How Perennials Are Born©

Karl Batschke
Darwin Perennials, Ball Horticultural Company, 622 Town Rd, West Chicago, Illinois 60185 U.S.A.
Email: KBatschke@ballhort.com

INTRODUCTION

I'm going to spend some time today giving a brief overview of how perennial plants come to market. This will include definitions of what a perennial plant is, history of plant introduction and cultivation, and modern-day examples of plants and techniques used to develop new perennials.

Perennial Definition:

- Any herbaceous plant that survives multiple flowering cycles over multiple years.
- Darwin Perennials definition: plants hardy to USDA Zone 6 or colder.

Why are perennials such an important class? Perennials continue to grow in popularity and are one of the fastest growing categories in the five-billion dollar green industry. Perennials are important because they are/have:

- Excellent landscape feature and transition plant between woody ornamentals and lawn.
- Long lasting.
- Diverse texture, habit, and colors.
- Very early to very late flowering species.
- Many native cultivars.

History. Plant collection for food and medicinal purposes has been documented by the ancient Egyptians back to the 14th century BC.

Our modern era of plant collection and cultivation for ornamental uses is well documented in the 15th century and really blossomed in the 17th and 18th centuries. The earliest plant catalogues date back to the early 17th century.

American botanist John Bartram was collecting, cultivating, and selling North American native plants to customers in England in the 1700s.

Some examples of early traded perennial plants we still enjoy today:

- *Hosta* — Asia late 1700s
- *Baptisia* — North America 1758
- *Iris sibirica* — Cultivated since the 1500s, introduced in North America in 1796

How was this made possible? Through the naturally occurring diversity in plant populations.

Historically and even to this day, plant collectors, hobbyists, and plant professionals use observation and collection as a tool for discovering new and exciting plants for cultivation. Some recent examples are:

> *Rudbeckia fulgida* var. *sullivantii* 'Early Bird Gold' — Dupont Nursery. The folks at Dupont Nursery noticed a plant among a population of *R. fulgida* var. *sullivantii* 'Goldsturm' that was flowering several weeks earlier than all the rest. Normally, *R. fuldiga* flowers after a certain amount of long days; usually by July to August. 'Early Bird Gold' is

truly a new and unique *R. fuldiga* that doesn't require the same number of long days to flower. This one individual plant was then multiplied and clones are sold into the market today.

Echinacea purpurea 'Magnus' — Nurseryman Magnus Nilsson set out to make improvements on the North American native, *E. purpurea*. He made crosses and selections over a 10-year period and finally introduced 'Magnus' in 1982. 'Magnus' is characterized by its compact habit, rich pink flowers, and excellent landscape performance making it one of the most popular seed-raised *Echinacea*.

BREEDING

Natural Pollination. There are a number of ways perennial plants are pollinated in cultivation and in the wild. The most common is with insects, primarily bees and wasps. These insects are excellent pollen carriers. Their territorial nature helps maintain a set population and many "open" pollinated perennials rely on this method.

Other natural pollinators include:

- Wind
- Butterflies and moths
- Hummingbirds

Focused Breeding. Although natural pollinators are responsible for many of the perennials currently on the market, professional breeders employ more focused breeding techniques to help direct the outcome and products they hope to bring to market.

The first step in the process is to set breeding objectives. These may include:

- Market objectives
  - What does the market have?
  - What does the market need?
  - Flaws in market leader?
  - Market size?
  - Market potential?
- Plant characteristics
  - Size
  - Color
  - Disease resistance

These objectives are critical to good breeding resource utilization. Modern breeding facilities are typically sophisticated greenhouses with educated breeders and technicians. A breeding project can take many years; often 5 or more, to start delivering income from the project. For this reason, breeders have to be very focused on achieving the objectives established at the start of the project. Also, it is difficult for them to respond to constantly changing objectives so it's critical that the objectives be well researched, clearly defined, and potentially attainable.

One of the most common techniques is hand pollination. In this method, male (M) and female (F) parents are selected by the breeder based on traits that, when combined, will bring about progeny that exhibit the best of both parents. In the case of M × F, the pollen is collected from the M parent. The F parent is emasculated (male flower parts are removed to avoid self-pollination) and the pollen from the M parent is applied to the F. The F flower is then covered to avoid wind or insect pollen contamination.

Another common technique is one M parent and multiple F parents. In this case, no emasculation takes place however; there is one specific M parent and multiple F parents. This is also a common production technique to produce true lines of perennial seed. Breeders and producers accomplish this by creating breeding cages where there is one M plant and multiple F plants and where pollinators, usually bees, are maintained. The cages ensure that the bees stay put and do their work and that other sources of pollen don't contaminate the area.

SELECTION AND TRIALING

Once seed has been collected from the breeding crosses, seedlings are grown and planted in fields or containers for evaluation. This is another critical phase. The breeder and product management team are looking for the plants that have developed the attributes set out in the breeding objectives.

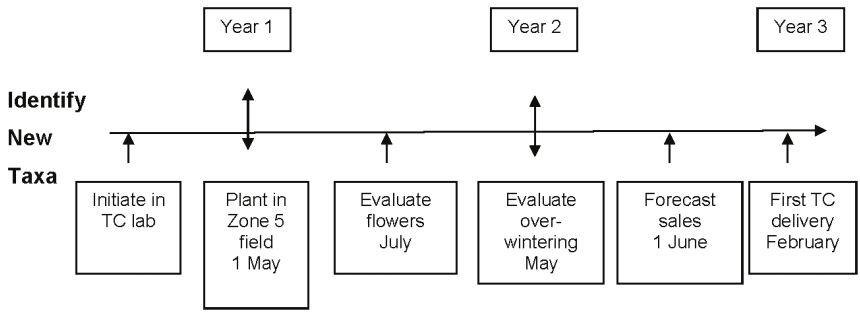
Typically, this work is done in a field setting. For Darwin Perennials, our initial trials are conducted in north eastern Illinois in a Zone 5 environment. We examine the plants for the following traits:

- Cold hardiness
- Heat tolerance
- Disease resistance
- Bloom time
- Color
- Flower size
- Ease of production
- Traits of differentiation from competing genetics

Data is collected from each group of seedlings. This data is used to make selections of the best progeny that will be trialed further. In most cases, fewer than 10% pass the first phase of trialing and less than 1% becomes market-worthy perennials.

After plants have passed field and container trials, they must also pass commercial production trials. These trails ensure that the plants can be produced in the lab as tissue culture plants or in the nursery as cuttings or as seed. Because most perennials are self-incompatible, the majority of taxa are produced by vegetative cloning as cuttings, divisions, or tissue culture plantlets. Professional perennial companies must have reliable supply of plants they introduce to the market and this production trialing step is a key link in the supply chain.

Here is an example of a typical introduction timeline for an *Echinacea* produced from tissue culture (TC) plantlets:



WHAT ABOUT THE FUTURE?

The future of the perennial market is very good. Despite the current economic conditions, the market is still growing. More new cultivars are being added. Perennials are bred to flower longer and are becoming "annualized"; used in mixed containers and as patio accents. The large plant retailers are doing a better job of displaying and marketing perennials and the heavier flowering and better habits of new cultivars add to the impulse appeal that drives sales in these outlets. Growers have more options for sourcing inputs than ever before. Breeders are continually refining production techniques to develop more perennials from seed.