Agronomy

Kangaroo Paw
(Anigozanthos & Macropidia)
Ross Worrall & Ken Young

Introduction

Kangaroo paws have attractive flowers that are in demand for cut flower, landscaping and flowering pot plant use. They are in the top three of the commercially grown Australian native cut flowers in Australia. It is only through innovation that Australia will maintain or expand its share of the world market. Australia has been the major source of new varieties, although Israel is now also a source. There is a need for higher yielding, more disease resistant clones, especially of the brighter colours and particularly yellow, and to extend the flowering season. PBR (Plant Breeders Rights) has made it possible to receive royalties for Australian developed plants grown overseas. Few successful new varieties have been developed in recent years.

There is also a trend to produce more flowers under protected cultivation. The unique Macropidia, with only one species in the genus (closely related to Anigozanthos), is in high demand but difficult to propagate and grow. Potential for the expansion of the industry mostly lies in overseas markets, especially Japan. However there is increasing competition from other countries. The largest cost is transport. Any savings have the potential to dramatically reduce costs.

Both horticultural (growing and harvesting-packaging) and marketing skills are very important in the production of kangaroo paws. They are not considered a difficult crop to grow compared to many other cut flowers, especially the flavidus hybrids. However proper scheduling of harvesting and marketing is quite important.

Markets and marketing issues

In 1994 about 53% of flowers were sold domestically- 15% locally, 15% in flower markets and 23% to wholesalers. Australia supplies 94% of Anigozanthos imported into Japan (4.6 million stems, 1995) Other smaller markets are USA, Europe and, increasingly, other South East Asian Countries. The biggest expansion in markets will be for export rather than domestic markets. However there is keen competition for the overseas markets from other large producers, such as California and Israel. Major competition for the European market is from Israel. Whilst Israeli production is "off-season" to ours, their proximity to Europe and relatively low freight rates means they can sell at a lower price than us but achieve a satisfactory return. This tends to stabilise returns from Europe to that of a commodity. Zimbabwe is also emerging as a major competitor for the European market. The USA and Canada only take small volumes of 60-90 cm range flowers.

There are currently few new plantings of Kangaroo Paws for cut flowers in W.A. although the position in the eastern states seems brighter. Part of the reason for this is that there have been few new high performing cut flower varieties released in recent years and the industry essentially relies on varieties developed many years ago. Competitors, such as Israel are undertaking breeding and development programs.

Flowers may be directly exported by larger growers, or through agents. In Japan, flowers may be sold at auction or directly by arrangement through importing agents. Different markets may have different preferences. For example Japan prefers longer stems (up to 150 cm), yellow flowers and 'clean' vibrant colours, especially yellow. The strongest market is in September-October. In contrast there is a niche market in Europe at Christmas time - mainly for red Kangaroo paws 70-100 cm long - with smaller volumes in the New Year. Colour preference also changes frequently.

Production requirements

An essential requirement is that soils should
be well drained and a slightly acidic sandy loam is preferred. Some varieties are particularly sensitive to phosphorus and a soil test is especially recommended for previously cultivated areas. Sites should be frost free. Although the foliage may not be damaged, flowers may be severely degraded by a light frost (ie. -0.5 °C), even in the bud stage. Plants may be grown in well ventilated greenhouses for earlier flowering and to protect them from weather damage. However high temperatures may result in severe flower fading. The red varieties are more severely affected. High summer temperatures limits production areas to approximately South Eastern Queensland and south in the eastern states and the south west of Western Australia. *A. flavidus* and its hybrids are generally much more hardy.

The approximate limits of commercial production are given in the accompanying map (not included in this issue - Ed). However many microclimates in this area may not be suitable for the reasons outlined above. Similarly it may be possible to grow plants in other areas. This can only be determined by trial plantings before full scale production is commenced.

Adequate irrigation using high quality water is usually necessary for maximum production and to extend the flowering season although production areas on the East Coast with high summer rainfall may have little need for irrigation. Extended periods of wet weather will also exacerbate disease problems. Provided that the area is well drained and flood and frost free, flatter areas are preferred for ease of cultural operations and harvesting. Availability and cost of transport to market or export airports should also be considered.

**Varieties / Breeds**

Most plants cultivated today are hybrids or selected clones, usually produced by tissue culture in a number of laboratories in Australia. *A. flavidus* hybrids are especially popular, especially in the more humid areas of the eastern states due to their resistance to most of the common pests and diseases. There are at least one hundred varieties available.

Taller (approximately 1 metre tall) varieties with clear bright colours, especially yellow, are favoured for cut flower production. However smaller varieties may have a place in the mixed bouquet market. Most commonly grown cut flower varieties are Yellow Gem, Big Red, *A. pulcherrimus* (orange and yellow forms) and the Bush Gem series especially Dawn, Noon and Sunset with smaller amounts of *A. manglesii* and *Macropidia*. Some other cutflower varieties are Bush Ranger, Bush Emerald, Bush Haze, Gold fever, Bush Harmony, Bush Ruby, Ruby delight; *A. rufus*, *A. bicolor*, Regal Claw, Orange Cross and Royal Cheer.

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After a suitable site is selected and drainage installed, if necessary, a basal dressing of fertiliser or chicken manure is incorporated into the beds, especially in poor sandy soils. In the field the distance between beds (usually 3-4 m) will depend on the equipment to be used for cultivation and transport of flowers. Failure to allow for free movement will greatly increase production and picking costs. Within beds there may be up to three rows 1m apart and plants are usually spaced 1 m apart within rows. Break rows every 50 m or so to allow for efficient vehicle movement. Beds are often raised to provide better drainage, especially in the eastern states where the use of weed mats and mulches is also common. Planting in spring/autumn to avoid very hot weather is preferred, especially on black weed mat. Applying fertiliser through the irrigation system is the most satisfactory method of fertilising kangaroo paw, especially if weed mats or mulches are used. Fertilising should be carried out during the growing season, especially from mid-autumn to mid-spring.

Plants will first flower about 6 months after planting then at their normal time each year. Full production will be achieved in the second to third year. The number of flowers will increase beyond this but the quality will be reduced, necessitating severe pruning (slashing). Some species such as *A. manglesii* are best treated as annual or biennial crops. The most time and labour critical operation is harvesting. Flowers must be harvested at the right stage for maximum quality and
processed, packed, cooled and transported to market promptly. Most varieties have flushes, therefore a mixture will help to even out production over a greater period.

Basic equipment and facilities required are a processing shed with facilities to treat flowers with fungicide/ insecticide and to grade, bunch and box flowers, forced air coolroom, buckets, chemicals, good quality water, tractor/ transport vehicles for site preparation and movement of flowers, slasher, spray equipment for pest and disease control, irrigation system and access to refrigerated transport.

**Pest and disease control**

Ink disease of kangaroo paws (blackening of the leaves and flowers) is a widespread problem, especially in the more humid areas e.g. coastal NSW and protected cultivation. Some varieties are much more susceptible than others. Ink spot is a response to a wide range of stresses e.g. insect damage, nutrient imbalance and pathogens (esp. *Alternaria*). Rust (*Puccinia haemodora*) is also a serious disease which causes typical rust pustules (blisters) on the leaves. Development of rust is favoured by hot, wet conditions as are a range of crown and root rots that are caused by a range of fungi (eg *Pythium*, *Fusarium*, *Phytophthora*, *Sclerotinia*, and *Rhizoctonia*). Young plants in poorly drained soils are especially at risk. Petal blight or grey mould (*Botrytis cinerea*) may also be a problem, especially in cool damp conditions. Severity of infection of these diseases can be minimised by the use of resistant clones (usually *flavidus* hybrids), avoidance of environmental stresses, good air circulation and trickle irrigation to avoid wetting of foliage and use of fungicides. An annual slash or slash and burn may be effective in removing infected material. Disease free planting material is also essential.

Compared to many exotic flower crops kangaroo paws are relatively free of pests. However for the production of high quality blooms a control program may be necessary, especially if flowers are to be exported. It is essential to reduce insect populations to low levels before harvesting because most disinfection treatments are only partly effective at levels that do not damage the flowers. Some problem insects are aphids, leaf miners, bud worm, thrips and leaf chewing small caterpillars. Most of these pests are relatively easily controlled by the application of an appropriate insecticide. Slugs and snails may also be a serious pest, especially of young plants in the greenhouse and in cooler areas. Susceptibility of species/ clones to slugs and snails varies widely with *A. flavidus* and hybrids generally being more resistant. Control is by good hygiene and application of a molluscicide, either as a spray or as pellets.

Birds may cause extensive damage to flowers by breaking stems and biting off flowers especially if other flowers are scarce. Control is by netting or human presence. Weeds may become a major problem, especially in the eastern states. Mechanical control on a large scale is often difficult due to the herbaceous nature and habit of the plant. Plastic weed mat or mulches are very popular with commercial cut flower growers in summer rainfall areas, especially to control broadleaf weeds. Care, however, must be taken with black weed mats due to elevated temperatures that occur under the mat. Small plants are especially vulnerable. Mowing or knock down herbicides are used for inter row weed control. Grasses can be controlled with post-emergent herbicides. Some herbicides may cause damage to or reduce the growth rate of kangaroo paws. Phytotoxic effects may vary with the rate, method of application and clone. Check to ensure that the herbicides are registered in your state for the intended purpose.

**Harvest, handling, packaging, storage, post-harvest treatments and processing**

Flowers are usually harvested when the first one to three florets on the spike have opened. Harvesting at an earlier stage (in bud) may cause 'bent neck'. Some growers leave at least 20 cm of the stems of *A. flavidus* hybrids to allow development of secondary flower spikes. However resulting flower stems may be small and dry spikes are a danger to pickers. As soon as possible after harvesting flowers should be placed in water or a preservative solution to prevent wilting and cooled as soon as possible.
After harvest, stems are usually re-cut to the desired length and bunched into five-stem units (10 stems if short i.e. <70 cm). Bunches are then usually sleeved into a micro-punched flower sleeve. Flowers are then disinfected by complete immersion in a Cislin, Rowral (or similar) mix to kill insects and to control Botrytis. Some growers, especially in WA, disinfect with the above mixture and dry the flowers before sleeving. Currently insecticidal dips such as Cislin, would appear to offer the most effective means of disinfesting flowers. Treatment of kangaroo paws with aerosols, such as dichlorvos or pyrethrin, is moderately effective. Some growers use a combination of insecticidal dip followed by aerosol treatment.

Freedom from live insects is an essential requirement for the export of flowers from Australia, especially to countries with strict quarantine requirements such as Japan and USA. Live insects on flowers will require fumigation or destruction of the flowers in these markets. Fumigation may damage the flowers and will cause a reduction in auction prices, delays and a reduction in consumer confidence. Insect contamination will also cause similar problems on the domestic market. Note—check the registered use of these pesticides in your state before use.

Use of pulsing solutions containing sucrose after harvest can extend the vase life of kangaroo paws. However, considerable variation exists in current recommendations which range from 2-20% sucrose and above. Acidification of the solution with citric acid at 200 ppm and a wetting agent may also improve vase life. Other chemicals, such as HQS at 200 ppm may also be used. Individual growers should experiment with rates and times (usually 12 hours) to find the best treatment under their conditions with the varieties grown. Use clean buckets and water at all times.

Kangaroo paws should be stored at low temperatures (−2°C) and at a high relative humidity (95−98%), including during pulsing. Forced air cooling should be used to reduce flower temperatures as soon as possible after harvesting and, again, after flowers are packed into cartons. Flowers should be at least than 5°C at dispatch. The vase life of kangaroo paw flowers is reduced by cold storage and storage on the farm should be limited to no more than a few days. The maximum total storage time should be no more than about 2 weeks and preferably less than one week over the entire marketing chain.

Economics of production
The 'typical' estimated start up costs for one Ha., not including land, machinery, clearing, labour, fencing or structures, is about $18,000 in NSW/SE. Queensland. This includes operating costs for one year. With little mechanisation, up to one years labour could be required to establish 2000 plants. It is emphasised that costs will vary widely from site to site, even in the same locality.

The Kangaroo paw export industry has reached a relatively mature stage with significant quantities having been exported for a number of years. There are also a number of competitors on the international market. A 'typical' gross margin analysis is presented below for flowers exported to Japan. It should be emphasised that the net return to the grower (after sales and freight) can vary considerably with variety (over a two fold difference) and time of year (over a five fold difference). As can be seen from the gross margin table if other sale prices are substituted, both a profit and loss are possible, depending on variety and time of year. Marketing knowledge and skills are needed to maintain profitability. It may also be very difficult to sell certain types at particular times of the year. Any change in the sale price, freight costs and the Yen/$AUD, all of which are largely outside the control of the grower, will also have a dramatic effect on the gross margin. Due to risks and to spread costs and labour, it is recommended that kangaroo paws be grown in conjunction with other crops and that a range of varieties be grown.

Processing, packaging and sales and freight costs will be very much reduced for the domestic market due to the less stringent quality requirements. The sale price is also often much lower and the market relatively small.
Gross Margin Analysis
Year 2-3, Export material, 5000 plants/ Ha.

Costs ($/stem)
Sale costs and freight (Japan) 0.41
Harvesting, processing 0.18
packaging and freight (Sydney)
Production costs 0.05
Plant amortization 0.01
Total Costs 0.65

Returns
Sale price ($/stem) 0.85
Gross margin/stem ($) 0.20
No. Stems /Ha. (20 stems/plant) 100,000
Gross Margin /Ha $20,000

Key contacts
- Flower Enquiries Officer, NSW Agriculture, Locked Bag 11, Windsor NSW 2756. Ph. (045)770-628, Fax. (045) 770-630.
- Agriculture WA. Plant Research and Development Services, Agriculture WA, Baron-Hay Court, South Perth WA 6151. Ph (06) 368-333, Fax. (06) 368-1205
- Other State Departments of Agriculture.
- Plant Sciences, Faculty of Agriculture, The University of Western Australia, Nedlands WA 6009. Ph. (06) 351-2000
- School of Environmental Biology, Curtin University, Perth, WA 6001 Ph. (06) 380-3838.
- Flower Export Council of Australia. Kim James, Executive Officer, P.O. Box 137 Nedlands WA 6009. Ph. (08) 9327-5583, Fax. (08) 9327-5683
Internet- http://www.iinet.net.au/feca/
Email- feca@iinet.net.au
- Australian Native Flower Growers and Promoters. C/- Craig Scott, P.O. Box 9 Kariong NSW 2250 Ph. (043) 741-018.

Key References
- Many State Departments of Agriculture, especially W. A., have numerous publications on Australian Native cut flowers, and kangaroo paws, in particular.
- Suppliers of tissue cultures, especially in W.A.; NSW may also supply cultural notes.
- Numerous articles also appear in Australian Plants (Sydney) and Australian Horticulture.

Key statistics
Approximately 4.3 million flowers were exported to Japan in 1995, mostly originating from W.A. and N.S.W. There is also a significant local market (3.9 million flowers in 1994). From 1993-1995 exports to Japan grew by about 20% p.a.

Key messages
- Approximately half of production exported.
- Significant competition from other countries.
- Low rate of expansion in recent years of domestic sales.
- Need for new varieties to compete.

Authors
- Ross Worrall (BSc Ag(Hons), MScAgr, PhD, M Teach. Stud.) is a Senior Research Horticulturist with NSW Agriculture who has specialised in the breeding and development of Australian native plants both as cut flower crops and pot plants since 1972.
- Ken Young. Australian native cut flower grower, exporter and consultant. He has had extensive experience in the growing and export of a range of Australian native cut flowers.