Streamlining New Guinea Impatiens

In a perfect world, New Guinea impatiens would all flower at the same time, but that doesn't happen. This Clemson University research will help you determine when your New Guinea impatiens will flower.

By Jim Faust, Kelly Lewis and Renee Keydoszius

New Guinea impatiens breeding for greenhouse and landscape performance has tremendously improved over the past two decades. At the Penn State Trials this past summer there were more than 100 great-performing cultivars in both the shade and full sun plots. However, spring greenhouse crops can still suffer from poor flowering uniformity and production efficiency. All too often, New Guinea impatiens lack flowering uniformity on a bench or between different cultivars. This often forces the grower to hand-pick plants or cultivars to ship.

Ideally, New Guinea impatiens could be made to flower uniformly, so the crops could be shipped in a bench-run. At Clemson University we have conducted a series of experiments over the past couple of years to refine the production characteristics of New Guinea impatiens. The goals of this project were to identify a series of cultivars that had uniform greenhouse production characteristics and develop methods to better predict flowering.

Predicting Flowering

In order to accurately predict flowering we separated crop lifespan into two phases. First is the vegetative phase, which ends when flower initiation occurs in the leaf axil. Second is the reproductive phase, which starts with flower initiation and ends when the flower opens.

The first challenge is the issue of flower initiation. New Guinea impatiens are day neutral with respect to flowering; thus, photoperiod is not a stimulus for flowering. At first glance, this may appear to be an asset, but in fact, it is a liability. For example, poinsettia is a very easy crop to predict flowering because the stimulus for flower initiation, namely short days, can be precisely controlled. In contrast, day-neutral species lack this "triggering mechanism," thus the date of flower initiation cannot be known.

The second challenge for predicting flower initiation of a vegetatively propagated day-neutral species is the variability of the cuttings due to the fact that the stock plants are continuously initiating flowers. Thus, the cuttings produced from week to week and cultivar to cultivar may have achieved varying degrees of flower initiation prior to being harvested. The first goal for achieving flowering uniformity is to have all the plants at a similar stage of flowering at onset of the crop. To do this, we will introduce the flowering clock concept.

The Flowering Clock Concept

When a plant is vegetative, it has made no progress towards flowering. In other words, the meristems located within the axillary buds are initiating microscopic leaves, not flowers. In the terms of the flowering clock, we can say that vegetative tissues are at 1:00.

For day-neutral species the meristem transitions from a vegetative state (producing leaves) to a reproductive state (producing flowers) once the plant has accumulated enough resources to support flowers. In other words, enough sunlight has been intercepted that photosynthesis has generated enough carbohydrates to provide sufficient energy for flowers to initiate and develop.

In the terms of our hypothetical flowering clock, sunlight interception allows the clock to move from 1:00 to 4:00. At 4:00 flower initiation begins in the meristems. Flower initiation can only be seen under a microscope. At 7:00 the flower bud in the leaf axil becomes visible to the naked eye. These buds are typically 1.5-2 mm in diameter.

Top: *Example of Ultra Paradise cultivars selected for uniform flowering across major color categories.* ***Bottom:*** *Aborted flower buds in a New Guinea impatiens cutting following a Florel application in propagation. Note the buds turn brown and then drop out of the leaf axils. Florel also can cause the leaf margins to curl inward as seen in this photo. (Photos courtesy of Jim Faust)*

As the flower buds become larger, the clock progresses until it hits 12:00, and the flower opens. The process of flowering is primarily driven by the average daily temperature. Therefore, the time to procedd from 1:00 to 4:00 is a function of light interception, while the time to proceed from 5:00-12:00 is a function of temperature.

Starting Vegetative

Unrooted cuttings of New Guinea impatiens can be at different points on the flowering clock. Since it is not possible to know the exact stage of flowering, Florel (ethephon, Monterey Chemical) becomes very useful. Florel can abort flowers, thus it can effectively reset the flowering clock to the vegetative state (4:00). If all cuttings are reset to the vegetative phase, then plants will develop in a more uniform manner. Thus, the use of Florel can improve flowering uniformity across many cuttings and cultivars.

Florel applications at the rate of 250-300 ppm are typically made during the first week of propagation, although extensive testing should be performed before applying Florel to the entire crop. Cultivars do vary in their responsiveness to Florel, so higher or lower rates may be needed. Florel is typically mixed with a wetting agent, such s Capsil (The Scotts Company LLC), and applied at the end of the day after the mist has been turned off for the night, so it can be in contact with the foliage for as long as possible. Note that New Guinea impatiens cuttings in propagation are more responsive to Florel than intact plants growing in a normal greenhouse environment.

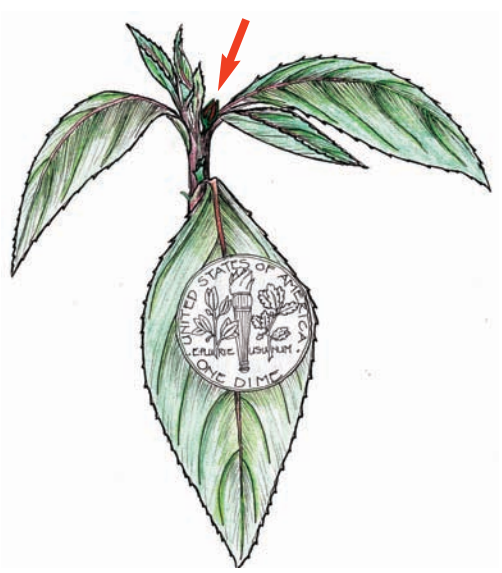
Light interception is important for uniform flower initiation. New Guinea impatiens are not a "low light" crop and should be grown with light levels typical of other vegetatively propagated annuals, i.e., 3,000-5,000 footcandles or 10-15 moles per day. Low light levels or excessively crowded plants will intercept less light and initiate flowers more sporadically. Excessive water and nitrogen will cause plants to develop very large leaves that promote overcrowding and thus delay flower initiation.

Flower Bud Meters

Once visible buds are observed in the leaf axil, bud expansion rate is primarily affected by the average daily temperature (24-hour average). In the 1970s, bud meters were developed for Easter lilies to assist growers in predicting the open-flower dates based on the greenhouse temperatures. We have applied the same concept to New Guinea impatiens. Figure 2, left, displays line drawings of top and side views of flower buds as they expand. The buds are measured across the widest part of the bud when viewed from the top side. We used digital calipers for our measurements, although a small ruler also works fine.

A bud is first visible to the naked eye when it is 1.5-2 mm. The time from visible bud to open flower decreases from 60 to 30 days, as the average daily temperature increases from 60 to 76° F (see Figure 3, page 26).

*Left: **Figure 1.** A drawing depicting the position and appearance of a visible bud on an Ultra Paradise New Guinea impatiens.*
*Right: **Figure 2.** Line drawings that display top and side views of New Guinea impatiens buds. The bud diameter measurements used to predict time to flower are made across the widest part of the bud when viewed from the top.*



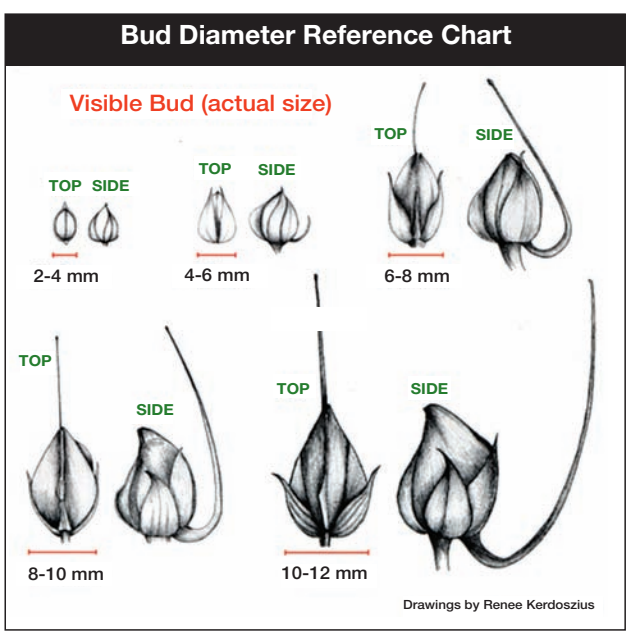


Figure 3. The time until open flower is described as a function of the average daily temperature (24-hour average) and a current bud diameter measurement. Visible bud is defined by a bud that is 1.5-2 mm in diameter.

New Guinea Impatiens Bud Meter									
Temp.	Bud Width (mm)								
(° F)	1.5	2	3	4	5	6	7	8	9
60	60	57	49	42	34	27	20	13	7
64	46	43	38	33	27	22	17	11	6
68	38	36	32	27	23	19	15	10	6
72	33	31	27	24	20	16	13	9	5
76	30	28	25	21	18	15	11	8	4
	Visible Bud		Days Remaining to Open Flower						

Comparison of New Guinea impatiens cuttings treated in propagation with Florel (six plants on the right) versus a non-treated control (six plants on the left). The non-treated cuttings produce premature flowers that do not contribute to the marketability of the plants and limit growth. The Florel application also acts as a growth regulator to reduce stem elongation and leaf expansion.

Measurements of buds within a crop can be compared to Figure 3 to determine the market date for any given cultivar or crop. For example, if the largest buds within a crop are approximately 4 mm, then a crop grown at 68° F will require approximately 27 more days to flower. If that crop needs to be ready in three weeks, then the average daily temperature would to be increased to 76° F in order to make the market date.

Flower Position

Watching for visible bud is an important technique for growers to learn. We can discuss the flower position by counting the number of nodes on the primary stem. The unrooted cutting has node 1, which is usually positioned near the media surface, while node 2 is very small at this time. If a cutting is reproductive at the time of sticking and no Florel is applied, premature flowers may appear in nodes 2 and 3. Florel applications made in propagation will typically abort flower buds that may develop in nodes 2, 3 and sometimes in node 4. These premature flowers rarely contribute to the marketability of the crop: They can reduce plant growth and branching, and they can create Botrytis problems as they die and fall onto neighboring leaves. The marketable flush of flowers typically occurs at node 5, although nodes 4 and 6 can contribute flowers depending on the cultivar. Excessively crowded plants or plants grown at low light levels will flower at positions higher than node 6.

In summary, this article provides growers with a few tools for assistance in improving the uniformity and predictability of flowering for New Guinea impatiens. These techniques should help growers improve profitability by streamlining production so that bench runs can be done on New Guinea impatiens. GPN

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