tall plants that are difficult to ship, have a short shelf life and perform poorly for the consumer. When water is required, irrigate thoroughly to prevent buildup of soluble salts.

F. Like water, fertilizer should be used sparingly. High levels of fertilizer will result in lush growth. A well balanced fertilizer, such as 15-15-15, can be applied at the rate of 100 ppm N every other watering. Light applications will not promote lush growth but should give the leaves a dark green color.



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G. Salvia is known to be responsive to several growth regulators. If the plants are grown using good cultural practices, however, growth regulators are generally not needed.
   1. If required, B-Nine can be applied as a 0.5 percent foliar spray when the plants begin to elongate.
   2. Cycocel can be applied in two applications a week apart at 750 ppm each time. Some cultivars may be damaged by Cycocel. Test Cycocel on a small number of plants before applying it to the entire crop.

H. In packs, salvia is normally scheduled as a 10-week crop. Plants may be ready for sale in as few as 8 weeks or as many as 12, depending on the cultural procedures used. Plants grown in pots will usually require two more weeks than those grown in flats.

VI. Plant problems

A. Several insects can infest salvia.
   1. Aphids are a common insect problem on salvia. Aphids are small, soft-bodied insects, usually green, that feed on the plant sap. The insects are usually found at the growing tips of the plant or on the undersides of the leaves. Symptoms include distorted or stunted growth. The most obvious sign of the problem is the honeydew the aphids excrete. This is a sticky substance found on the leaves that can provide a medium for black sooty mold.
   2. Whiteflies are also found on salvia, normally on the undersides of the leaves. The eggs are resistant to pesticides, so several successive applications of pesticides are required.
   3. Spider mites, though not true insects, can infest salvia. They are normally found on the undersides of the leaves. Spider mite activity and growth increase under warmer temperatures. The first signs of a spider mite infestation are distorted leaves that have a slightly mottled appearance. Take steps for control at this time. In advanced stages of infestation, spider mites will produce webbing over the tops of the plants. Once the webbing can be seen, plant damage is usually extensive, and the problem is very difficult to control.

B. A few diseases may infest salvia.
   1. Botrytis can be a problem under cool, humid conditions. It appears as a gray mold on the soil or leaf surface. Botrytis rapidly appears if dead flowers are allowed to remain on the leaves.
   2. Rhizoctonia and pythium are the two diseases primarily responsible for damping-off. After the seeds germinate, the seedlings wither at the soil line, and the plants collapse and die. In more mature plants, the roots will turn black and die, causing stunted plants. Damping-off is commonly caused by overwatering.
   3. Powdery mildew appears as a white fungus on the tops of the leaves. To prevent it, avoid splashing water and provide good air circulation.

C. Insect and disease problems can be controlled with cultural and chemical controls.
   1. Cultural controls
      a. The easiest way to control insect and disease problems is to prevent them from occurring. The use of proper cultural proce-

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WEEK 10

dures—temperature, watering and humidity—will help keep problems to a minimum.

b. Sanitation in and around the greenhouse, use of pasteurized media and weed control eliminate host areas where disease and insect problems can begin.

2. Chemical controls

a. Many excellent chemicals are available to control insect and disease problems. Use these chemicals with caution—they are dangerous when used improperly.

b. New chemicals are constantly being introduced. Consult with the county Extension agent to determine which chemicals are being recommended.

D. Several physiological problems may detract from plant quality.

1. Leaf drop

a. The leaves drop from the plant in large numbers. Leaf drop is commonly seen in older plants.

b. The most frequent cause of leaf drop is water stress, caused by either overwatering or underwatering.

2. Poor germination; distorted, stunted growth.

a. These symptoms may occur when salvia is grown in soil treated with methyl bromide.

b. Salvia is sensitive to methyl bromide and should not be grown in treated soil.

3. Burned leaves, few roots.

a. Salvia is susceptible to salt damage.

b. Monitor the salt levels regularly and leach the soil often.

VII. Postharvest considerations

A. Salvia is normally sold in flower except for tall cultivars, which are sold green.

B. Properly identify plants for the consumer with some type of label.

C. Water flats before shipping to prevent drying out while in transit.

D. Handle the plants with care to prevent damage.

E. Inform the retailer of the proper care required by the plants.

1. Plants should be given adequate space in a shady location.

2. The retailer should check for the need for water several times a day.

3. If plants are placed in an enclosed area, the temperature should be monitored. Temperatures in excess of 90 degrees F can injure plants.

Many other Extension publications are available on commercial flower production. Call, write or visit the Cooperative Extension Service Office in your county for more information. Following is a list of related publications available there or by writing to the MSU Bulletin Office, P.O. Box 6640, East Lansing, MI 48826-6640.

E-1275, *Chemical Controls for Michigan Commercial Greenhouse/Bedding Plant Production* (55¢, for sale only)

E-1276, *Insect Controls for Michigan Commercial Greenhouse/Bedding Plant Production* (55¢, for sale only)

E-1375, *Producing Petunias for Profit* (free)

E-1400, *Identifying Major Pests of Greenhouse Bedding Plants* (45¢)

E-1443, *Producing Marigolds for Profit* (free)

E-1493, *Geranium Rust—Symptoms/Disease Development/Control* (free)

E-1579, *Growing Fibrous Begonias for Profit* (free)

E-1580, *Producing Impatiens for Profit* (60¢, for sale only)

E-1664, *Producing Coleus for Profit* (free)

E-1861, Producing Potted Marguerite Daisies for Profit (free)

E-1996, *Producing Seed Geraniums for Profit* (40¢, for sale only)

E-2136, *Producing Tuberous Begonias from Seed* (60¢, for sale only)

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