

# Begonias

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Begonias are perennial, succulent herbs native to tropical areas of Mexico, Central and South America, Asia and South Africa. The genus *Begonia* contains more than a thousand species, and these make up all but 15 of the species in the Begoniaceae family, which contains only two other genera — *Hillebrandia* and *Symbegonia*. Only a few *Begonia* spp. are grown commercially, yet more than ten thousand cultivars and hybrids of them exist.

Begonias are named for Michel Begon (1638-1710), a French magistrate and administrator who, in 1681, following a series of civil disorders, was sent to the French Antilles to introduce legal reforms. An amateur botanist, Begon introduced begonias to European botanists upon his return to France. He was noted for his large collection of botanical books, many including original paintings, which he readily shared with interested students or other amateurs.

Some begonias have fibrous roots (*Begonia semperflorens*, the Wax Begonia), some a semi-tuber (*Begonia socotrana*, the Norwegian or Christmas Begonia), and others have a definite tuber (*Begonia x tuberhybrida*, the Tuberous Begonia). Leaves are alternate but of variable shape. Begonias are monocious (one house), which means that male and female flowers occur on the same plant (*i.e.*, house).

Basically, flowers are white, pink, red, orange or yellow. In the greenhouse, begonias are grown as potted plants, but *B. Semperflorens* does quite well as a bedding plant in shade or full sunlight. If intended for growth in full sunlight, Wax Begonia seedlings and small cuttings should be grown in full sunlight before outdoor planting. If grown in shade and then transplanted into outdoor beds in full sunlight, foliage burning is almost certain to occur.

## Wax Begonia

The Wax Begonia is *day neutral*, which means that it will flower regardless of the length of the night, making it ideal for year-round production with little effort. It is propagated by seed ( $F_1$  hybrid, two million per ounce) or shoot cuttings. Its foliage may be green, green with a red edge or dark, bronzy metallic.

Wax Begonias are divided into three classes: dwarf, intermediate and tall. The dwarf is the most popular, growing to 3-5 inches in pots, 6-8 inches in outside beds. Plantlets may be pinched to keep them compact and to increase their branching.

For pot plants, seed sown in July should make the 4-inch pot size for Christmas, the 5-inch pot size for Valentine's Day. Five-inch spring plants can be produced with September sowings. Seed sown in a very light medium

(sandy) germinate at 21°C (70°F) in *ca.* 10 days. Reduced strength liquid fertilization should be applied just after germination. Later, only moderate fertilization (4 oz. 20-20-20/100 gal. water) is required with no particular minor element requirement. Growing media with lots of peat and a 6 pH work well. Nights of 15.6°C (60°F) are recommended.



## Norwegian (Christmas) Begonia

The Norwegian (Christmas) Begonia is a *short day plant*, flowering *ca.* 8-9 weeks after long nights are imposed — similar to a 9-week response mum. Today, it (*B. Socotrana* 'Glorie de Lorraine') has, in effect, been replaced by the kids of her marriage to *B. Dregei*, a long day plant.

Her kids (*B. x cheimantha*, the Christmas or Lorraine Begonias) resemble her in appearance and, for the most part, in temperament (*i.e.*, they are SDPs), requiring nights  $\geq 11\frac{1}{2}$  hours for floral initiation. Unlike mom or pop (both semi-tuberous), the kids are fibrous rooted.

Their flowers are white, pink (most common) or red. They are propagated by leaf or stem cuttings. Adventitious bud formation by leaves occurs readily at 18°C (64°F), with almost complete suppression at 81°F (27°C).

Short days stimulate adventitious bud formation but inhibit root formation. Plants from leaf cuttings taken in the fall should be shifted to 4-inch pots in the spring and into 6-inch pots in late summer, when they should receive 12-inch spacing until Christmas sales.

Terminal cuttings taken in July will easily make attractive 5-inch flowering plants by Christmas. It is important that cuttings do not receive long nights to ensure their continued vegetative growth. This is also true of leaves utilized for propagation. If removed leaves  $\geq 3-4$  cm<sup>2</sup> receive LNs for a couple of months, the plantlets they produce will be reproductive.

The influence of night temperatures on the short day effect is interesting and very important. At  $\geq 21^\circ\text{C}$  (70°F), floral initiation occurs only under  $\geq 11\frac{1}{2}$ -hour-long night conditions. Temperatures below 20°C inhibit the SD (LN) effect — *floral initiation will occur under LDs as well as SDs*. No floral initiation takes place if the nights are 10°C (50°F), even if the days are 30°C (86°F); however, if these temperatures are reversed, floral initiation will occur. So, to control the vegetative/reproductive cycle, make sure the nights are *ca.* 21°C and employ the night length effect.

Both GA<sub>3</sub> (gibberellic acid) and IAA (indole acetic acid) foliar sprays will inhibit floral initiation of *B. x cheimantha*

plants growing under 21°C, LNs. IAA will also inhibit floral initiation of plants growing under 15-20°C nights, but GA<sub>3</sub> will not.

Here in the South, it is often difficult to maintain temperatures cool enough to preclude excessive internode elongation induced by warm temperatures. Growth retardants offer a means of keeping height down in spite of less than favorable temperatures. After the cuttings are well rooted and just after the final pinch is made, a chlormequat (Cycocel) foliar spray (ca. 1,000 ppm) or a growing medium drench of 6 ounces/6-inch pot of 0.25mg active ingredient of ancymidol (A-Rest) will keep plant height down. Avoid applying the foliar spray during sunny conditions.

## Reiger Begonias

The name Reiger, also called the Hiemalis Begonia [*B. x hiemalis* in the United States, *B. x elatior* in Europe (since 1979)], is for the German Otto Reiger, who released many of these cultivars (e.g., 'Schwabenland,' 'Aphrodite,' etc.) during the past 40 years. The species resulted from crossing the smaller flowering *B. socotrana* (SDP) with the larger, more colorful flowering *B. x tuberhybrida* (LDP); thus, the plants selected from these crosses to be Reiger's are large flowering, colorful (white, pink, red, yellow and orange), fibrous rooted SDPs.

Some of the crosses were originally made in 1885 by the famous firm John Vietch & Sons (England). The cultivars vary in chromosome numbers; therefore, variations among cultivars in their physiological responses as well as their leaf size and shape, flower size and type (i.e., single, semi-double and double), growth habit, etc., are not surprising. Most have the upright growth habit suitable for pot plants, but some cultivars (e.g., Aphrodite types) have pendulous stems and flowers, making them ideal for hanging baskets. Reigers were introduced into the United States by Mikkelsen's of Ashtabula, Ohio.

Like Christmas Begonias, Reiger Begonias are propagated via leaf or stem cuttings, which respond to photoperiod and temperature similarly to Christmas Begonias; however, there are differences: At  $\geq 24^{\circ}\text{C}$  (75°F), they exhibit as SD response (i.e., a critical  $\geq 11\frac{1}{2}$ -hour night), while at cooler temperatures, they will initiate flowers under LDs.

A cutting (2 per 6-inch pot) should be stuck with ca.  $\frac{1}{4}$  inch of its root ball top out of the growing medium. A mixture of half peat moss by volume makes an ideal growing medium. Superphosphate and micronutrients should be included in the medium, which should be adjusted to ca. 5.7 (pH) with ground limestone. The cuttings should be grown at ca. 18°C (65°F) under 16-hour days and pinched to induce ca. three shoots per cutting. When these shoots have ca. three leaves each or are ca. 2 inches long, they are ripe for the LN treatment.

If the recommended LN/temperature combination is imposed for three weeks, flower development will continue even under SNs (i.e., LDs). A switch to SNs following the

three weeks of LNs encourages continued floral initiation by the growing shoot. If there is no switch to SNs following the three weeks of LNs, shoot growth will cease (i.e., the shoots will no longer continue to initiate more flowers), and the plant will go dormant.

The most rapid flower development is at 24°C; however, at this temperature, internodes and inflorescences elongate, flower size and color intensity are reduced and leaf size increases. For these reasons, the plants are finished at 18°C for high quality production.

Like other begonias, Reigers are not "heavy feeders." Vegetative growth is sufficiently promoted by constant feeding with N, P and K at 200, 190 and 200 ppm, respectively, until the end of the third week of LNs. Then only water should be applied for a week. Lastly, at the beginning of the fifth week of LNs, alternate each N, P and K (100, 190 and 150 ppm, respectively) application with water only.

Light intensities for quality Reigers must be adjusted to production temperatures. In general, the higher the growing temperature, the lower the light intensity recommended: maximum ft-c of 3,000 at 18°C (65°F), 2,000 at 23°C (70°F) and 1,500 at 27°C (85°F).

Depending on the cultivar and season, it takes 10-16 weeks to produce a marketable 6-inch pot of Reigers.

To produce hanging baskets, plant three cuttings per 8-inch or four per 10-inch basket. Give them three weeks of SNs, then pinch them and give them LNs. If double-pinched, the cuttings are kept under SNs until the second pinch is made, which should be a month after the first pinch. It requires 10-16 weeks to produce a hanging basket from single pinched cuttings, 14-20 weeks to produce one from double-pinched cuttings.

Reigers have successfully been propagated via tissue culture, but high mutation rates are common. Leaf and flower stems are the best plant parts to use for this procedure, with one stock plant yielding ca. 250 plantlets ready for transfer into a peat medium in ca. 10 weeks.

Chlormequat (Cycocel) also has been used on Reigers to control plant height. When the shoots that develop after pinching are ca. 5 cm. (2 in.) long, foliar sprays of 500 to 1,500 ppm are effective. Higher concentrations can produce leaf chlorosis, especially if an application is made on a sunny day. Safer, but requiring more labor than a foliar spray, is a Cycocel drench of ca. 3,000 ppm.

The fungicide Bayleton, recommended for begonia powdery mildew control, will interestingly reduce plant height. It should not be applied until floral initiation has occurred, which makes it very suitable for those cultivars that have a tendency to elongate during late development.

Dikegulac (Atrimmec) foliar sprays (4,000 ppm) applied early to non-pinched rooted cuttings [i.e., those with ca. 5 cm. (2 in.) of new growth following a planting] have been reported to increase lateral growth and enhance plant compactness.

## Tuberous Begonias

Tuberous Begonias (*B. x tuberhybrida*) are the result of crosses of many begonia species from the Andes; among the plants were *B. baumannii*, *B. boliviensis*, *B. Davisii*, *B. Pearcei*, *B. froebelii* and *B. Veitchii*. The male (staminate) flowers are double and very large, some camellia-like in appearance; hence, they are often used in corsage work.

Tuberous begonias are divided into 13 groups based on plant habit, flower form and color of the male flowers. It appears to me that there is some overlapping among the groups. Tuberous begonias often are planted in shady beds for the summer and, occasionally, potted ones are forced under supplemental lighting in the winter. Some groups make fantastic hanging baskets.

Presently, most of the tuberous begonias grown in the United States are from seed, with <10 percent produced by tubers from Europe.

Seed mixtures and individual colors are available. The seeds should germinate in a couple of weeks at 18-21°C (65-70°F). Because light is required for seed germination and because the seeds are small (a million-and-a-half seeds/ounce), seeds should be misted (not hose-water) and not pushed into germinating medium. Once large enough to handle (*i.e.*, *ca.* eight weeks after sowing), the seedlings should be transferred into a community flat. Once crowded there, they should be shifted into 2½-inch pots and subsequently up-potted until sold.

Night light breaks ensure vigorous growth, even with just-germinated seedlings. Constant, moderate fertilization (*ca.* 150 ppm N) should be done thoroughly, and the growing medium should never be allowed to dry. High quality plants from seed sown in December can easily be produced in 4- or 5-inch azalea pots for May/June sales if warm temperatures 18°C (65°F), shading and high humidity are maintained. Beautiful flowering begonia pot plants may be produced from a tuber in only three months.

Tuberous begonias should be grown at 18°C (65°F) and *ca.* 3,000 ft-c maximum light intensity. At <17°C (63°F), tuber formation is induced, and at >26°C (79°F), small plants with few flowers result.

Tuberous begonias are generally classified as long day plants, which, I think, strictly speaking is questionable. The plants initiate flowers while growing vegetatively, the vegetable phase induced by nights  $\leq$  12 hours. The plants will not grow vegetatively without producing flowers — so is their characterization as a LDP really correct?

If subjected to nights  $\geq$  12 hours, tuberous begonias cease growth, their leaves abscise, and they form a tuber. Once tuber formation is initiated (*i.e.*, induced by LNs), even the immediate implementation of SNs will not reverse the rest induction process. As previously mentioned, long night rest induction is enhanced by cool temperatures, but night length is the dominant factor. Rest is satisfied by time — the tubers will sprout after a couple of months. Only 10 ft-c light is sufficient to produce an LN effect — 10 ft-c for only 6 minutes/30 minutes of dark will do the job.

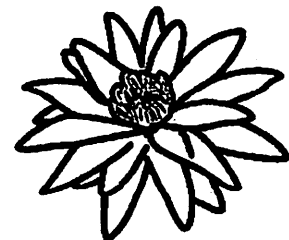
In the 1970s, Benary Seeds (Germany) introduced the "Non-Stop" series of tuberous begonias. They are popular as potted plants, bedding plants and hanging baskets. They are grown from seed, they grow uniformly in various environmental conditions, and the color range of their semi-double flowers is wide.

In addition to the above, some other popular tuberous begonia series generally produced commercially include the 'Pavilion,' 'Patio' and 'Memory' series with their large, camellia-like flowers. The 'Musical' series has medium-large, double flowers and is used for hanging baskets.

Flower shattering (drop) is a physiological problem that may occur with tuberous begonias. A foliar spray with silver thiosulfate (STS) right before they are shipped should prevent this from occurring. Solution sufficient for foliar spraying 750 plants (10 ml spray each) is as follows:

- ✓ Dissolve 380 mg silver nitrate in 1 gallon of water.
- ✓ Dissolve 2.2 g sodium thiosulfate in another gallon of water.
- ✓ Slowly pour the gallon of silver nitrate into the gallon of sodium thiosulfate, stirring vigorously while mixing the two.
- ✓ DO NOT use a spreader/sticker.
- ✓ Wear protective clothing, including a respirator, when applying the foliar spray.

Plant height can be reduced by 500 ppm chlormequat (Cycocel) foliar sprays when lateral growth is *ca.* 5 cm (2 in). A more concentrated application can induce foliage



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yellowing, which usually disappears before marketing. The fungicide Bayleton also reduces plant height during the latter growth stage. Daminozide (B-Nine) foliar sprays up to 3,000 ppm have proven *not* effective for height reduction of tuberous begonias.

## Rex Begonias

The Painted-Leaf or Rex Begonias (*Begonia x Rex-Cultorum*) are grown primarily for their foliage, not their flowers. The original Rex Begonia, probably not in cultivation today, was accidentally imported into England in 1856 as a weed in a potted orchid. Typically, they have a rhizomatous stem. Their leaves may be 15 x 20 cm (6 x 8 in.); they are highly pubescent, oblong, pointed, wrinkled and wavy-margined. Their colors vary and may be a rich metallic kaleidoscope of green, gray, pink, red, rose, maroon, silver and purple. Many cultivars are available. Some quite popular ones include 'Merry Christmas,' 'Stained Glass,' 'Mardi Gras,' 'Her Majesty' and 'Yule Tide.' They grow best under filtered light (2,000 ft-c for a few hours a day is fine) at 15-18°C (60-65°F) nights, 21-24°C (70-75°F) days. If artificial light alone is used, a minimum of 400 ft-c for 16 hours/24 hours should be applied. They will not tolerate constant moisture. If they wilt, they will recover quite nicely when watered. Moderate fertilization only during rapid growth is recommended.

They are propagated by plant division, usually done

when repotting, and by leaf cuttings, which readily generate new plantlets when pinned, usually with toothpicks, to a moist medium. In a home situation, it is also recommended that the plants be divided if they become pot-bound. In some cases, this must be annually. Rex types often lose their intense color if they become pot-bound.

## Insects and Diseases

For insect and disease control, please follow the recommendations in the *Agricultural Chemicals Handbook* published by your Cooperative Extension Service.

Aphids, white flies, mealy bugs, thrips, cyclamen mites and fungus gnats can infest begonias. Aphids reduce leaf color and cause leaf crinkling. Fungus gnats hinder rooting. Cyclamen mites reduce internode length and leaf size. They also "dry" (brown) the leaves and flowers. Thrips induce leaf streaking.

Many, but not all, begonia diseases can be "discouraged" by conventional sanitation measures.

Powdery mildew (*Erysiphe* and *Oidium*) produces white blotches on the foliage. It seems to be encouraged by high humidity and irregular watering, so maintain the plants with even moisture and provide rigorous air circulation.

Bacterial leaf spot (*Xanthomonas*) of begonia leaves first appears as small round spots on the leaves. It looks like a drop of oil. These become large and water-soaked. Infected leaves (really, probably the entire plant) should be removed immediately and destroyed. In severe cases, the entire plant may wilt. Excellent air circulation and reduction of high temperatures and humidity help prevent its infection, as does keeping moisture off the foliage.

Botrytis on begonia may infect the stem (It can girdle it.) and leaf (The entire leaf may blacken.) as well as the flowers, which brown and die. Its infection is promoted by cool temperatures and high humidity. Propagate only from healthy stock and keep water off the foliage.

Stem rot at the soil line (*Rhizoctonia*) and root rot (*Pythium*) can be controlled if plant material, rooting/growing media and pots are disease-free.

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