Petunias For Sale 8 Weeks After Potting

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What factors affect the growth habit and flowering of petunias? About six years ago this question was asked by a retail grower who wished to pot petunia seedlings in early April and sell flowering plants in late May. Light, temperature, soil moisture, soil fertilization, size of pot, and variety have an effect on rate of growth, habit of growth, and time of flowering. These factors were studied in experiments conducted by the author in the Pennsylvania State University greenhouses in 1954 and 1955. The photos, first used in the Pennsylvania Flower Growers Bulletin 51 of March 1955, are from the Department of Horticulture at Penn State.

HOW THE PLANTS WERE HANDLED

Seeds were sown March 2, 1954 in a quarter inch layer of vermiculite over a steam sterilized soil-sand mixture in a steamed flat. A plastic covering kept the soil moist so the seed germinated quickly. A 60 degree temperature gave rapid growth making the seedlings big enough for transplanting on the first of April.

Except where special treatments were made, all seedlings were potted directly in a soil mixture of equal parts of sand, soil, and peat in 2½ inch standard clay pots, which were placed on crushed stone on a raised bench and surface watered daily. Every two weeks a solution of 20-20-20 soluble fertilizer (2 pounds per 100 gallons) was applied. The plants had normal greenhouse light conditions, which on clear days in the latitude of State College, Pa. would have a daylength varying from approximately 13½ hours in early April to about 16 hours in late May.

Plants in the 60° compartment had 60° at night (N.T.), 70° on cloudy days, and 75° on bright days, as closely as could be maintained with automatic heat and ventilating controls. In the 50° compartment the temperature was kept at 50° at night (N.T.), 60° on cloudy days, and 65° on bright days. During late April and May it often was not possible to keep the temperature this low.

The plants were not pinched. Many plants started to flower in early to mid-May. Records of flowering were obtained when the plants were photographed May 24, which was 7½ weeks after potting. There were 30 plants in each treatment. The tables of data give the number of

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plants in bloom on May 24 as a percent of all of the plants in the specific treatment.

FERTILIZER AND TEMPERATURE EFFECTS ON ALLEGRO

One group of 90 plants was grown in the 60° greenhouse and one group at 50°. Each group was divided into three lots each given different fertilizer treatments.

One lot was fertilized with 20-20-20 fertilizer solution just once 4 days after potting, with no subsequent fertilization. Another lot was given an application of fertilizer solution every 3 weeks, and another lot was fertilized regularly each week.

By the end of May the plants with one application were definitely light colored and deficient in nitrogen. The plants with fertilizing weekly or every three weeks had good foliage color with the weekly applications giving slightly darker green color than plants fertilized every three weeks.

Fertilization practices and temperature both had important effects on flowering as shown in table 1.

Table 1. Effect of Fertilization and Temperature on Allegro

	Percent of Plants in Flower, May 24	
	50 degrees	60 degrees
Fertilized once, 4 days after potting	0	33
Fertilized every 3 weeks	0	86
Fertilized every week	7	90

The plants grown in the 50° house were full of flower buds, but none of the plants were in bloom on May 24 except 2 of the plants fertilized weekly, each plant having only 1 flower open.

In the 60° temperature, 86 to 90 percent of the plants fertilized weekly or every three weeks were in flower and made nice plants in 2½ inch pots as shown in Figure 1. Of the plants with only one fertilizer application, only one third of the plants had flowers open, and flowered by May 24, and were short and stunted.

Regular fertilizing, daily watering to keep the soil moist, and a 60° night temperature gave rapid production of well-flowered compact plants of the variety Allegro in 8 weeks after potting. Starving the plants did not force them into bloom earlier than well fertilized plants.

SOIL MOISTURE AND TEMPERATURE EFFECTS ON COMANCHE

Many growers believe it is possible to force petunias into bloom by "running the soil dry." The effects of soil moisture and temperature on Comanche petunias are illustrated in Figure 2, and by the data in table 2.

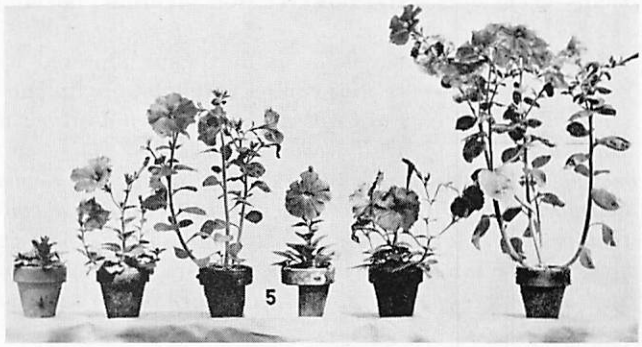

Figure 2. Moisture and temperature effects on Comanche. Three plants on left grown at 50° N.T.; three on right at 60°. Left to right: "run dry;" watered daily; watered daily with pots plunged in sand.

Some plants were grown at 50° and others at 60°. One group of plants was "run dry" by letting the soil become dry before watering. The second group was watered daily. The third group was kept moist by plunging the pots in continuously moist sand and watering the plants daily.

Table 2. Effect of soil moisture and temperature on Comanche

	Percent of Plants in Flower, May 24	
	50 degrees	60 degrees
"Run dry"	7	60
Watered daily	53	96
Plunged in moist sand	70	93

In the 50° temperature only 2 out of 30 plants "run dry" or 7%, had bloomed by May 24, whereas 53% of the plants watered daily had bloomed, and with the constant moisture 70% of the petunia plants had flowered. The plants "run dry" were stunted; those with continuous moisture were leggy. The daily watered plants were best.

In the 60° night temperature, plants "run dry" made a little more growth than at 50° but the plants were small. Although 60% of the plants bloomed, there was only one

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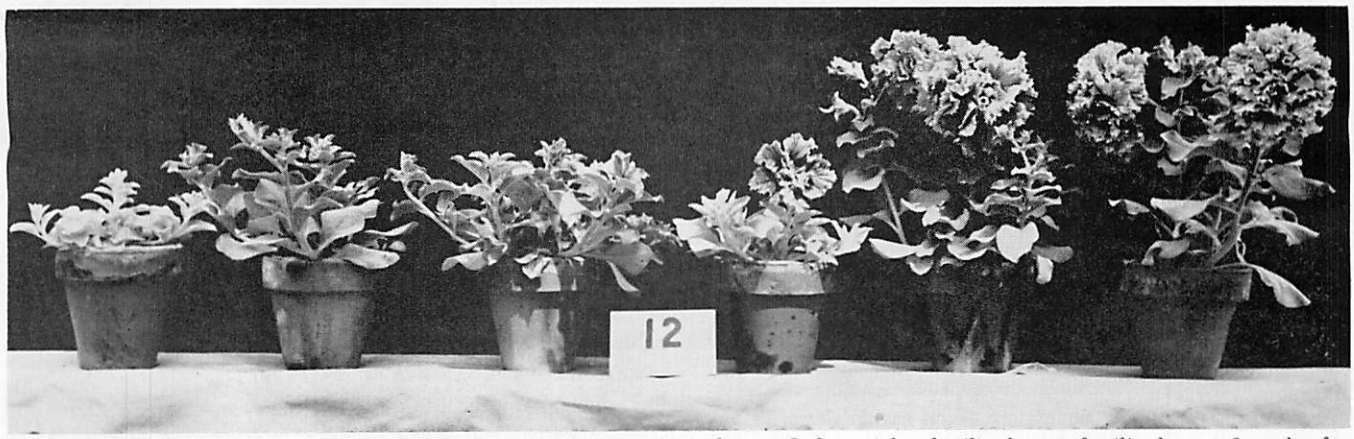

Figure 1. Fertilizer and temperature effects on Allegro in 2½ inch pots. Left to right: fertilized once, fertilized every 3 weeks, fertilized weekly, all grown at 50° N.T. Three plants on right grown at 60° N.T. with the same fertilizer treatments.

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flower per plant and the flowers were smaller than with more moisture.

The very moist plants made vigorous growth and 93% bloomed by May 24 and there were many flowers per plant. The plants were, however, too vigorous, tall and leggy.

With daily watering, 96% of the plants flowered by May 24 and these were nice compact well-flowered plants.

Running the plants dry did not stimulate flowering; it retarded the plants. Daily watering produced good compact plants with both 60° and 50° N.T. but the 60° plants had more flowers per plant and bloomed earlier. A constant moisture supply obtained by plunging the pots in moist sand resulted in even more flowers per plant and good blooming, but the growth was too rank and tall and unsatisfactory.

SOIL MOISTURE AND TEMPERATURE EFFECTS ON LA PALOMA

Plants were grown in 50° and 60° greenhouses. Half of the plants at each temperature were placed on crushed stone and watered every day. The remaining plants were plunged in moist sand and also watered every day, so these plants remained moist continuously.

The 60° plants flowered much earlier than the 50° plants. Nearly every plant grown at 60° flowered by May 24. The continuous supply of moisture in the plunged pots also speeded up growth but did cause stretching as shown in Figure 3. The plants watered daily were compact and very satisfactory.

Table 3. Effect of soil moisture and temperature on LaPaloma

	Percent of Plants in Flower, May 24	
	50 degrees	60 degrees
Daily watering	40	97
Plunged in sand	66	97

In the 50° compartment only 40% of the plants with regular daily watering were in flower on May 24; these plants were short and very compact. At the same temperature, constant moisture by plunging the pots in sand caused more rapid growth and 66% of the plants were in flower on May 24; these plants were taller and less compact than desired.

With LaPaloma most rapid production of high quality plants was obtained with the 60° night temperature and regular daily watering.

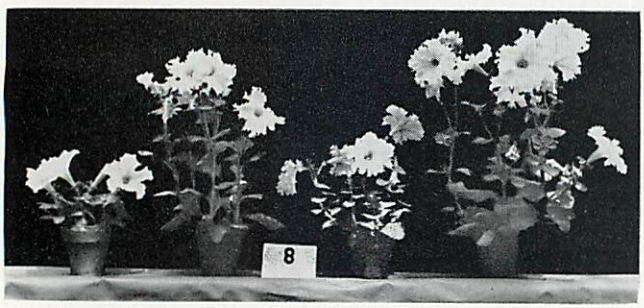

Figure 3. Water and temperature effects on LaPaloma. Left to right: 50° N.T. and daily watering; 50° with pots plunged; 60° and daily watering; 60° with pots plunged.

SOIL MOISTURE AND TEMPERATURE EFFECTS ON POPCORN

The variety Popcorn tends to have a more compact growth habit than some other varieties. Popcorn seedlings were potted and handled the same as for LaPaloma to see how Popcorn would respond.

The flowering and growth responses are shown in Figure 4 and by the data in table 4. With a 60° temperature and continuously moist soil, 96% of the plants were in flower May 24; with 50°, 90% were in flower.

Table 4. Effect of soil moisture and temperature on Popcorn

	Percent of Plants in Flower, May 24	
	50 degrees	60 degrees
Daily watering	50	83
Plunged in sand	90	96

With 60° and regular daily watering of pots placed on crushed stone, 83% of the plants were in flower by May 24, and in the 50° temperature only 50% of the plants had bloomed.

The 60° plants were larger and had more flowers than those in 50° and the continuous supply of moisture gave increased growth without causing leggy tall growth.

The natural habit of growth of the variety Popcorn gave rapid compact growth and early flowering with 60° night temperature and continuously moist soil. Of course, the plants were well fertilized with regular applications of liquid fertilizer.

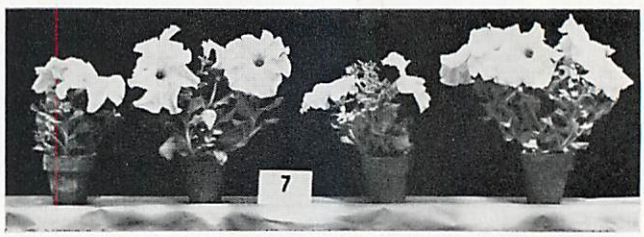

Figure 4. Water and temperature effects on Popcorn. Left to right: 50° N.T. and daily watering; 50° with pots plunged; 60° and daily watering; 60° with pots plunged.

WATER, TEMPERATURE, AND LIGHT EFFECTS ON SONATA

Plants were grown at 50° and 60° N.T. with and without 4 additional hours of light (10 pm – 2 am) every night from 60-watt incandescent bulbs and reflectors spaced 4 feet apart and 2½ feet above the plants.

With normal light and 60° N.T. and regular daily watering 98% of the plants were in bloom by May 24; with the additional light every one of the plants bloomed by that date. In the 50° compartment 73 and 80% were in bloom without and with the additional light respectively.

Although the additional light each night caused earlier blooming than with normal daylight, the lighted plants were taller than desirable. See Figure 5.

The 60° plants bloomed earlier than the 50° plants and were a little taller but not too much taller than those in

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the cooler temperature. The plants made nice salable stock in May.

Similar light and temperature treatments also were given to plants with pots plunged in moist sand. The continuous moisture caused plants in the 60° section to bloom earlier and have more blooms than similar plants watered daily. The continuous moisture supply, however, caused the plants to be 50% taller than with daily watering and to be objectionably tall.

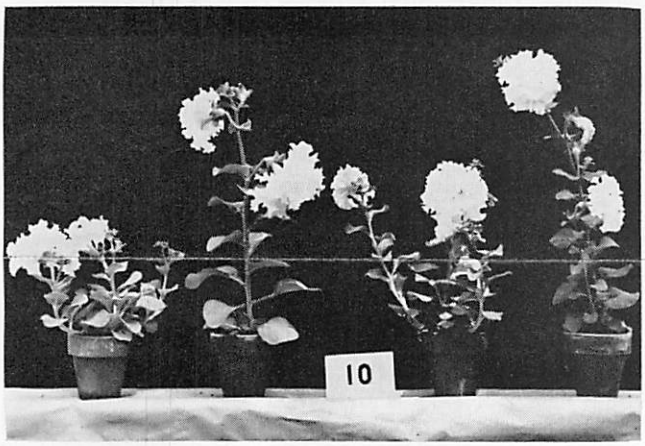

Figure 5. Temperature and light effects on Sonata. Left to right: 50° N.T. with no supplementary light; 50° with 4 hours of light per night; 60° without lights; 60° with lights.

In the 50° house the plants in pots plunged in moist sand were not much taller than those with regular watering but the continuously moist soil did not cause the plants to bloom any sooner or much more profusely than with regular daily watering in the 60° temperature.

With Sonata most rapid production of good salable plants was obtained with regular daily watering, fertilizing with liquid solution every 2 weeks, 60° night temperature, and normal light.

With 60°, the extra soil moisture and supplementary light at night speeded up blooming but made the plants too tall and leggy.

EFFECT OF SIZE OF POT

Some growers feel that a pot-bound petunia plant will bloom quicker than plants which are not pot-bound.

Plants of the variety Linda were grown in 2¼, 2½, and 4 inch standard clay pots. All pots were plunged in moist sand and fertilized every two weeks to keep the moisture and nutrient conditions as nearly equal as possible. All were grown with 4 hours of supplementary light at night.

The plants in the 2¼ inch pots became pot-bound first and in the 4 inch pots last. Plants in the 4 inch pots bloomed first, and had more flowers than plants in the smaller pots, as shown in table 5. All of the plants tended to be tall in this experiment due to the supplementary light and the lack of adequate spacing but the plants in 4 inch pots made the most growth and were tallest.

On May 24 all of the plants in the 4 and 2½ pots were in bloom in the 60° house, whereas only 90% of the plants in 2¼ inch pots had flowered.

Table 5. Effect of size of pot on blooming of Linda

	60 degrees			*50 degrees*		
	Size of pot (inches)			*Size of pot (inches)*		
	2¼	*2½*	*4*	*2¼*	*2½*	*4*
No. of flowers per plant (May 24)	3.4	3.3	14.2	0.7	0.5	5.7
Percent of bloom May 24	90	100	100	33	30	100
Height (In.)*	13.2	15.0	19.0	11.5	12.5	13.9

*Excessive height due to crowding, extra light at night, and continuous moisture by plunging pots.

With the 50° night temperature, every one of the plants in 4 inch pots had flowered by May 24, whereas only one third of the plants in the 2¼ and 2½ inch pots had flowered.

This shows that the use of small pots to induce pot binding did not induce earlier flowering; the reverse was true. If the pots had not been plunged in sand, the smaller pots would have dried out more quickly than the larger ones and the differences probably would have been greater.

This does not mean that we suggest growing petunia bedding plants in 4 inch pots but does show that pot binding does not stimulate flowering.

SUMMARY

1. Good salable plants of the varieties Comanche, La-Paloma, Allegro, Popcorn and Sonata were produced for sale in late May by sowing seed March 2, potting seedlings April 1 in a well prepared soil, watering the plants daily to provide a good but not excessive moisture supply, maintaining a night temperature of 60°, and fertilizing the plants with solution every two weeks.

2. The conditions that gave the most rapid growth of petunias caused the earliest flowering, but these conditions are not necessarily satisfactory for salable bedding plants because the plants may be too tall. It is necessary to have the proper balance of temperature, moisture, light, fertilizer, and spacing to produce good salable plants.

3. Plants with a 60° night temperature flowered earlier than with 50°. Good petunias can be produced at 50° but it takes longer. Whether you use 50° or 60° will depend on the time schedule you wish to use. Although 55° was not used, it might be expected to give an intermediate rate of growth.

4. A continuous supply of moisture obtained by plunging the pots in moist sand caused earlier flowering but plants tended to be too tall. "Running plants dry" delayed growth and flowering, and the plants were small. Daily watering of the plants in pots set on crushed stone gave the best balance of early flowering and compact growth. Since soil moisture has such an important effect on the growth and flowering of petunia, and soil moisture in pots is affected by such factors as soil mix, type of drainage, type of pot or plant container (clay, peat, or plastic) the grower has to adjust his watering practices accordingly.

The variety Popcorn has a compact habit of growth and even with pots plunged in sand the plants were early flowering, compact, and very nice plants; this variety did

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not become tall and leggy with the continuous moisture supply.

5. Four hours of incandescent light per night speeded up growth and flowering but tended to make the plants too tall.

6. Plants in small pots which caused them to become pot-bound earlier than in large pots did not result in earlier blooming.

7. Proper spacing is necessary to keep the plants from

growing too tall, and saves labor by eliminating the need for a pinch.

8. Different varieties respond differently in growth and a grower has to keep his own records for future reference. With the 8 week production program, we are giving *the* plants the conditions that will give rapid growth and flowering and still maintain a good habit of growth. If you handled plants the same way on a 3 or 4 months basis, the plants would be ready to sell too early and would be too big at the time of most sales in May and June. Earlier plantings can be grown cooler whereas for late plantings, optimum conditions for rapid growth are essential.