Development of Rice Flower (*Ozothamnus diosmifolius*) as a Cut Flower Crop

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Abstract

Rice flower (*Ozothamnus diosmifolius*), an Australian native plant, was harvested for cut flowersfrom natural stands up to the late 1980s. Comprehensive research into marketing and cultivation of rice flower was conducted from 1992 to 1995. Marketing research established that the industry was based on 25,000 plants in the ground in 1992. Maturity standards for export rice flower were determined. The need to integrate efficient production with market strategies involving quality control, promotion and test marketing was acknowledged. Production research identified promising varieties (including two commercially available PBR varieties, 'Cook's Tall Pink' and 'Cook's Snow White', and QDPI variety 'Redlands Sandra') with an aggregate 3-6 weeks production season. A major opportunity for extending the production season to 10-12 weeks from existing germplasm was also identified. Agronomic requirements have been suggested, disease problems identified and tentative control measures suggested and aspects of harvesting and postharvest handling indicated. The results of these investigations have enhanced the opportunities for commercial development of this emerging industry.

Introduction

Ozothamnus diosmifolius syn. *Helichrysum diosmifolium* (rice flower), family Asteraceae, is a spring flowering perennial woody shrub occurring naturally in the eastern mainland states of Australia with colour forms ranging from white to dark pink. Rice flower has considerable potential for development as a cutflower crop as it is in demand on both the Australian and international markets. Until the late 1980s this flower was cut exclusively from natural stands. Early research to develop rice flower as a cut flower crop was conducted by Lacey (1989) and by pioneering growers (Graham and Esther Cook, pers. comm.). Information on handling of rice flower for export and marketing opportunities for growers, wholesalers and exporters was required. In addition, there was a need for information on the selection and use of superior cutflower forms, the most appropriate cultural requirements, disease problems and their control and postharvest treatment. These two areas of investigation, funded by Rural Industries Research and Development Corporation, were incorporated in the marketing project 'Development of rice flower as a cut flower export industry' and the production project 'Development of rice flower as a cut flower crop'. This paper reports on the research undertaken in these projects from 1992 to 1995 to improve understanding of these marketing and production issues.

Marketing Research

The potential of, and constraints to, both the domestic and export markets for rice flower were assessed through a survey (conducted by the Department of Primary Industries, Queensland) of growers, wholesalers and exporters conducted in September and October 1992. This was followed up by desktop research of overseas markets for flowers in December 1992 and January 1993. Also, quality standards for export stems of rice flower were developed in conjunction with growers and exporters. Supplementary market research, specific to rice flower, is in progress in countries identified by desktop research. The project aimed to develop an integrated management package for growers with a market-driven approach to production, emphasising export. The roles of each of the links of the export marketing chain from grower to overseas buyer have been examined for the main market. This has developed an understanding of the processes of and impediments to successful rice flower export.

Industry Survey

The 1992 RIRDC survey found that 94% of rice flower was grown for the export of fresh product. The remainder was sold on the domestic market as either fresh or dried product. Ninety percent of exported product was sent to Japan, with small quantities being tested in other markets. In 1995 Japan was still the primary market, however the quantities sold into the USA have increased. Exhibits of rice flower and other Australian native flowers, by the Flower Export Council of Australia (FECA) and Austrade in Asian flower shows, has lead to an increased interest and demand from new Asian buyers, in particular Taiwan and provincial Japan.

Correctly harvested and treated dried or preserved rice flower exceeds the standard set by most other dried filler flowers marketed in Australia, and possibly the world. The development of treated product lines has been hindered by value-adding companies not matching fresh rice flower market prices.

In 1992 25,000 rice flower plants were in the ground, with major expansion predicted. A RIRDC commissioned survey "The Australian Wildflower Industry - A Review", in late 1993 estimated 45,000 rice flower plants in cultivation, with a further 33,000 intended for planting in 1994 (Karingal Consultants, 1994). This Australia-wide survey of all wildflower growers revealed 38 rice flower growers (total wildflower grower population 445), with 14 hectares of rice flower, representing 0.5% of Australian wildflower plantings (2,515 hectares including South African Proteaceae). Cultivated rice flower can be found in all states of Australia. Many growers have small experimental plots of only a few hundred plants. The harvests from these are often sold on the domestic market.

In 1992 total rice flower production was estimated at 200,000 stems. In 1995 an estimated 500,000 stems were produced. This is well short of theoretical production figures due to a combination of poor varieties and grower practices leading to high levels of product wastage, high plant mortality and drought.

The move into rice flower has been driven by the enthusiasm of various individuals and regional development/diversification groups scattered around the country. However, it is timely to now (1996) repeat the original survey to determine current industry status.

*Product Characteristics and Standards*

Rice flower is suitable for use in both wildflower and conventional floral arrangements. Long distance transport is facilitated by an excellent product vase-life.

Rice flower is positioned as a high value focal filler on the Japanese export market, which has had significant exposure to rice flower. The "rice" flower name, rice grain shape, and colour (white and green in combination and pink) are product attributes that are culturally valued by Japanese designers. Product is sold in 10 cm increments from 50 to 110 cm. Premium prices are paid for high quality material, long stems and pink flower heads. Long stemmed rice flower is suited to large public and foyer displays, shorter stems are used in a variety of modern arrangements and in traditional Ikebana. Very short offcuts are used at the base of floral arrangements.

The Japanese market values clean distinct flower colours (clear whites and non-fading pinks), even maturity within the flower head with no "bypassing" (vegetative shoots) and strong straight stems. Clean green high density foliage is used as an indicator of product freshness.

On the Australian market, the production season of rice flower (September-October) clashes with a glut of other filler flowers. The oversupply of substitute fillers and the exposure of east coast Australian markets to poor quality bush-harvested product has lowered the perceived value of the product in Australia. Similarly, rice flower is regarded as a general purpose filler in the USA market. The USA is a price sensitive market and substitution with cheaper filler occurs if the price is considered too high.

Maturity and objective quality standards have been developed, primarily for export. These have been accepted by both FECA and Standards Australia. The standards incorporate flower, foliage and stem quality, harvest maturity (see Figure 1), uniformity of grading, accuracy in labelling and postharvest cooling. They are designed to provide a basis for Australian rice flower growers to meet customer requirements for quality and consistency.

1(a) Immature (wilted)   1(b) Mature   1(c) Over-mature
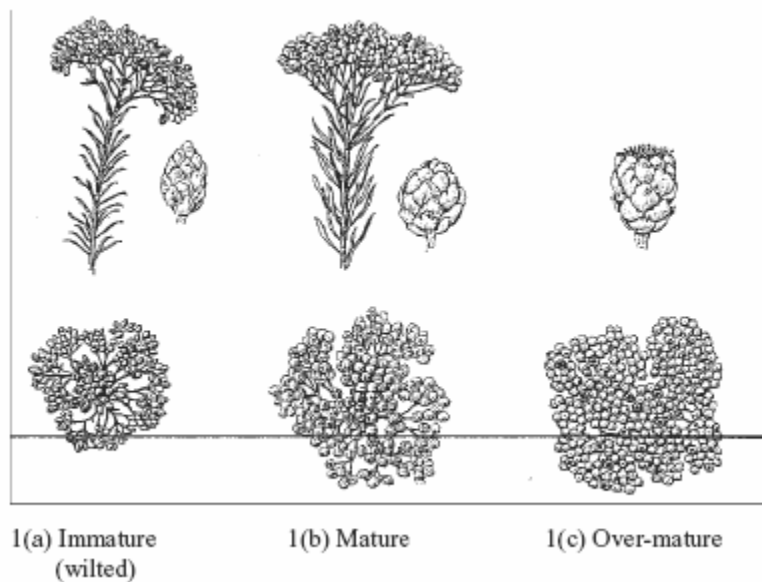
Figure 1: Corymbs and capitula at three stages: 1(a) immature (wilted); 1(b) mature and 1(c) over-mature.

Meeting the Market

Customers seek quality, service and value for money from their suppliers. In the case of rice flower, quality encompasses the use of superior clonal forms, good vase life (supported by an efficient cool chain) and the implementation of the Australian Standard for grading and treating rice flower.

The service dimension is a crucial and frequently neglected area, which is partially within the control of growers. It covers on time delivery, supplying to specification, accurate and complete documentation, the extended availability of product and the free flow of information.

A grower has multiple "customers" in the marketing chain, each with their own perspective. Table 1 contains a hypothetical example from the Japanese marketing chain to illustrate this point. The challenge for producers is to broaden their outlook to consider the wider needs of their market and to be responsive to feedback.

Each marketing chain has its own unique links and characteristics and will differ from the example. In a ideal system there would be a free flow of information on product quality, performance, quantity and price in both directions through the length of the chain. This would enable continual modifications to the supply, quality, timing, presentation and type of product to meet the changing requirements of the market.

Table 1. Some sample viewpoints within an export marketing chain

Export Chain	Example Viewpoint
Grower	production, profit
Exporter	quality, quantity and timing of production, profit
Overseas -Importer	quality landed, customs clearance, dealing with documentation, profit
Overseas - Local Wholesaler	predicting likely demand, product use, profit
Overseas - Retailer	ease of handling (packaging and storage), profit
Overseas - Customer	attractiveness, purpose of purchase, probable vase life, value for money

The Role of Exporters
Unfortunately the reality is that most marketing chains are flawed and hampered by poor communication. Often the price received is the sole feedback to the grower. For this reason it is crucial that growers establish a rapport with a reputable exporter. Exporters are in a position to obtain overseas market intelligence, and provide information to growers on both production and postharvest practices. They aim to provide their customers with volume, continuity of supply, and product diversity by sourcing from a range of growers and localities.

By working together exporters and growers can achieve the goal of supplying quality, consistent, well presented rice flower on time. This will engender buyer confidence, bringing the repeat sales that ultimately will build an industry.

Strategic issues to be considered by rice flower growers as a group include:

• the use of a range of superior clones, geographical locations and possibly preserved or dried product to extend the (currently short) flowering season.

• the development of a marketing strategy embracing;

⇒ test marketing into new Asian markets, identified from desk top research, particularly Taiwan, South Korea, Hong Kong / China, Singapore and provincial Japan

⇒ value-added rice flower (including dried, dyed, preserved and bleached product, souvenirs and crafts)

⇒ promotion to move rice flower from being a niche product based on its' curiosity value, to a main stream world flower, with intrinsically useful floral characteristics.

Production Research

Germplasm Evaluation

Rice flower germplasm was collected from the wild, propagated clonally where possible, and evaluated in comparative trials with grower selections or standard genotypes on farms or research stations. Desirable genotypes were identified using criteria including high plant survival, high stem production per plant, high flowering stem quality including long vase life, extension of flowering season, flower colour etc.

The collections of rice flower and related Asteraceae germplasm, made and/or evaluated in this project, represent a major resource for the rice flower industry. This germplasm is diverse in attributes relevant to commercial production, i.e., plant vigour and ability to survive in cultivation, productivity, flowering time (September to December), flower colour (white and a range of pinks) and of flower quality.

The three clones, 'Cook's Tall Pink', 'Redlands Sandra' and 'Cook's Snow White', together can provide a 3 to 6 weeks harvest season. The commercial and experimental clones of rice flower currently held by growers and researchers allied to this emerging industry, have the potential to provide a 10 week harvest season in South East Queensland. Substantial extension of the harvest season, by the influence of location, particularly colder sites in different parts of Australia, is anticipated but is still to be properly defined. In the longer term, a 12-16 week harvest season seems possible if the potential for further genetic improvement is realised.

Propagation

Rice flower is generally routinely propagated by conventional cutting propagation techniques, stem cuttings producing roots within 5-8 weeks. Methods of clonal propagation including different media, fog and mist systems and different levels of rooting hormone were evaluated. Better strike rates were achieved when motherstock was healthy and vigorous, hormone treatment (2,000 ppm IBA in ethanol) was used, a high minimum relative humidity was constantly maintained and well drained propagation media was used. Tissue culture protocols may have to be developed for difficult to propagate genotypes.

Growing Conditions

Comparison of different cultural practices included the use of supportive mesh, post planting and postharvest pruning and a range of intrarow spacings (i.e. 0.5, 0.75 and 1.0m). Trials with 'Redlands Sandra' at Redlands Research Station, Cleveland, Queensland, in well drained (mounded), fertile krasnozem soil, with adequate irrigation and planted at optimum intra-row spacings of 0.5-0.75m, resulted in yields of 30-43 marketable stems per plant in the first year of growth and 85-109 stems in year 2. At planting densities of 3,333-5,000 plants per ha, this cultivar has the potential to produce yields in the vicinity of 150,000 stems in year 1 and 400,000 in year 2. However, annual productivity of the rice flower crop is strongly determined by plant survival. This may be influenced by genotype, growing conditions, disease incidence and crop management.

Diseases and Pests

Plant losses in rice flower plantings, associated with a range of diseases and disorders, commonly range from 10-20% per year. Severe continuing losses (greater than 20%) can reduce economic life of a crop to three years or less. Measures to control these problems and reduce losses are therefore of great importance. Diseases and disorders affecting rice flower were identified as: phytophthora root and collar rot, a major problem at some but not all locations; white rot, a common problem at most locations; root-knot nematodes, causing major damage at many locations; and stem or wood damage caused by wind to which fast growing rice flower is particularly prone. Various fungal wood rot diseases usually follow any plant damage; longicorn borer damage and root congestion aggravate the above problems, all of which contribute to the early decline of plantings.

Predisposing factors in the development of these diseases and disorders have been described and tentative measures for control recommended. Rice flower lines tolerant of *Phytophthora* (three species), have been identified. As yet no useful resistance to root rot nematode infection has been found in rice flower.

Harvest and Post-harvest Techniques

Preliminary investigations were conducted into earliest inflorescence maturity for harvest, the influence of vase solutions (including sucrose levels) on vase life and the value of cool storage on stem quality.

Harvesting and postharvest handling practices to extend the harvest season and maintain stem quality have been identified. The present harvest maturity recommended to industry is when capitula are mature yet unbroken, the corymb is fully expanded and does not readily wilt after harvest. Flowering stems in some clones can be harvested at an earlier maturity (20-40% of capitula of full size) than presently specified. This has the potential to extend the commercial harvest of such clones by up to 10 days, much longer than the present 2-5 day harvest periods of some clones. Rice flower had at least 10 days vase life when held in 0% or 2% sucrose solution with 50ppm chlorine. Sucrose levels of 5% in vase solution were found detrimental to rice flower vase life. The benefits of removing field heat from rice flower stems immediately after harvesting and holding the commodity at around 2₀C to avoid foliage blackening was shown in laboratory trials.

Conclusion

Members of the emerging rice flower industry have been provided with over 20 relevant technical publications on the results from the production and marketing research projects (e.g. Beal *et al.* 1994, Carson *et al.* 1994). A comprehensive rice flower growing and marketing booklet for growers and members of the grower service sector is now being produced. A wider range of rice flower references are easily accessible from the Ornamental Crops database at 'GrowSearch', Redlands Research Station, Cleveland Q. Telephone: 07 3286 1488; Facsimile: 07 3821 3784.

Further production and postharvest research on rice flower and related species is being undertaken in a new project by the authors together with Tony Slater and Rod Jones of Agriculture Victoria, Institute for Horticultural Development, Knoxfield, Victoria 3180. This project entitled 'Development of new Asteraceae from the Australian flora to complement the current rice flower industry' is funded by the Rural Industries Research and Development Corporation.

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