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Selection and Evaluation of *Ozothamnus obcordatus* and *Chrysocephalum semipapposum* as cut flowers

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Summary

Chrysocephalum semipapposum and *Ozothamnus obcordatus* are two Victorian species of daisies which have potential as commercial cut flower crops. Development of these species has involved the selection of vegetative and floral material from natural populations, the assessment of their vase life, and their suitability for commercial propagation and cultivation.

The yellow flowers of both C. *semipapposum* and *O. obcordatus will* complement the established market for *Ozothamnus diosmifolius* (rice flower), which is restricted in colour from white to pink. These daisies can be used as filler flowers in either fresh or dried arrangements.

The floral display and vegetative form of *O. obcordatus is* nearly identical to that of *O. diosmifolius*. Increasing the colour range of rice flower will enhance its market potential.

Introduction

Rice flower (*Ozothamnus diosmifolius* (Vent.) DC. syn. *Helichrysum diosmifolium*) is a relatively new export flower crop (Carson 1993). Currently rice flower is worth an estimated $150,000 per annum (farm gate). The majority of production is exported (94%), with Japan as the main destination (90%) (Carson 1993). There are currently commercial plantations of rice flower in Western Australia, South Australia, New South Wales, Queensland, and Victoria, and the extent of these plantations is increasing as the market grows.

Rice flower is used primarily as a floral filler in mixed bunches and in dried arrangements, but has a restricted use as a fresh filler due to its short flowering period (Carson and Lewis 1993; 1994). Individual clones are harvested over a 10 to 14 day period (Beal 1994), while the flowering season of the currently cultivated clones is discontinuous with a gap in production in the middle of the season (Beal 1994). The use of rice flower is further restricted because of its limited colour range of white through champagne to dark pink (Carson and Lewis 1994).

The market for this crop will be expanded by extending the flowering time of the current selections, by selecting new material which flowers before and after the current selections, and by increasing the available colour range. These factors would allow the material to be used as floral fillers for a longer season in a greater array of mixed bunches and floral arrangements.

This project has identified daisies from the Victorian flora, which have similar vegetative structures and floral displays, but different flower colours to rice flower. *Ozothamnus obcordatus* DC. (syn. *Helichrysum obcordatum*) and *Chrysocephalum semipapposum* (Labill.) Steetz (syn. *H. semipapposum*) flower in late spring to early summer and have large yellow inflorescences (Allen et al. 1994).

The objectives of our work has been to survey field populations of *O. obcordatus* and *C. semipapposum* for plants which show characteristics suitable for development as cut flowers. These plants were then collected from the field to determine their vase life, and the suitability of these selections for commercial propagation and cultivation.

Species descriptions

Ozothamnus obcordatus is an attractive multi-stemmed shrub which reaches a height of 2m. The flowering season extends from late October to mid December. The floral display is a corymb (a compound inflorescence) up to 12cm in diameter. The corymb is composed of densely packed capitula containing floral bracts which vary in colour from pale lemon to bright yellow and mustard, and occasional plants have red-brown bracts. The branches, which may be up to 1.3m in length, are covered by rounded, shiny, dark green leaves which contrast to the floral display.

Chrysocephalum semipapposum is a highly variable small shrub with a number of distinct forms up to lm tall. The flowering season is from September through to December, and the floral display is a corymb up to 10 cm in diameter. The corymb contains up to 70 capitula which vary in colour from lemon to a more common orange-yellow. The stems and foliage are covered in silky white hairs giving the plants a siIver-grey appearance. The leaves are mostly linear and decrease in size towards the tip of the stem.

Selections from populations of the two species were made according to the following characteristics:

- stem length suitable for harvesting (longer than 40 cm),
- vigorous erect habit,
- large number of stems per plant,
- corymb at least 8 cm in diameter,
- capitula within the corymb displayed at an even height, and floral maturity,
- clear bright colours,
- early and late flowering forms.

Chrysocephalum semipapposum

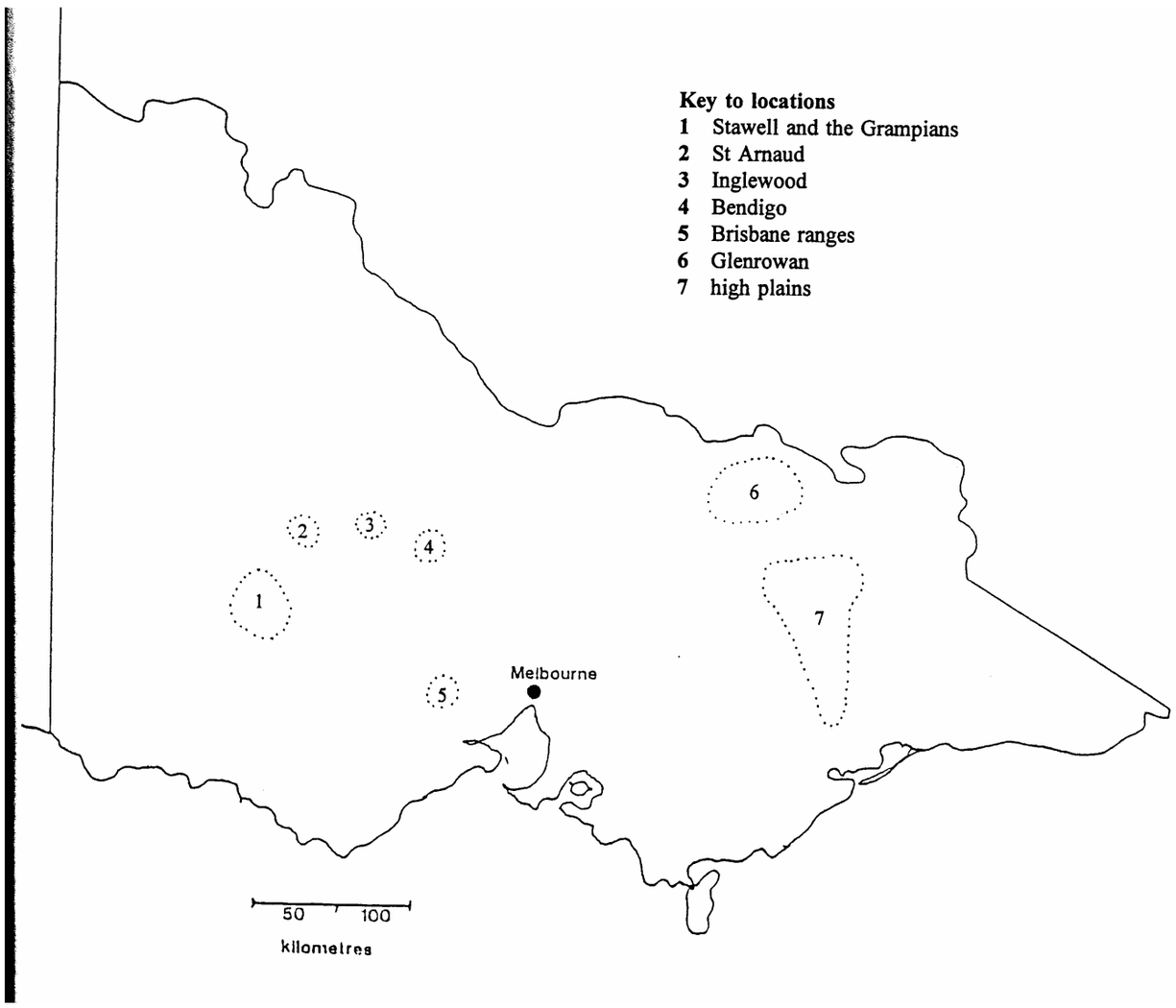
Ozothamnus obcordatus

Collection locations

Herbarium records were examined to identify sites with promising material, as the two species are variable in their vegetative and floral forms throughout their range. In order to maximise the variability sampled, plant populations were surveyed over a large part of Victoria. Populations were surveyed at St Arnaud, Stawell, the Grampians, Inglewood, Bendigo, the Brisbane ranges, Glenrowan and in the high plains (Fig. 1).

Figure 1. Collection areas within Victoria.

(dotted lines represent areas surveyed)



In total 48 clones of the two species were collected (Table 1). The 24 clones of *C. semipapposum* were collected based on variations in flowering time, stem length and leaf size. The colour of the stem and leaves also varied, possible due to the cover of hairs. The colour of the flower heads was also selected for, as they varied from lemon through to orange-yellow. The 24 clones of *O. ozothamnus* were collected mainly on flowering time, stem length and the diameter and presentation of the flower head. The diameter of the flower head was also noticed to vary in association with leaf size, with the smaller leafed selections having smaller flower heads.

Table 1. Collection details for clones of *C semipapposum* and *O. obcordatus*.

Species	**Code**	**Collected by**	**Collection location**	**Comments**
Chrysocephalum semipapposum	CSB1	ATS & ADA	Bendigo	shrub to 80 cm, flower heads to 8 cm
C. semipapposum	CSB2	ATS & ADA	Bendigo	shrub to 60 cm, flower heads to 8 cm
C. semipapposum	CSB3	ATS & ADA	Bendigo	shrub to 60 cm, flower heads to 13 cm
C. semipapposum	CSBLI	ADA	Blue Rag range[1]	late flowering, large number of stems
C. semipapposum	CSBL2	ADA	Blue Rag range[1]	late flowering, large number of stems
C. semipapposum	CSBL3	ADA	Blue Rag range[1]	late flowering, large number of stems
C. semipapposum	CSBL4	ADA	Blue Rag range[1]	late flowering, large number of stems
C. semipapposum	CSC1	ADA	Cobannah[1]	stems to 80 cm, flower heads to 13 cm
C. semipapposum	CSDR1	ADA	Dargo rd[1]	stems to 60 cm, flower heads to 8 cm
C. semipapposum	CSDR2	ADA	Dargo rd[1]	
C. semipapposum	CSDR3	ADA	Dargo rd[1]	
C. semipapposum	CSDR4	ADA	Dargo rd[1]	
C. semipapposum	CSG1	ADA	Glenrowan	stems to 100 cm, flower heads to 10 cm
C. semipapposum	CSG2	ADA	Glenrowan	stems to 60 cm, flower heads to 8 cm

Table 1. Collection details (con't)

Species	**Code**	**Collected by**	**Collection location**	**Comments**
C. semipapposum	CSG3	ADA	Glenrowan	stems to 60 cm, flower heads to 13 cm
C. semipapposum	CSG4	ADA	Glenrowan	stems to 100 cm, flower heads to 10 cm
C. semipapposum	CSMJ1	ADA	Dinner Plain[1]	late flowering
C. semipapposum	CSMJ2	ADA	Dinner Plain[1]	late flowering
C. semipapposum	CSMM1	ADA	Mt. Moornapa[1]	stem length to 50 cm and inflorescence size
C. semipapposum	CSSA1	ATS & ADA	St. Arnaud	plants 60 cm, flower heads 5 cm
C. semipapposum	CSSA2	ATS & ADA	St. Arnaud	plants 60 cm, flower heads 5 cm
C. semipapposum	CST1	ADA	High Plains rd[1]	late flowering
C. semipapposum	CST2	ADA	High Plains rd[1]	late flowering
C. semipapposum	CSU1	ADA	Dargo rd[1]	late flowering
Ozothamnus obcordatus	OOBR1	ATS & ADA	Brisbane Ranges	stems to 50 cm, flower heads > 8 cm
O. obcordatus	OOBR2	ATS & ADA	Brisbane Ranges	stems to 40 cm, flower heads to 5 cm
O. obcordatus	OOBR3	ATS & ADA	Brisbane Ranges	stems to 30 cm, flower heads to 5 cm
O. obcordatus	OOBR4	ATS & ADA	Brisbane Ranges	stems to 40 cm, flower heads to 5 cm
O. obcordatus	OOBR5	ATS & ADA	Brisbane Ranges	stems to 90 cm, flower heads to 10 cm
O. obcordatus	OOBR6	ATS & ADA	Brisbane Ranges	stems to 50 cm, flower heads to 10 cm
O. obcordatus	OOBR7	ATS & ADA	Brisbane Ranges	stems to 70 cm, flower heads to 10 cm
O. obcordatus	OOBR8	ATS & ADA	Brisbane Ranges	stems to 80 cm, flower heads to 10 cm
O. obcordatus	OOBR9	ATS & ADA	Brisbane Ranges	flower buds with red hue
O. obcordatus	OOBR10	ATS & ADA	Brisbane Ranges	flower buds with red hue
O. obcordatus	OOL1	ATS & ADA	Grampians	Bush to 120 cm, flower heads to 8 cm

Table 1. Collection details (con't)

Species	Code	Collected by	Collection location	Comments
O. obcordatus	OORG1	ATS	Grampians	
O. obcordatus	OORG2	ATS	Grampians	
O. obcordatus	OORG3	ATS	Grampians	
O. obcordatus	OORG4	ATS	Grampians	
O. obcordatus	OOS1	ATS & ADA	Stawell	bush to 150 cm, stems to 40 cm, flower heads to 13 cm
O. obcordatus	OOS2	ATS & ADA	Stawell	bush to 200 cm, stems to 30 cm, flower heads to 13 cm
O. obcordatus	OOS3	ATS & ADA	Stawell	bush to 150 cm, stems to 30 cm flower heads to 10 cm
O. obcordatus	OOS4	ATS & ADA	Stawell	
O. obcordatus	OOS5	ATS & ADA	Stawell	bush to 200 cm, stems to 50 cm, flower heads to 13 cm
O. obcordatus	OOS6	ATS & ADA	Stawell	
O. obcordatus	OOS2a	ATS	Stawell	Late flowering clone
O. obcordatus	00S2b	ATS	Stawell	Late flowering clone
O. obcordatus	00S2c	ATS	Stawell	Late flowering clone

[1] location 7 in Fig. 1 (high plains)

Vase life

Plants selected in the field were assessed for their post-harvest vase life. Five stems were collected from each plant, placed in a plastic bag with moistened paper then placed on ice for transport back to the laboratory. Transport and treatment of the flowering material occurred within 48h of harvest. The stems were placed in distilled water and maintained under controlled environmental conditions 20ºC, 65% RH, 10 µmol $m^{-2}s^{-1}$), until they were no longer considered suitable for sale. The assessment of the vase life for all selections was terminated after 14 days inside the controlled temperature room.

The optimum length of vase life for both species could not be determined as the field collected material was of unknown maturity, and was kept dry for up to 48 hours after harvest.

The stems of *C. semipapposum* remained acceptable for a period of between 7 and 14 days (Table 2). Some of the *C. semipapposum* stems developed leaf tip die back and blackening. Further work will be required to determine if this would occur on cultivated stems, and if antisenescence or ethylene-inhibiting treatments, such as STS could control leaf blackening as shown for rice flower (Johnson *et aL* 1992). The stems of *O. obcordatus* were generally selected from the field when they would have been deemed to be over mature. These stems remained acceptable for a further period of between 5 to 13 days (Table 2). Further work is required to determine the optimum vase life of stems in cultivation.

Table 2. Vase life details for the selected clones.

Species	**Code**	**Vase life (days)**	**Comments**
Chrysocephalum semipapposum	CSB1	6-9	
C. semipapposum	CSB2	6-9	
C. semipapposum	CSB3	6-12	
C. semipapposum	CSBL1	-	affected by transport
C. semipapposum	CSBL2	-	" "
C. semipapposum	CSBL3	-	" "
C. semipapposum	CSBL4	-	" "
C. semipapposum	CSC1	-	not tested
C. semipapposum	CSDR1	-	" "
C. semipapposum	CSDR2	-	" "
C. semipapposum	CSDR3	" "	" "
C. semipapposum	CSDR4	-	" "
C. semipapposum	CSG1	> 14	flowers OK, tips of leaves blacken
C. semipapposum	CSG2	> 14	" "
C. semipapposum	CSG3	> 14	" "
C. semipapposum	CSG4	> 14	" "
C. semipapposum	CSMJ1	-	affected by transport
C. semipapposum	CSMJ2	-	" "
C. semipapposum	CSMM1	-	not tested
C. semipapposum	CSSA1	6-12	

Table 2. Vase life details (con't)

Species	Code	Vase life (days)	Comments
C. semipapposum	CSSA2	6-7	
C. semipapposum	CST1	-	not tested
C. semipapposum	CST2	-	" "
C. semipapposum	CSU1	-	" "
Ozothamnus obcordatus	OOBR1	8	
O. obcordatus	OOBR2	8	
O. obcordatus	OOBR3	8	
O. obcordatus	OOBR4	8	
O. obcordatus	OOBR5	10	
O. obcordatus	OOBR6	10	
O. obcordatus	OOBR7	13	
O. obcordatus	OOBR8	8	
O. obcordatus	OOBR9	-	not tested
O. obcordatus	OOBR10	-	not tested
O. obcordatus	OOL1	7-9	
O. obcordatus	OORG1	-	not tested as too advanced
O. obcordatus	OORG2	-	" "
O. obcordatus	OORG3	-	" "
O. obcordatus	OORG4	-	" "
O. obcordatus	OOS1	7-12	
O. obcordatus	OOS2	6-8	
O. obcordatus	OOS3	7-9	
O. obcordatus	OOS4	6-9	
O. obcordatus	OOS5	6-9	
O. obcordatus	OOS6	6-9	
O. obcordatus	OOS2a	5	
O. obcordatus	OOS2b	5	
O. obcordatus	OOS2c	-	not tested

Propagation and cultivation

The plants were propagated using semi-hardened tip cuttings, dipped in Clonex®, purple gel (3g/l indole-3-butyric Acid) and placed into a mist bed. As expected the strike rate of the material which was collected in the field varied from clone to clone. The majority propagated in acceptable numbers while there were a few clones where very few struck, and 13 clones which did not strike (Table 3). As the exact collection site was recorded for each clone, further collections can be made if necessary.

Table 3. Propagation and cultivation success of selected clones.

Species	Code	Number of Cuttings	Strike rate (%)	Tubes at Apr 94
Chrysocephalum semipapposum	CSB1	47	0	0
C. semipapposum	CSB2	40	0	0
C. semipapposum	CSB3	47	6	3
C. semipapposum	CSBLI	25	36	9
C. semipapposum	CSBL2	6	83	5
C. semipapposum	CSBL3	18	61	11
C. semipapposum	CSBL4	10	50	5
C. semipapposum	CSC1	37	92	34
C. semipapposum	CSDR1	12	50	6
C. semipapposum	CSDR2	28	32	9
C. semipapposum	CSDR3	26	23	6
C. semipapposum	CSDR4	28	75	21
C. semipapposum	CSG1	47	81	38
C. semipapposum	CSG2	44	88	39
C. semipapposum	CSG3	55	96	53
C. semipapposum	CSG4	55	40	22
C. semipapposum	CSMJ1	20	35	7
C. semipapposum	CSMJ2	20	95	19
C. semipapposum	CSMM1	29	62	18
C. semipapposum	CSSA1	43	0	0

Table 3. Propagation and cultivation details (con't)

Species	Code	Number of Cuttings	Strike rate (%)	Tubes at Apr 94
C. semipapposum	CSSA2	32	0	0
C. semipapposum	CST1	26	77	20
C. semipapposum	CST2	24	75	18
C. semipapposum	CSU1	30	0	0
Ozothamnus obcordatus	OOBR1	46	35	16
O. obcordatus	OOBR2	52	4	2
O. obcordatus	OOBR3	32	0	0
O. obcordatus	OOBR4	65	24	16
O. obcordatus	OOBR5	62	66	41
O. obcordatus	OOBR6	48	0	0
O. obcordatus	OOBR7	43	49	21
O. obcordatus	OOBR8	55	27	15
O. obcordatus	OOBR9	47	21	10
O. obcordatus	OOBR10	18	0	0
O. obcordatus	OOL1	21	61	13
O. obcordatus	OORG1	50	52	26
O. obcordatus	OORG2	47	4	2
O. obcordatus	OORG3	46	0	0
O. obcordatus	OORG4	68	18	12
O. obcordatus	OOS1	40	5	2
O. obcordatus	OOS2	40	8	3
O. obcordatus	OOS3	40	0	0
O. obcordatus	OOS4	42	0	0
O. obcordatus	OOS5	41	0	0
O. obcordatus	OOS6	38	11	4
O. obcordatus	OOS2a	55	16	9
O. obcordatus	OOS2b	50	4	2
O. obcordatus	OOS2c	50	0	0

Conclusion

Our work has identified two species of daisies which can be used as floral fillers to complement the market for rice flower. The limited natural colour range of *O. diosmifolius* can be enhanced and complemented through the use of the related species *O. obcordatus* and *C. semipapposum*. There is already increasing demand for rice flower in both local and export (particularly Japan) markets.

We have identified a number of clones from both species which exhibited the physical characteristics, had an acceptable vase life and a good strike rate. Continuing assessment in regard to propagation, agronomic potential, pest and disease resistance, and post-harvest vase life is under way. Potential cultivars from our initial selections will be trialled with current rice flower growers to determine their suitability for commercial cultivation. The market potential of the selections will be assessed by surveying local florists, flower wholesalers, and exporters of wildflowers.

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