Sturt Peas: Propagation and Breeding Strategies for Different Markets

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INTRODUCTION

Sustained commercial production of Sturt's desert peas (*Swainsona formosa*) has not been successful, despite many attempts in several parts of the world, see Williams and Taji (1991) for some of the history. Barth (1990) summarised a study of cultivation and production requirements and a survey of three potential markets: cut flowers, cut runners, and pot plants. She emphasised the need for a breeding programme to produce cultivars suitable for each market. The great variability observed between plants grown from seed collected from natural populations showed that there was an opportunity for breeding Sturt peas in Australia for the different markets, particularly pot plants and cut flowers.

The Flinders University breeding programme began with a germplasm survey of plants grown in pots and a garden from seed collected from natural populations in Western Australia and South Australia. Plants with characteristics deemed most appropriate for each of the markets were crossed and the first few generations of selection were primarily aimed at increasing longevity (most plants from wild seed die of wilt disease at an early age), maintaining vigour and improving floriferousness (some plants from wild seed are slow to flower, especially in late summer and autumn). After a couple of years, these characters were much improved and breeding for particular markets became feasible.

NATURAL BREEDING SYSTEM

Although there are no quantitative data on the natural breeding system, experience indicates that it is a mixed breeding system based upon cross-pollination by birds, with the option of self-pollination when the birds are not sufficiently active. The amount of natural selfing is probably not high enough to purge the populations of deleterious recessive genes because inbreeding depression becomes severe after a few generations of selfing.

The Sturt pea offers the breeder a range of options for breeding strategies, unlike many species where the breeding system is relatively inflexible (autogamous or obligately allogamous). Thus the breeding programme for each market is driven by the preferred mode of propagation for that market with the consequence that each has a different breeding strategy. In many ways, Sturt peas are an excellent subject for breeding work because the large flowers are easy to either self-pollinate or emasculate and cross pollinate. In addition, each pollination usually produces 50 to 80 seeds: a good yield for relatively little effort.

POT PLANT MARKET

A good pot plant will have an upright growth habit and comes into flower quickly at a small size. Seed propagation is preferred, but modern growers demand a high

standard of uniformity in their crops. Open-pollinated cultivars may be too variable and inbred lines lack vigour, hence an F1 hybrid cultivar is our objective because it should combine vigour and uniformity. The necessary prerequisite is two unrelated inbred lines, at least one of which is sufficiently vigorous and fertile to produce seed efficiently. The first attempt to produce inbred lines failed after 3 to 5 generations of selfing when inbreeding depression in the form of a lack of vigour and/or fertility caused the termination of all lines. Some of the better lines were intercrossed and new inbreeding lines established. These have now reached the third generation of selfing and will need to pass through another 2 to 3 generations of selfing before they can be evaluated for the production of F1 hybrids.

HANGING BASKET MARKET

A good hanging basket plant produces many runners in a prostrate growth habit that cascades over the edge of a basket. This growth form appears correlated with the vigorous production of shoots from vegetative nodes on the runners, so there is an abundance of shoots that can be used for grafting or cuttings. In 1992, a plant of excellent form and flowering habit was selected, but because it was short-lived on its own roots, it had to be grafted onto a wilt-resistant species. Three species used by Sturt pea growers in Europe (*Clianthus puniceus*, *Colutea arborescens*, *Sutherlandia frutescens*) and a native, *Swainsona canescens,* were trialed as rootstocks. Grafted plants were vigorous and long lived, but the grafting process was too tedious to be successful commercially. Hence a breeding programme was started to combine the hanging basket growth habit with the longevity (wilt resistance) that was becoming apparent in the pot plant breeding lines at that time. The best hanging basket plant was crossed with several lines that appeared to have good longevity. The progeny of these crosses were selfed for two generations with selection for good hanging basket growth habits, floriferousness, and vigour. The best plants were intercrossed and from their seedlings, 24 plants with the right growth form have been selected for further evaluation. Currently we are assessing the survival of cuttings in the propagation unit, later we will evaluate longevity, growth habit, floriferousness, and production of cuttings from the surviving clones.

Cuttings are placed in Oasis® Horticubes® under mist with a bottom heat of 30C. Many plants produce cuttings that simply rot under these conditions, but a proportion are able to survive and quickly produce roots. Several good clones have been identified that are easy to propagate from cuttings, rooting in less than 2 weeks. Recent experiments have shown that rooting hormones do not significantly improve rooting speed and growth, although more replications may make the difference significant.

CUT FLOWER MARKET

This market demands peduncle (flower stem) lengths much longer than are seen on Sturt pea plants from natural populations. Thus a breeding programme to improve peduncle length and strength is essential. In addition, growers will want long-lived plants with minimal risk of root disease, which implies that grafting onto hardier rootstocks will be essential. The breeding strategy in this case is based upon avoidance of inbreeding (because we think this reduces peduncle length), the crossing of plants with long and strong peduncles, and near the end, the selection of a compatible rootstock.

A subsidiary objective is to introduce a variety of flower colours into this breeding programme so that the desire of the market for novelties can be satisfied. In addition to the traditional red flower with a black boss and the all red flower, we have introduced genes for pink, white and red-black-white flowers into this breeding programme. Although bright red colours are magnificent on pot plants and hanging baskets, the cut flower market may well prefer paler colours. Even South Australian florists admit that they cannot use red and black flowers very often because of the clash of two strong colours.

Looking to the future of cut flower breeding, there are several genes that change the size of flowers, the number of flowers per peduncle, and the arrangement of flowers on the peduncle, that could be used in the future when peduncle lengths have been increased sufficiently. At present, we actually select against large flowers because they hang further down the peduncle and effectively shorten the peduncle length that is available to the florist.

LITERATURE CITED

Barth, G. 1990. Cut flower potential of Sturt's desert pea. Austral. Hort. 88(8):48-53.

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