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ENH 1096

Cultural Guidelines for Commercial Production of African Violets (*Saintpaulia ionantha*)[1]

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African violets (*Saintpaulia ionantha*) are consumer favorites and have been enjoyed as flowering houseplants since their introduction into the United States in 1894. They readily adapt to interior conditions and are commonly seen as specimen plants, in dish gardens, and in terrarium plantings. This article is intended to provide guidelines for the commercial production of African violets including propagation, cultural requirements, and common physiological problems.

Figure 1. Their bright flowers and multiple colors and sizes along with their velvety, evergreen leaves make African violet plants consumer favorites.

Origin and Description

African violets were discovered in 1892 in eastern Africa by Baron Walter von Saint Paul, and the genus was named *Saintpaulia* in his honor. Two species, *S. ionantha* and *S. confusa*, are parents of most of the hybrids lines available today. Cultivars are available in many floral colors including reds, blues, purples, lavenders, pinks, whites, and bicolors (Fig. 1). Plant sizes of *Saintpaulia* varieties include standard, miniatures, and trailing types; all of which exhibit a wide range of leaf shape, pattern and variegation.

Thousands of varieties exist throughout the world. Cultivars for commercial production are selected for consistent growth, uniform flowering, trueness to type, and better interior performance. Most growers offer a wide assortment of flower colors for flexible consumer options. The primary market holidays for African violets are Mother's Day, Easter and Valentine's Day.

Cultural Guidelines

Propagation

Very few *Saintpaulia* cultivars come true from seed. The major means of propagation are by leaf cuttings and tissue culture. Seeds are extremely small: approximately one million seeds per ounce. Sow *Saintpaulia* seeds thinly onto the surface of very fine, screened, pre-watered, level, peat substrate. Irrigate with a fine mist so that seeds will

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settle into the medium. Further covering is not necessary. Maintain high humidity with mist or fogging. Avoid direct watering. At 70°F media temperature, germination should take approximately 25 days.

Many cultivars with suitable growth characteristics for commercial production are patented. Asexual propagation of these varieties is prohibited unless a propagator license and agreement is obtained from the patent holder. Therefore, the decision to propagate on site or to purchase liners from a commercial supplier should be made carefully.

Growers who wish to propagate using leaf cuttings should cut from healthy stock plants. The petiole should be trimmed, dipped into rooting hormone, and inserted into the propagation medium. The cutting instruments should be sanitized between cuts to prevent the spread of pathogens. Many different propagation media can be used including peat, peat and sand mixes, vermiculite, peat and vermiculite mixes, or commercially bagged growing mixes. High relative humidity should be provided, usually by use of a mist or fog system to maintain the leaf cuttings until rooting occurs. Cuttings should be spaced so that leaves do not touch each other and the media should not be water saturated during propagation since this favors development of pathogens, such as bacterial and fungal rots.

Leaf cuttings root in about two to three weeks at 70°F. Plantlets emerge from the base of the petiole approximately six to eight weeks following root development. Many growers remove the "mother leaf" at this time to avoid shading the newly emerged plantlets. Plantlets can be fertilized with a dilute liquid fertilizer at this time. The total propagation time to obtain transplantable material (three to five leaves per crown) from leaf cuttings is approximately 14 to 16 weeks.

Micropropagation is largely used to rapidly increase new cultivars or to propagate chimeras that are not capable of being maintained through leaf cuttings. Licensed commercial tissue culture laboratories supply liners in cell plug trays. They are graded into small, medium or large sizes in 188, 98 or 72 cells per tray. Tissue-cultured liners are easily removed from the cells and potted directly into the finish pots.

Production

Saintpaulia is commonly potted and finished in 4-, 4.5- and 5-inch pot sizes. During potting, care should be taken not to plant crowns or tissue-cultured liners too deeply. Roots of *Saintpaulia* are very fine and require a light-weight, well-aerated, well-drained substrate. The substrate should be composed primarily of peat amended with pine bark, vermiculite or perlite to provide sufficient water-holding capacity since drying out will suppress growth and flowering. The pH of the substrate should be adjusted to a range of 5.8-6.5.

African violets have relatively low requirements for nutrients. Newly potted plants should not receive fertilizers until root growth is well established. Plants then should be fertigated using a balanced liquid fertilizer, such as N-P_2O_5-K_2O at a ratio of 15-15-15 or 20-20-20 with nitrogen at 100-125 ppm or 1,000 lbs N per acre annually. Micronutrients may be included in the substrate or can be included in the fertilizer program. Monitor substrate electrical conductivity (EC) at least monthly to be sure plants are not over-fertilized. Recommended EC readings are about 1.0 dS/m with a maximum of 1.7 dS/m during the active crop growth. Table 1 provides a guide for determining appropriate fertilization for African violets based on leaf analysis.

Subirrigation methods, such as capillary mats and ebb-and-flow, or drip irrigation are generally used for *Saintpaulia* production. If overhead irrigation is used, apply early in the morning so that foliage can dry during the day. Foliage should not be wet overnight or spotting can result. Water temperature is critical. If irrigation water is too cold or too hot, foliar damage will occur. This is most common in Florida during the winter when irrigation water is colder. Light green or yellow spots (chlorosis) can appear on the upper surfaces of the leaves. Deep well water is usually near 70°F and rarely causes problems, except when it is stored in hoses or irrigation lines or outdoors in fertilization tanks.

Saintpaulia grows well at 50% to 70% relative humidity. Low humidity in Florida in the spring and fall can cause flower petal burn. Humidity may be raised by wetting walkways and underneath benches with a hose.

Light intensity is a very important factor in production of quality *Saintpaulia*. Light recommendations vary by cultivar and season, but a range of 800 to 1,200 foot candles is satisfactory. During the winter, growers may adjust shade fabrics or greenhouse coating paints to allow higher light intensities since temperatures are cooler and the hours of natural light are short. In the summer, growers add shade fabrics and glass coatings to lower light intensities and to help control heat. Light intensity influences the foliar appearance of *Saintpaulia*. Cultivars that produce dark green leaves with long petioles may require higher light levels, while varieties with light green foliage may require lower levels.

Plants that receive too much light will be generally stunted, producing brittle leaves, shortened petioles and bleached foliage. Excess light, even for a short duration, can actually burn both flowers and leaves. Shading can be applied to the greenhouse especially from March through October in Florida to reduce light intensity. This should be removed in October. Care must also be taken to control excess light intensity during the packing and shipping process.

An average day temperature of 77°F provides the highest rate of vegetative growth. When the day temperature exceeds 85°F, plant growth and flowering are stunted. Cooling systems are necessary for *Saintpaulia* production in Florida. Night temperature for *Saintpaulia* should be warm (68-70°F) for rapid vegetative growth. Plant growth slows at night temperatures of 65°F, and almost stops at or below 60°F. Bench surface heating or under-bench heating pipes are effective for increasing the growth of African violets. Temperature is the main factor used by growers to speed up or slow down flower development as the crop approaches finish. In summer, excessive production temperatures may cause flowers to abort or open improperly.

The most important factor to ensure a disease-free crop is sanitation. Isolation of incoming material and maintaining greenhouse cleanliness are major control factors for preventing insect and disease problems. All pots, flats, benches, media, tools and any other articles coming in contact with *Saintpaulia* should be clean. It is easier to prevent diseases than to cure them.

Finishing, Shipping, and Interiorscaping

Plants are usually grown pot-to-pot for vegetative size during the first 5 to 6 weeks. Optimum light, temperature, and fertilization are important at this stage for uniformity. When flower buds appear, plants are given spacing at about four pots per square foot. *Saintpaulia* is usually shipped when 5 blooms are open. The total production time from leaf cutting to a finished 4-inch pot is 32 to 36 weeks depending on the time of year.

Finished plants should be groomed and packed by inserting individual plants into sleeves and placing sleeved plants in appropriate boxes for shipping. The sleeve is necessary because the leaves of this plant are fragile. African violets should be transported in refrigerated carriers at a temperature of 60 to 65°F for long-distance shipping. Chilling injury may occur if shipping temperature drops below 50°F for more than 12 hours.

Once they arrive at their final destination after shipping, plants should be placed in interior light levels of 150 foot candles or higher. African violets are often placed on office desks or table tops. Although cultivars vary in blooming in building interior, bloom production will gradually decrease over a three-month period. Occasional grooming of the plant is needed to remove senesced leaves and inflorescences. Plants should not be fertilized unless soluble salt readings are below 0.8 dS/m. Media should be kept slightly moist in interior conditions. Temperatures of 68 to 75°F are most appropriate.

Physiological Problems

Common physiological problems in African violet production are listed in Table 2. Suggested treatments may help reduce the occurrence of the problems.

Table 1. Nutrient concentrations in mature leaves considered low, medium, and high for African violets (*Saintpaulia ionantha)* production.

Nutrient	Low	Medium	High
Nitrogen (%)	<2.5	2.5-4.0	>4.0
Phosphorus (%)	<0.2	0.2-1.0	>1.0
Potassium (%)	<2.5	3.0-6.0	>6.0
Calcium (%)	<1.0	1.0-1.5	>1.5
Magnesium (%)	<0.5	0.5-1.0	>1.0
Sulfur (%)	<0.3	0.3-0.8	>0.8
Iron (ppm)	<70	70-300	>300
Manganese (ppm)	<35	30-300	>300
Zinc (ppm)	<25	25-80	>80
Copper (ppm)	<5	5-30	>30
Boron (ppm)	<30	30-200	>200

Table 2. Causes and effects of various physiological problems during African violet production.

Symptom	Probable Cause	Treatment
Chlorosis: Leaves are light green or medium green with chlorotic edges.	Nutrient deficiency or high light intensity.	Increase fertilizer level or decrease light intensity if blooming is satisfactory. Also, check to see whether micronutrients were included in the potting medium or are included in the fertilizer program. Sometimes different cultivars grown side by side will have one with superb quality and another with off color because of different nutritional or light requirements.
Leaf spotting: Circular, light yellow or greenspots appear on the upper surfaces of leaves.	Water colder than the leaf surface causes spotting and is most common in placeStateFlorida during winter.	Deep well water is usually near 70°F and rarely causes problems, except when it is stored outdoors in tanks. Be sure temperatures of overhead water applications are near leaf surface temperatures.
Long petioles: Leaves appear on extended petioles, giving the plant an undesirable shape.	Low light and high fertilizer rate usually causes the problem.	Increase the light level and/or lower the fertilizer level. Consider cultivars that do not have the tendency to produce stretched petioles.
No flowers or scanty flowers.	Low light.	Plants produced under low light may not bloom profusely, and therefore at least 1,000 foot candles are required. Excessive light will cause plant yellowing, dwarfed plants and reduced flowering. In summer, excessive production temperatures may cause flowers to abort or open improperly. The only control for this problem is to reduce greenhouse temperatures or select different cultivars.
Multiple crown plants.	Young plantlets are potted too deeply into the substrate.	Single-stem plants are generally preferred in the market place to multiple-crown plants in North America. Multiple-crown plants trend to develop when young plantlets are potted too deeply into substrate, which results in the development of adventitious shoots.