

## Opportunities for Breeding Woody Ornamentals, With Particular Reference to *Sambucus*

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With a few important exceptions, little systematic plant breeding has been undertaken in woody ornamentals. A research programme at HRI - East Malling is focused on the breeding and genetics of ornamental trees and shrubs and good progress has been made with elderberry, *Sambucus* spp. With *S. nigra*, various crosses have been made among the cultivars 'Aurea', 'Guincho Purple', 'Laciniata', 'Fastigiata', and 'Pulverulenta', and subsequent generations have been raised. Yellow leaf and purple leaf were identified as dominant characters, while lacinate leaf, fastigate habit, and variegated leaf are recessive. Trials have begun on several selections containing two or more of these characters. Propagation for commercial release of the most promising cultivar is under way. With *S. racemosa*, a second generation cross has been raised from 'Sutherland' × 'Tenuifolia'. This segregates for leaf colour, leaf shape, and vigour, and trials of several promising selections have begun.

### INTRODUCTION

In many woody ornamentals, little systematic genetic improvement work has been undertaken. Rose, camellia, and rhododendron are obvious exceptions, but in most genera the diversity available to the gardener depends on observant botanists and horticulturists selecting interesting variants from the wild or from open-pollinated seedling progenies. The plant breeder, by careful choice of parents, controlled crossing and selection of promising seedlings, can take this existing variation and put it into new, commercially-useful combinations.

There are several stages to the plant breeding process, both before and after the actual act of cross pollination. First, the objectives of the breeding programme need to be defined. These depend on the subject but, in general terms, compact habit is often desirable for modern, small gardens, and novelty is important because it helps to stimulate demand to a greater extent than minor improvements of existing cultivars.

Once the objectives have been set, likely parents which have the potential to transmit the desired characteristics can be chosen. Works such as those by Bean (1970-1988) or Krussmann (1984-1986) are invaluable guides. For tracking down the plant material of the desired species and cultivars, the RHS Plant Finder (Lord, 1997) and the National Plant Collections organised by the National Council for the Conservation of Plants & Gardens (NCCPG, 1997) are extremely useful.

Controlled crosses involve several processes including emasculation, pollen extraction, and the checking of pollen viability. After the cross has been made, the resulting seeds may need stratification or other presowing treatments to optimise seed germination. Inferior seedlings must be discarded and promising ones selected. Then the promising selections are trialled to determine whether they are worth releasing, or whether they can be used as parents to raise a further generation of seedlings.

Genetic research enables the breeder to understand the mechanism of inheritance of important traits and so predict with greater accuracy the outcome of subsequent generations.

HRI-East Malling has received funding from the Horticultural Development Council and the Ministry of Agriculture, Fisheries & Food to work on the breeding and genetics of woody ornamentals. Much of this work is with elderberry, *Sambucus* species. Work has been undertaken on two different species and the brief account that follows represents an update on work described by Tobutt (1992).

### **BREEDING NEW CULTIVARS OF *SAMBUCUS NIGRA***

*Sambucus nigra* is the black-berried elderberry native to Britain. The wild form is attractive enough in flower or fruit and is tolerated in hedgerows, but otherwise it is decidedly drab. Over the years, botanists and gardeners have selected and propagated more attractive forms or cultivars that have arisen as sports or chance seedlings. At East Malling, crosses have been made using the following such cultivars in different combinations: *S. nigra* 'Aurea' (yellow leaves), 'Guincho Purple' (purple leaves), 'Pulverulenta' (variegated leaves), 'Laciniata' (lacinate foliage), and 'Fastigiata' (erect growth habit). The aim was to recombine these ornamental features into novel combinations by intercrossing.

**Techniques.** The crossing technique was tricky with *Sambucus* because the flowers are so small. To prevent self-pollination, the young flowers on the female parent were emasculated with forceps, before the pollen was shed. The flower clusters of the male parent were then dusted over the prepared flowers on the female. The flowers were covered with a bag to exclude insects and, later, to protect the ripening berries from birds. The resulting seed was sown in autumn in proprietary seed-raising medium, ripened in the warm for 1 month and then stratified at 4C for 3 months before germinating in early spring.

**Results.** When 'Aurea' was crossed with 'Guincho Purple', the seedlings segregated for yellow, purple, yellow and purple, or green leaves indicating that yellow leaf and purple leaf are both dominant characters. The yellow-purple combination often appeared as an eye-catching tawny or amber, especially on young shoots.

When 'Laciniata' was crossed with 'Aurea' and with 'Guincho Purple', the first generation segregated for yellow versus green leaf or for purple versus green leaf, respectively, but all seedlings had normal-shaped leaves, suggesting that the lacinate leaf character is recessive. To re-express the lacinate leaf, we intercrossed a yellow and purple seedling; the second generation expressed all eight combinations of yellow, purple, tawny, or green leaf colour and lacinate or normal leaf shape. Examples of yellow lacinate, purple lacinate, tawny lacinate, and tawny normal have been selected, propagated and planted in trial.

When 'Guincho Purple' was crossed with 'Fastigiata' the first generation segregated for leaf colour but all seedlings had normal growth habit, suggesting that fastigate habit is recessive. A second generation was raised by intercrossing two purple seedlings. The resulting offspring segregated for green seedlings versus purple seedlings, some of which were exceptionally dark and presumably homozygous, and for normal seedlings versus fastigate seedlings. A few interesting low-growing types appeared too.

Some of the fastigate purple seedlings and some of the exceptionally dark seedlings

of normal habit were propagated and planted in trial. Selection 528-180, one of the exceptionally dark purple seedlings, has pinkish flowers and appears to be sufficiently novel and garden-worthy that the HDC and HRI have decided to release it, probably under the name 'Black Beauty'. It is currently being bulked up by propagation from softwood cuttings.

Another cross was between 'Laciniata' and 'Pulverulenta'. As all the first generation of seedlings appeared normal, we intercrossed two seedlings. The second generation progeny segregated for lacinate versus normal, and also for variegated versus green, indicating that variegation is a recessive character. Some of the lacinate variegated seedlings were planted in trial, but their ornamental merit is debatable.

There is certainly further scope for breeding between these cultivars of *S. nigra*. For example, a fastigate type with lacinate, tawny, variegated foliage should be achievable, though not necessarily desirable. In addition, within *S. nigra* there are other potentially interesting characters that have not yet been explored in breeding work at East Malling, such as weeping habit from *S. nigra* 'Pendula', thread-like foliage from 'Linearis', and dwarf habit from 'Pygmaea'.

### **BREEDING NEW CULTIVARS OF *SAMBUCUS RACEMOSA***

*Sambucus racemosa* is the red-berried elder, native to mainland Europe. In the work described here, only two cultivars have been used as parents, 'Sutherland' (yellow cut-leaved) and 'Tenuifolia' (dwarf with green, highly dissected leaves).

**Results.** Crosses between 'Sutherland' and 'Tenuifolia' produced seedlings that segregated for green versus yellow but with cut leaves rather than dissected leaves. With the aim of re-expressing the dissected character, two yellow seedlings were intercrossed; the second generation gave various combinations of green, yellow, or very pale yellow, with cut or dissected shape and normal or dwarf vigour.

These seedlings were grown in the field for about 5 years. Several are promising and have been propagated for trial. They include dwarf, cut-leaved forms in green and in yellow, and dissected, yellow slow-growing forms.

### **CONCLUSION**

The natural variation that occurs in *Sambucus* has been exploited by conventional breeding, to produce a range of selections worth considering for commercialisation. The success of this approach justifies a similar approach being taken in comparable genera.

### **LITERATURE CITED**

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