

## Selecting and Breeding of New Plants at the Boskoop Research Station for Nursery Stock

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### INTRODUCTION

Plant breeding has been undertaken at the Dutch Research Station for Nursery Stock in Boskoop since the 1940s, resulting in several popular cultivars such as *Buddleja* 'Pink Delight', *Cytisus* 'Boskoop Ruby', *Pieris japonica* 'Debutante' and 'Cupido', *Agastache* 'Blue Fortune', and *Lonicera* 'Honey Baby'. In 1990 the Dutch government withdrew finance for plant breeding research but nurserymen undertook to financing the selection of new crops in certain categories, through their commodity board.

In 1992, 5-year programmes started on four categories of plants:

- 1) Showy container plants for the impulse market;
- 2) Herbaceous perennials for low-maintenance amenity plantings;
- 3) Small trees for private gardens;
- 4) Woody ground cover plants for amenity plantings.

These four categories of plants cover 75% of all the species grown in nurseries.

### Defining the Perfect Plant

Plant hunters or nurserymen find new species, new seedlings or sports, and trial them to see what they might be suitable for. A breeder starts with a specification of an ideal cultivar for a specific purpose and then aims to reproduce it as closely as possible through breeding and selection. Our work combined both approaches. We had specifications for the sorts of crops we wanted and set out to find them either by selection from species not currently in commerce or by breeding better strains of currently commercial plants.

The list of criteria the plants have to meet (Table 1 shows criteria for the most demanding of our four categories, as an example) is drawn up from information from literature, growers, salespeople, auctions, market research, etc. Because the demands change, these lists have to be kept up to date continuously.

### CHOOSING THE PLANT MATERIAL

**Selection from Species not Currently in Commercial Cultivation.** Most of the new species in our trials came from botanical garden seed-exchange schemes and were selected from literature descriptions (if available). Winter hardiness was an important criterion, so we mainly ordered seeds originating in areas with a climate roughly similar to the Netherlands (USDA Zones 3 to 7). We were most successful in getting new winter hardy plants from the U.S.A. and Canada, the Far East (China, Nepal, Korea, Japan), Eastern Europe, North Asia, and the Mediterranean.

**Table 1.** Breeding and selection criteria for showy container plants.

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Attractive leaves, flowers or fruits, borne for a long period — especially if attractive during a market “gap”.
Resistance to diseases and pests.
Reliable winter hardiness.
Versatility (e.g. can also be used as a houseplant).
Easy maintenance by consumer.
Meets market trends — currently fragrance, hot flower colours, attractiveness to butterflies.
Absence of bad smells, skin irritants or toxic chemicals.
Grows well in a standard container size, uses standard potting mixture and fertiliser.
Compact habit needing no chemical inhibitors; the size and shape is easy to transport.
Easy to propagate consistently and uniformly.
Crop can be scheduled using temperature or day length.
Production does not require complex cultivation (grafting, cutting back, grading) or work during the busy periods of the year.
Work can be mechanised.

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When checking seed lists for new plant genera to try out, without any specific plant in mind, some plant families were especially promising. These families had a large number of winter hardy genera that contained ornamental perennials or woody plants. These were the Apiaceae (Umbelliferae), Asteraceae (Compositae), Brassicaceae (Cruciferae), Fabaceae (Leguminosae), Lamiaceae (Labiatae), Liliaceae, Poaceae (Graminae), and Scrophulariaceae. In some smaller families, almost all the genera were attractive and winter hardy. These included the Berberidaceae, Caprifoliaceae, Cupressaceae, Dipsacaceae, Ericaceae, Oleaceae, Onagraceae, Plumbaginaceae, Primulaceae, Ranunculaceae, Rosaceae, and Saxifragaceae.

**Selection of Commercially Available Species with Potential for Improvement by Breeding.** One of the things we were interested in was to improve the disease resistance of showy container plants. To find the best crops for us to work on, we asked the Aalsmeer flower auction (an important sales outlet for these products in the Netherlands) for their top 100 nursery products. We ignored all the products on which commercial companies were working on a large scale (*Rosa*, *Rhododendron*, *Hydrangea*, *Chrysanthemum*, *Clematis*, and heathers), and products that only specialists breed well (conifers, grasses, alpines). This left about 60 different lines. From these we chose crops known to have major disease problems, or ones whose compactness or flowering could be improved.

## SELECTION AND BREEDING

**Selection from Species not Currently in Commercial Cultivation.** Seeds were sown in a warm or cold greenhouse, depending on germination requirements. From the species that germinated a maximum of 40 seedlings were pricked out and hardened off. These were planted out in our experimental garden for between 1 to

3 years, to determine habit, winter hardiness, and susceptibility to pests and diseases. Although the tallest species were protected from wind no frost protection or pesticides were used; weeds were removed by hand.

We selected potentially showy, compact plants and these were divided and put in containers in a convertible-roof greenhouse. They were tested for ornamental value, while techniques for propagation and cultivation were devised. If there were differences between the seedlings we selected the best among them, and these were propagated.

A committee of nurserymen will then evaluate the plants and the best will be released. We will apply for plant breeder's rights where applicable and appropriate.

Perennials and shrubs for amenity plantings were not tested in containers but were tested at different locations on different soil types. We also looked at amenity planting densities and at how well the plants suppressed weeds and, where appropriate, recovered after mowing. The small trees for private gardens are not mature yet, but we have tried to propagate them. Some were grafted on different rootstocks to test their compatibility and we have trialled propagation by seed and cuttings.

**Improving Commercially Available Species.** We first obtained mother plants, which as a group possessed all the properties we wanted. Then we made test crosses, to determine the best way to remove anthers, hand-pollinate, keep insects out, and harvest the seeds. This also gave us information about which combinations of parents were possible. In the following years we made crosses between desirable parents. The seeds from these crosses were sown and the seedlings were selected in the field, as described above.

## RESULTS

Seed accessions numbering 1250 from about 750 different species were obtained from botanical garden seed lists. From the plants we tested more than half have been rejected already because of: insufficient winter hardiness, not perennial or woody enough, too little improvement over similar plants already in commerce, low ornamental value, susceptibility to disease, weak stems, or invasiveness.

We expect that about 40 new species and cultivars can be released in the next few years. Most of them are new to the trade, some are known but rare in commerce. Plants currently looking promising include:

### **Showy Container Plants for the Impulse Market.**

**New plants.** *Amsonia*, *Rhexia*, *Physochlaina*, and *Zizia*. Selections and cultivation trials currently under way.

### **Improved Plants.**

*Pieris japonica*. A selection with upright, red-budded inflorescences.

*Ligustrum*. We had a large collection of *Ligustrum* species available, so we harvested free-pollinated seeds from interesting mother plants. We selected a compact but fast-growing type that can be used for low hedges and topiary.

*Cytisus*. We had a selection of *Cytisus* with a low and broad habit. This type is interesting to grow in containers because it doesn't have to be cut back as hard as the usual upright cultivars to keep it compact. We are trying to produce a complete colour range of this type by crossing.

*Hypericum*. Species with berries have become very popular in the last few years, in

gardens, parks, containers, and for cutting branches for mixed bouquets. However, all the existing cultivars are susceptible to rust. By crossing cultivars with wild plants, we are trying to produce rust-resistant plants.

### **Herbaceous Perennials for Low-Maintenance Amenity Plantings.**

#### ***New Plants.***

*Coluria*. This Chinese relative of the strawberry has white flowers in May. The ornamental value is modest, but the leaf rosette seems dense enough to control weeds.

*Silphium*. Selections of these high plants with yellow flowers are very sturdy.

#### ***Improved Plants.***

*Solidago*. We selected and crossed several species which are mildew resistant and have strong stems.

### **Small Trees for Private Gardens.**

#### ***New Plants.***

*Sorbus*. We tested several new compact shrubs from China with white or pink berries. They can be grown on rootstocks, from cuttings, or from seed.

### **Woody Ground Cover Plants For Amenity Plantings.**

#### ***New Plants and Selections.***

*Aronia*. We are comparing several well-known and new cultivars for their suitability for parks etc. A new cultivar from Sweden, 'Hugin', seems interesting because of its compactness.