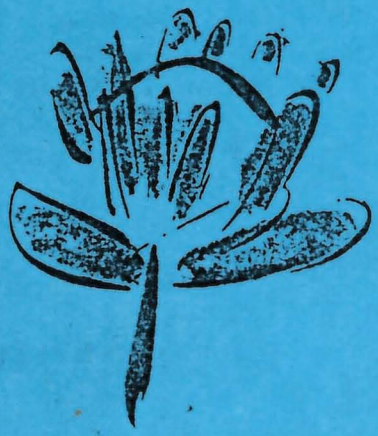
9th BIENNIAL INTERNATIONAL PROTEA ASSOCIATION CONFERENCE

and

INTERNATIONAL PROTEA WORKING GROUP WORKSHOP

CAPE TOWN - August 1998



PROGRAM SUMMARY

REGIONAL REPORTS

DAILY PROGRAM and ABSTRACTS

PARTICIPANTS LIST

Printing sponsored by Oudendijk b.v., Aalsmeer, Netherlands

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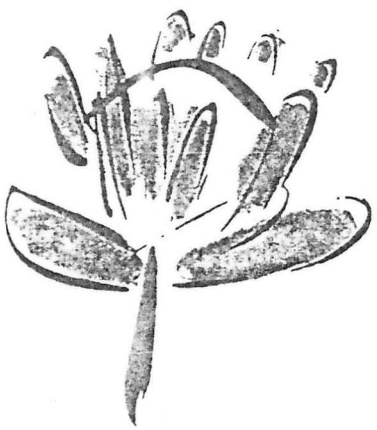

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SAPPEX

Professionals with a Pioneering Spirit

Professionals in the way in which they work, but with a pioneering spirit that continually results in new initiatives.

This is the typical image of Oudendijk, an organisation that consists of several companies - combined they successfully source flowers produced worldwide.

Several companies under one flag.

At present these are Oudendijk Import, Oudendijk Bulbs and Seeds (Bulb Quest BV) and Oudendijk Flower Trade Department.

The three firms operate independently from one another in order to specialize in particular areas, but are nevertheless closely linked.

The companies are based at various locations in The Netherlands. The head office is in Aalsmeer, a few kilometers from Schiphol Airport

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Welcome to the
9th Biennial International Protea Association Conference and
International Protea Working Group Workshop

Important notes for all delegates

- Please wear the name tags provided to all functions. For security reasons they are also your entry ticket.
- Please have breakfast at the hotel where you are staying.
- Where meal vouchers are provided, please ensure that you have them with you.
- Please switch off all cell-phones (GSM/Mobile phones) during functions and lectures
- All lectures will take place in the Breakwater Business School, except on Thursday 13th. Please follow directions to the different venues posted in the Business School.
- All exhibitions (Commercial, Associations and Posters) are to be put up in the Exhibition Hall. Please follow directions posted in the Business School.
- Tea will be served in the Exhibition Hall.
- Lunch will be served in the 'Stonebreakers' Canteen, to be found in the Breakwater Lodge (sea-side block), except on Thursday.
- Board Meetings and the Research Meeting will take place in the Breakwater Lodge Lounge. The room number will be advised, or check the notice board.
- The Wide Horizons Travel Help-Desk is situated in the foyer of the Exhibition Hall every day during tea, and lunch, and for half an hour after the end of lectures, except on Thursday 13th.
- **Help Hotline**, Dr. Cobus Coetzee, Tel. 082-550 7321

Program: Tuesday 11 August

noon onward	Exhibitors and Posters set up in the Exhibition Hall
16.00 - 18.00	**Registration** - at delegates' hotels - also for delegates on the Pre-Conference Tour.
18.30 - 20.00	**Welcome function** - Venue: Aquarium, Victoria & Albert Waterfront
21.30 - 22.30	**IPA Board Meeting** - Breakwater Lodge Lounge

YOUR PROGRAM AT A GLANCE

(see colour coded Daily Program, 12th - 15th August, for full details)

On the next page you will find a summary of the Conference Program. Full daily programs are colour coded. Daily programs are to be found after the Regional Reports. Each day's program is followed by abstracts of papers, talks and posters in the order in which they will be presented on that day.

SUMMARY OF DAILY PROGRAMS

Wednesday 12 August - Opening (*yellow*)

07.15 - 08.00	Breakfast at your hotel
07.30 - 08.00	Late **Registration** and Day delegate Registration
08.15 - 08.45	**Opening Ceremony**
08.45 - 10.00	Keynote speakers: Prof. R.M. Cowling, Dr. K. Dixon: Conservation
10.00 - 10.15	Indigenous Knowledge Systems
10.15 - 10.45	**TEA**
10.45 - 11.00	Air Transportation
11.00 - 11.15	IPA Restructuring Report
11.15 - 12.30	Panel Discussion with Area Representatives
12.30 - 14.00	**LUNCH - Group photo at venue to be advised**
14.00 - 17.00	Guided visit to Kirstenbosch National Botanic Gardens
18.00 - 19.00	**IPWG/IPA Research Meeting**, Breakwater Lodge Lounge
	Dinner own arrangements

Thursday 13 August - Elsenburg (*blue*)

07.00 - 07.45	Breakfast at your hotel
08.00	**Bus departs** from hotels for Stellenbosch
09.00 - 10.00	Farm Visit: Protea Heights,
10.00	**Bus departs** for ARC-Fynbos Research Unit, Elsenburg
11.00 - 13.00	Tour of Nursery and Genebank
13.00 - 14.00	**LUNCH**
14.00 - 14.10	Welcome
14.10 - 14.50	The Protea Nursery
14.50 - 15.10	From harvesting to cultivation
15.10 - 15.30	The challenges of growing Protea magnifica
15.30 - 16.00	**TEA**
16.00 - 16.20	New cultivar releases
16.20 - 16.45	Panel: Growing experiences in different climatic regions of South Africa
16.45 - 17.20	Lectures by the ARC-Fynbos Unit
	B-B-Q

Friday 14 August - IPWG Workshop (*purple*)

07.15 - 08.00	Breakfast at your hotel
08.15 - 08.30	Fynbos Research, a future perspective
08.30 - 09.00	Session 1: Diseases of Proteaceae
09.00 - 09.45	Session 2: Nutrition and Plant Management
09.45 - 10.45	**TEA**
10.45 - 12.00	Session 3: Cultivar development and selection
12.00 - 13.10	Session 4: Pruning and Manipulation
13.10 - 14.30	**LUNCH**
14.30 - 16.00	Flower arranging demonstration in Exhibition Hall
16.15	**IPA Board Meeting** in Breakwater Lodge Lounge

Saturday 15 August - Growers Sessions (*orange*)

07.30 - 08.15	Breakfast at your hotel
08.30 - 10.00	Session 1: Technology Transfer
10.00 - 11.00	**TEA**
11.00 - 11.45	Session 2: From Harvesting to Point of Sale
11.45 - 12.45	Session 3: Marketing
12.00 - 12.45	Panel Discussion with Industry
12.45 - 14.00	**LUNCH**
14.00 - 14.45	Session 3: Marketing - continued
14.45 - 15.15	IPA Biennial General Meeting and next conference invitation
19.00 to ☺ ?!	GALA DINNER at The Forum (opposite V&A Hotel, Waterfront)

REGIONAL REPORTS FROM AROUND THE WORLD

Australia: AFPGA, Queensland, Western Australia
Chile
El Salvador
Madeira
New Zealand
South Africa
USA: California, Hawaii

AUSTRALIAN FLORA & PROTEA GROWERS ASSOCIATION (AFPGA)

Submitted by Mrs. Chris Horsman, National President

The Protea and Australian native flower industry has reached a cross-road, and the next few years will determine whether it successfully makes the quantum leap from cottage industry to a serious money-making business. Increasingly, over the last few years, there have been severe gluts of product like *Protea* 'Pink Ice' and *Leucadendron* 'Silvan Red'. This year saw the popular *Leucadendron* 'Safari Sunset' join that list. Problems are due largely to increasing production, rather than declining sales. Because of this, prices have been dropping in actual terms, and at times, even top quality product has remained unsold. A large number of mainly part-time growers have decided to leave the industry, but there are still many people who believe that there is a future.

The AFPGA has always been an Association of 'doers', and so at the AGM in 1997, approval was given for the national committee to employ Jan Davis, a well known and successful marketing strategist. Together with various key industry figures, Jan developed a strategic marketing plan, which maps out a future direction for the industry in Australia. The national committee is overseeing the implementation of the plan, which in the first instance encompasses a national plantation survey, and the development of a "Flower Price Index" so that movement in flower prices can be checked. Once baseline data has been established, a marketing campaign will be implemented, which aims to increase the farm gate value of sales by 15% over production increase by the year 2000 within Australia.

The Sydney 2000 Olympic Games will, we expect put the spotlight on Australian native flowers, as all floral tributes to athletes will be made from only natives. AFPGA hopes to position the industry to make the most of this event.

AFPGA has an on-going commitment to research and is presently funding two projects - one on nutrition for proteas and leucadendrons, the other to establish an effective control for Elsinoe scab disease. This support will continue, even though the flower industry as a whole has voted against a national levy to fund such projects. Opposition came mainly from traditional flower producers, and our positive stance was overwhelmed by weight of numbers.

In summary, it has been a difficult year, but there are indications that with hard work, the industry will become profitable again in the near future.

AUSTRALIA: QUEENSLAND

Submitted by Judy Moffatt

Number of Growers
This is very hard to estimate as many growers are not members of either IPA or Australian Flower & Protea Growers Association. Those with more Australian native flowers than protea are likely to join one of the smaller flower associations which have sprung up in the coastal and northern areas. I know of about 25 new growers who are trialling a few plants, such people are not likely to join either IPA or AFPGA until they are certain they wish to continue.

Irrigation and Area Planted: So far as I am aware all growers have irrigation. Our long term drought has emphasised the need, as the odd one or two growers without irrigation have seen a drop in quality and have now installed irrigation.

The figures provided by Dr. L.V. Turnbull in Volume 34 of the IPA Journal would be the best guide for Queensland, namely a total area of about 81 ha. I regret I cannot give any figures on Wax, Rice Flower or any of the many genera grown for "filler" or "greens".

Research
The AFPGA has an ongoing programme on Elsinoe which is being funded (to the best of my knowledge) by AFPGA and the Horticultural Research Development Council. Various other projects are being conducted by Queensland growers themselves - 3 or 4 grouping together and conducting trials on nutrition for local conditions and manipulation of flowering times. Any funds needed are provided by growers themselves.

Pest and Diseases
The principal disease is still Phytopthora and to a much lesser extent Colletotricum which is becoming less of a problem by the selection of resistant cultivars. Scale is always with us, but is easily controlled and other insect pests such as borers, caterpillars and grasshoppers are a minor nuisance. The incidence of Elsinoe is very low now and during the last 12 months, I have only heard of one minor outbreak.

Labour, Transport, etc.
Labour for picking is usually by local people on a casual basis. Domestic transport seems satisfactory. Air conditioned or refrigerated trucks are used in most areas and go direct to wholesaler or auction.

Sales destination
I cannot give you the figures on export vs. Local markets, I would guess about 50:50 of protea, a higher percentage of native products would be exported. A large proportion of Queensland domestic product goes to the southern states. The export destinations are many: Japan of course, Taiwan, Singapore, Hong Kong, Holland, Germany, America and Canada, and even trial shipments to England.

Promotions
There is always a special display at the Brisbane exhibition every August and growers take the opportunity of local shows, exhibitions or anywhere they feel a display would be worthwhile. The national Association has produced excellent posters and brochures.

Future Outlook
We have a few new cultivars to look forward to, both South African proteaceae and Australian natives which should help to fill "gaps". Now that both quality and quantity have improved, growers are combining their product and exporting. All in all I would say that we are older, wiser, more efficient and have improved quality and management practises which seems to point to a bright future.

AUSTRALIA - WESTERN AUSTRALIA

Submitted by Ralph Sedgley

Number of Growers

Data for 1996 indicate that the value of wildflowers exported out of Western Australia was approximately $15,000,000 of which about one third were estimated to be proteás of South African origin.

Growers of South African proteas are not a clearly defined group in Western Australia. Probably a little more than one half of the estimated production comes from dedicated protea growers and the rest from growers of Australian natives and hobby farmers. Because ground water is plentiful, land relatively cheap, acid soils, and mild climate, just about anybody can be a potential protea grower, particularly on the coastal part of the mid- and lower south western region, south from Perth.

Membership of the Proteaceae Producers Association of WA (Inc.) (PPAWA) is fairly stable between 30 to 40 commercial or would-be commercial growers, compared with that of the Western Australian Wildflower Producers Association (WAWPA) at more than 150. Membership of the latter includes wholesalers and a number of non-grower members. The PPAWA is dedicated to South African proteas and WAWPA to Western Australian native species. Although plantations overlap into native and exotic wildflower species there is little overlap in membership. This situation is due to historical and geographical factors as well as differences in methods and requirements under cultivation as well as differences in personal attitudes towards the native and exotic flora.

Reliable industry data are not available because much product is shipped directly out of Western Australia via the eastern states' centres of Sydney, Melbourne and Brisbane, as well as to global markets. As indicated in the Karingal Report such product appears as exports from those states. Some attempts have been made to collect data on exports of wildflowers by the Flower Export Council of Australia (FECA) supported by RIRDC. However growers have been loath to support collection of statistics on a long term basis. Data on plantings on individual farms are regarded as confidential or difficult to interpret and are not currently available.

Growing region

Limited mainly to south western corner of Western Australia which has a well defined mediterranean climate and is bounded roughly by the triangle formed by Geraldton in the north, Augusta in the south and Esperance to the west of Augusta. Most protea farms (SA species) are grown in the higher winter rainfall belt (>460 mm), centering on the Busselton /Margaret River area (lat. 33.5 deg. S). Because of the almost rainless summers all plantations are irrigated. Growers depend on ground water, which is abundant in most parts in the flatter coastal areas, or on stored surface water in the more hilly areas. Production of Western Australian natives is spread more evenly over the region, particularly on deep sands north of Perth and in the region known as the Great Southern which includes the town of Albany and is noted for its Banksia coccinea.

Soils

Proteas tend to be planted in areas where wine grapes can be grown successfully, but on the lighter textured soils and medium to upper slopes which are better drained and less frost prone.

Soils vary considerably from loams to sands with gravelly or clay subsoils at varying depths, and deep sands with no subsoil layer. Most of these soils vary from 4.5 to 6.5 in pH.

Varieties

Species and varieties of all important SA Proteaceae genera are grown, eg:

Protea: magifica, Pink Ice, repens, eximia, Ruby Blush, compacta, cynaroides, nerifolia, Frosted Fire, and non-registered grower selections.

Leucadendrons: Safari Sunset, Inca Gold, Maui Sunset, Silvan Red, Pisa, Jubilee Crown, argenteum, conicum, coniferum, discolor, eucalyptifolium floridum, galpinii, gandogeri, laureolum, procerum, rubrum, salicifolium, salignum, xanthoconus, plus non-registered grower selections.

Leucospermum: Various grower and Proteaflora selections of L. cordifolium, Highgold, Tango, L. patersonii, Scarlet Ribbon, reflexum.

Serruria: Various grower and Proteaflora selections of S. floridum, Superb Blush, Sugar and Spice.

Some South African Berzelia is also grown for export.

The most important species of Western Australian native origin include: Banksia coccinea, B. ashbyi, B. hookeriana, B. prionotes, B. speciosa and B. baxteri, all of seedling origin, a wide range of kangaroo paws, including selected hybrids, a number of waxes, of which Purple Pride is still an important variety, Stirlingia, Boronia sp., Beaufortia, Verticordia sp., Conospermum sp, and Dryandra.

Research

Until 1998, public funding through the Wildflowers and Native Plants Sub- Program of the Rural Industries Research and Development Corporation (RIRDC) has been the main source of finance for R & D for indigenous wildflower species in Western Australia, by the Commonwealth Government. However, the Government is now restricting this type of funding to projects where growers are prepared to match their contribution with a 25 % cash contribution of their own. An important element of this type of funding is that the research must involve a level of technology and research capability that would not otherwise be available to growers.

This means that much of the more routine testing of new varieties and other agronomic practices which is of great importance to growers is no longer eligible for matching funds from the Commonwealth Government. In an attempt to help growers move in this direction, RIRDC is funding a DOOR - Do it Ourselves Research project lead by Dr Mal Hunter from Queensland involving Queensland and West Australian protea growers. The idea is to test whether growers can actually do some of their own research with a modest amount of technical support. In addition, the experience is designed to give growers greater insight into how research is done and so help them when seeking government funds for research which is beyond their resources. The DOOR project has been integrated with the newly formed Product Groups of the Center for Australian Plants.

In 1998, protea growers were successful in attracting matching funds for a modest breeding project to produce locally adapted hybrid Leucadendrons. The Centre for Australian Plants, which is a consortium of research institutions in Western Australia and includes the School of Agriculture of the University of Western Australia and Agriculture West - the state department of agriculture, will be contributing the services of a plant breeder to collaborate with a syndicate of growers to breed and develop new Leucadendron hybrids for the Japanese market. The growers will be matching the contribution from RIRDC with their own cash contribution of 25 % and will undertake trials under supervision of the plant breeder, Dr Guijin Yan. Participating growers will benefit by gaining priority access to new cultivars for a limited period before they are made available to the industry in general.

Contributors to the project will earn royalties in proportion to their contribution. In the case of the growers and the Centre for Australian Plants these will be ploughed back into new projects. RIRDC will receive royalties in cash.

The business structure is designed to allow for continuance beyond the three year tenure and to facilitate entry of new participants, either growers contributing cash and "in kind", or donors of significant germplasm. In the case of the latter, royalties could be negotiated.

To expand the range of Leucadendron hybrids available for testing beyond what can be achieved with traditional approaches, Dr Yan will be studying pollen/stigma interactions using fluorescent microscopy, embryo rescue and other specialized techniques which he has been using in the major research programs on native plants, e.g. wax, Verticordias, etc.

Another source of Commonwealth Government research funds is through the Strategic Partnerships with Industry-Research and Training (SPIRT) Scheme. This scheme is sponsored by the Department of Employment, Education, Training and Youth Affairs (DEETYA) through the Australian Research Council (ARC). These projects must demonstrate a high level of collaboration between the university researchers and the eligible industry partners, together with the potential to develop new university industry links or to enhance existing links significantly.

At least four principles seem to be emerging from the Government's approach to supporting R & D for industry.

1. Industry must accept major responsibility for funding its own research in the future.

2. The Government will help fund research where Industry shows a willingness to pay for its own R & D.

3. The Government recognizes the value of the intellectual property generated by the research institutions through state of the art application of science and technology to industry problems.

4. Taxpayer funding of industry research can only be justified if it increases profitability and leads to further employment opportunities in the community.

The secret of success of these R & D schemes will lie in our ability as growers to see our projects as business enterprises in themselves and as opportunities to enhance our competitive ability, rather than as handouts from the Government, for which we have contributed little.

The bottom line is that if we do not take up this challenge we will lose Government support. For wildflower producers who are in a global market, the recent rejection of a national flower levy for promotion, research and development is an ominous sign for the future. For the local domestic market it may not matter, but for export industries, R & D is our lifeblood. If we want to compete in a global market we have to aim to be the best.

In the case of breeding new varieties there is an almost inexhaustible amount of variation waiting to be tapped in our native floras. However, without investment in research and the latest technology most of this variation will remain untapped. We as growers need to understand that the "hardware", i.e. resources of land, native flora, water, soil and climate which we enjoy are in themselves not worth a great deal. It is only through the "software" i.e. the products of the brain power and skills of our scientists and technologists that we can unlock and husband the wealth residing in these resources. Basically, growers have to work to find ways of unlocking the treasures that reside in our national assets: the natural environment and our research institutions.

Local Conditions

The cost of freight is the overwhelming burden of wildflower growers in Western Australia. It costs more to send flowers to Europe and Japan from Perth than from Melbourne. A large proportion of wildflowers are exported out of Australia via the eastern states. This adds a substantial cost to our exports which can only be offset by using premium grade cultivars produced to the highest quality.

Currently many of the varieties used are old and no longer command a premium. Growers are only now becoming aware of the benefits of proper fertigation and irrigation in enhancing yield and quality, through their experiences with the DOOR project.

In Western Australia growers are slowly being forced to move from a low capital input cottage industry to a modern, more capital intensive technologically based industry.

Diseases and pests are always with us. Most of the chemicals, equipment and know-how to deal with these are available but are not yet coordinated and used to good effect. "Sudden death syndrome" is attributed to many causal agents including Phytophthera, and work is under way to develop practical methods for growers to adopt, both for identification and control. This is one of the projects that Mark Heap from Agriculture West has initiated under the DOOR project, with collaboration with Murdoch University.

Although root diseases get most attention foliar diseases are also causing problems: canker in Banksia has devastated plantations and natural stands in the Great Southern, and Alternaria and Coleroa have been reported in the genus Protea. Pathology services in Western Australia cost $45 per specimen, are under-resourced and growers experience long delays in receiving results of tests. Some growers send specimens to Knoxfield in Victoria which has a good turn around and access to a pathologist for advice. This costs $90 per specimen.

There are two types of insect problem: damage to the plant itself and infestation of product entering countries with strict quarantine regulations such as Japan and the USA. In the first category, insect pests of proteas are mainly various species of leaf chewing weevil and beetle. Native and introduced scales and mealy bug are also a problem and often result in claims for disinfestation on exports to Japan. In the second category is a wide range of native and introduced pests, including Western Flower Thrip.

A major problem in dealing with pests is the general lack of registration of chemicals for use in combating them. Pest control services are unable to make recommendations for many chemicals.

Infrastructure in terms of the horticultural service industries is well developed, but with limited information on application to wildflowers which tend to be of lesser value and are scattered over a wider area than other horticultural crops. Wholesale nursery services are available locally for growers to propagate their selections at a reasonable price, and a number of growers regularly import plants from Proteaflora Enterprises which is the main professional source of new material. Local road freight is available from the main growing areas but not generally with chilling facilities.

Labour is of uneven quality and usually not well paid by local standards. This is unlikely to change until the industry becomes more profitable and can support training programs and higher rates of pay.

Markets and Marketing

Some 90 % or more of wildflower production is exported out of the state to a wide variety of markets which include the main population centres of the eastern states of Australia, Japan, USA, Canada, Netherlands, Germany; France, Singapore, Taiwan. South African proteas are exported for 11 months of the year, whereas Australian native wildflowers have a more limited season. But this is expanding as more growers find that a mono-culture does not make for a viable business.

The industry is characterized by a few large producers who do their own marketing, with the medium to small growers adopting an opportunistic approach and selling wherever they can for what they can get. The more organized growers develop niche markets with wholesalers who know their product.

Attempts are currently being made to make it possible for growers to consolidate their marketing arrangements, but this is a slow process. Growers tend to lack confidence and are most interested

in these schemes when prices are poor, but soon lose interest when they get a few good prices. In addition any scheme to benefit by consolidating product requires a more professional approach, with stringent attention to quality and the integrity of the cool chain. This cannot happen without education and capital investment.

Growers participating in a cooperative marketing group need to invest in a suitable packing shed, fax and phone answering machine, fumigation, cool room and forced draught cooling facilities, and to have access to a suitable freight service to Perth destinations. They also need to accept the discipline of submitting weekly availability lists, and filling orders as specified, and on time. Among the benefits are a greater predictability of marketing, higher average prices over a season, access to a wider variety of markets plus the opportunity to create new niche markets, and a more reliable payment system.

At the state level, the Government of Western Australia has backed a Plan for the development of the Western Australian Cutflower Industry. This plan was initiated by the Minister for Primary Industry who set up a Floriculture Market Development Group comprising leaders from the various components of the industry in Western Australia assisted by Mark Webb, an Executive Officer of Agriculture Western Australia.

After a year-long consultation process with Industry the Group has just completed a 29 page Report (Misc. Pub. 7/98 ISSN136-4168) in which it has set out the following key objectives:

- to have a single Association representing fresh cutflower growers that can address key issues affecting industry growth and profitability.
- to better resource the Association to allow it to move to a new level in professionalism in the delivery of information and services to its members.
- to have significant improvements in product quality, especially on export markets.
- to supply good quality native plants and proteas to the domestic market.
- to identify and develop appropriate strategies to promote quality cutflowers on domestic and export markets.
- to ensure the access and timely dissemination of market information to industry.
- to strengthen our position in Japan, and to diversify into new markets or increase sales into smaller, existing markets.
- to improve grower networks and co-operation on a regional or crop basis.
- to have an equitable and efficient funding mechanism that provides adequate resources for promotion and grower directed research.
- to ensure effective and efficient technology transfer and adoption by the industry to provide for increased profitability.
- to have a continuous release of new plant material that appeals to consumers and improves industry profitability.
- to improve consumer knowledge in purchasing and handling cutflowers.
- to improve all aspects of the cool chain.
- to overcome quarantine and trade barriers that limit access on export market.

The M[illegible]ing Group has now been charged with the job of implementing the first key objective which [illegible]ects to complete before the end of the year.

Promo[illegible]s are an ongoing affair and include local exhibitions and displays as well as contrib[illegible]ns to international trade fairs in Europe, Japan and Singapore organised by FECA and Austra[illegible].

Future Outlook: The future outlook for the wildflower industry in Western Australia is either good or bad, depending on your outlook. It is good if the Industry meets the challenge of the global market and all that that entails. It is bad if growers fail to see how co-operation to meet the key objectives outlined above can result in a WIN-WIN situation for all.

CHILE

Submitted by Ana Maria Lobos

At this moment I am the only one doing research in Chile. I have a lot of experience in vineyards (winery and alcohol production are my main business) and growing garden plants is my hobby. On a trip to Melbourne, Australia, I saw the protea flowers for the first time and fell in love with them. Knowing that Melbourne has almost the same climate that we have in central Chile and that I had already been successful in growing Australian flora, I began to make some enquiries with my Australian garden friends about where I could learn more about this plant. With their help I was able to visit Proteaflora, where I met David Mathews. He showed me his beautiful farm and facilities and he recommended some books where I began to learn all the different requirements for growing proteas.

Back in Chile I began to investigate if there was someone growing proteas. It was difficult to find people who knew what I was talking about. I met a teacher from the University of Talca who had seen the proteas at a flower meeting in Israel. She introduced me to a teacher from the University of Valparaiso who had made an attempt of growing proteas with plants and instructions from Israel, with very bad results.

After this I realised that it was impossible to get help here in Chile, so I began my own plantings with seeds imported from South Africa. I had good results in reproducing proteas and *leucadendrons*, but very bad with *leucospermum*.

At that time I learned about a training course on Fynbos Cultivation at ARC, Elsenburg. I knew that if I wanted to grow proteas, I had to learn a lot. I attended the course and it was like opening a big new world in gardening. Proteaceae are so different from the rest of the garden plants!

Since my visit to South Africa, my experience with Proteaceae in Chile began to grow. I imported a few rooted and unrooted cuttings in October 1996. At this moment they are big and healthy and I cut my first flower in April this year.

Number of growers:	1
Area planted:	½ hectare under irrigation: Leucospermum, Leucadendron and Proteas - origin South Africa.
Research:	Protea growing in Chile, by Ana Maria Lobos.
Market:	Internal flower market
Future Outlook:	Counselling for new growers, selling plants.

EL SALVADOR

Submitted by Bert Veltman

History

We initiated our efforts to grow Proteas commercially in El Salvador in 1982. At that time we grew Bird of Paradise, and saw Proteas for the first time during a visit to California. As mostly is the case, we started out with importing seed, mainly to find out if our conditions were adequate. It turned out that indeed proteas could be grown at our location, but of course the quality of our plants, being grown from seed, was unsatisfactory.

At that time the civil war that tore the country apart during almost ten years made us suspend our efforts to proceed with the growing of proteas, mainly because our location was almost impossible to reach because of war related activities. In 1989, when things started to improve, we re-initiated our plans to grow proteas commercially, confident that as proven it was possible. Apart from having land with the necessary conditions to grow proteas, we also are ideally located to export to the East coast of the USA, Miami being only a 2½ hours flight away. So we imported rooted cutting from Jack Harre in New Zealand, and started all over again. When the situation looked promising we asked Jack Harre to come and visit our farm, and then sent our farm manager for some time to New Zealand where Jack taught him how to propagate plant material. Another visit to our farm important to mention is that made by Phil Parvin, who last year spent some time in El Salvador and made very valuable recommendations. So much for the history. Hereafter some relevant information about where we are now.

Location

El Salvador is part of the Central American istmus, between Mexico and South America. We have a sub-tropical climate, with a rainy season (May/October) and a dry season (November/April), and daytime temperatures between 20ºC and 30ºC, and night time temperatures of 11ºC to 15ºC. During the rainy season we will get about 8 inches of rainfall.

Our farm is on the high part of the slope of a volcano, about 15 miles from the capital city of San Salvador, at an elevation of 1700 M above sea level. (San Salvador is at 800 M). The road to the farm is rather bad, unpaved, and unfortunately also rather unsafe because of robbers.

The Farm

The area under cultivation totals about 7 HA, soil is black with volcanic rock. During the dry season we can only water the newly planted proteas, by hand. We have 10 people working on the farm, cleaning weeds, fertilising, propagating, spraying pesticides, and once a week cutting and packaging flowers for export. Of our total area we have abt. 2 HA of Pincushion (Harry Chittek, Patersonii and Firefly), abt. 2 HA of Kings (3 types), abt. 2 HA of Silvan Pink, Neriifolia, Candy Floss and Eximia, and the remaining 1 HA with Aristata, Pudens, Grandiceps and Kangaroo Paws. We have two greenhouses where we reproduce by cuttings, with an automated watering system and a capacity of 50.000 cuttings. We have been producing abt.12.000 rooted cuttings per year. Further we have a packing shed where we pack our flowers for export, and a large cooling room where we keep the flowers at 5ºC.

Operations

In 1997 we harvested the following number of flowers:

Pincushions:	45.000 stems
Silvan Pink	32.000 stems
Kings	18.000 stems
Neriifolia	14.000 stems
Assorted Pr.	10.000 stems

We expect to grow at least 10% per year in total yield, and are trying to grow and introduce new varieties. We export 100% of our production, to an importer in Miami who distributes our products to wholesalers in the USA. We use the national Airline (TACA) for the transportation of our flower boxes to Miami, once a week. We have very few pest problems, and whatever problem we have we have been able to solve with locally available pesticides and fungicides.
We would like to add Banksias to our production program and will try to do so. We are also always trying to add new types of Proteas, but within reason. We would like to have a more active role in the marketing of our flowers in the U.S.A. and are working on some ideas.

We also have a farm of tropical flowers in El Salvador (Bird of Paradise, gingers, heliconias, etc), and export the tropicals and the Proteas together to the same firm in Miami. As far as we know we are the only farm growing Proteas in Central America (and maybe Latin America), which has the advantage of there being a good demand for our flowers, but the disadvantage of not having any shared experience with other growers in our area.

Finally, the name of our company growing Proteas is EL SALVADOR PROTEA FARMS, and our company growing Tropicals is called MAGIC FLOWERS.

MADEIRA

Submitted by J. Fernandes and A. Blandy

Proteas have been grown commercially in Madeira for about 25 years.
Relatively flat available land is scarce and most plantations are located on hillsides facing south about 500 metres above sea level.

There is one major cut flower grower on the island - "Florialis" which grows cymbidium orchids and 8 hectares of Proteas. There are smaller enterprises growing proteas for the local market and I estimate that the area under protea cultivation in Madeira is about 20 hectares.

In recent years the climate has changed quite dramatically; the low range of temperatures has increased from 10º - 18º to 12º - 20º and rainfall which used to spread fairly evenly over the period September to June, now tends to become more concentrated, falling more aggressively and during fewer days (surely not El Niño?...). With these climatic conditions, plants do not 'rest' sufficiently in the winter and their vegetative development is strong at the time of flower formation, these conditions make for erratic flowering times and the plants need constantly to adapt to their habitat, thus causing vegetative dysfunction.

Cynaroides: - Production is between December and May. Flowers are large and spectacular and the colour tends to be white-pink rather than the deeper red. Root systems are susceptible to soils with *phytopthora* and *roselina*.

Pink-Ice: - Some production has been achieved two years after planting due to their strong vegetative development. Production occurs between October and February and production is sold locally and in Europe. However, we find with this cultivar and also Neriifolia that when the flowers are picked before the first rains, the leaves black rapidly - even when put in fresh water. Consequently their value suffers in the market place.

Leucospermum cordifolium: - Plants are very sensitive to soil borne diseases including *drechslera* which cause plants to die. As elsewhere, they flourish best in areas where the soil is light and well drained. Production is normally concentrated in 2/3 months.

Safari Sunset: - A good compliment to proteas and much used locally in flower arrangements. Production is from September to January and stems sold with flower at the end of the season are always popular.

Weed Control: Our balmy climate causes weeds to grow strongly and we combat them by hand and chemically. We are studying the possibility of planting grasses to control and avoid weed development.

Outlook: For the protea growers in Madeira the outlook remains good though experiments with new variety and improved cultivars need to be made in the light of our changed climate in order to ensure success for the future.

NEW ZEALAND

Submitted by Robin A. Soar

Introduction

I have recently taken over the responsibility of Area Representative from Bill Garnet and as yet am not fully conversant with all aspects of the job. However, the following is an appreciation of the current situation in New Zealand.

Statistical Data

There are no statistics available on the number of growers or the area planted in foliage crops. However, it may be useful to give a general description of the foliage production units in New Zealand.

Although Proteaceae and related species can be grown in selected locations throughout New Zealand it is in the north of the North Island that the climate permits plantations in almost any location provided other factors are favourable. In the Bay of Plenty, parts of the East Coast and in the Auckland/Northland the areas of well drained volcanic soils are most favourable. In Auckland/Northland high humidity presents limitations with certain species due to difficulties in controlling fungal diseases.

Although there are a number of larger production units, a typical plantation is about 4.25 hectares (10 acres) and is run by one or two full time operatives. Part time casual staff may be employed at times of peak labour demand. Such small units may appear to unusual by international standards but have evolved because of a number of factors. These include high labour costs, distance from markets, high freight rates and limited air freight capacity. New Zealand producers aspire to produce to a high quality niche market concept.

Due to a small population base, even in the proximity of the larger cities the domestic market is limited, forcing growers to export much of their production.

Research

Very little research is being undertaken in our field of horticulture. The Government has divested itself of much of its responsibility to scientific research. It has set up self supporting research organisations but unfortunately the funds available to a small part of the industry through voluntary growers organisations are too small to initiate meaningful research.

Transportation

Local transportation of flowers to internal markets for export is generally good particularly where road transport is used. Internal air cargo is giving some concerns as there has been a merger of the transport businesses of the internal airlines.

International air cargo from New Zealand suffers from the dual problem of a shortage of space and high price. At times of high demand as when strawberries are being exported there can be severe limitations on space and advance bookings are necessary.

It is a fact of life for New Zealand growers that their markets are distant and the problems associated with air transport are a limiting factor.

Recent Conditions

El Nino weather has become a familiar phenomenon everywhere over the last few years. In New Zealand it has brought extremes. In the North where the bulk of proteaceae are grown there was an extremely wet spring followed by drought conditions through summer. Although the drought has been alleviated to some extent, in most areas the net rainfall for the year is still below average.

The very wet spring caused root damage and during the dry hot summer more plants then usual succumbed. In the relatively moist climate of New Zealand phytophora is a constant problem; this year it assumed plague proportions.

An additional problem which occurred with the hot conditions which were accompanied by high humidity was the high incidence of insect and fungal infestation. Sprays appeared to be less effective than normal and it was suggested by one consultant that this could be due to reduced translocation of systemic sprays within the plants.

Local Organisations

Efforts are being made to revitalise the NZ Protea Growers Association. There will be a reorganisation and constitutional changes designed to reflect the current situation. When these changes have been made, a drive to recruit more members will take place so that the Association will more representative. The propcsed change of title to the NZ Protea and Foliage Growers Association will more accurately describe the activities of the vast majority of growers in New Zealand.

Work continues on establishing an industry wide organisation called Flower Industry of New Zealand (FINZ). It is hoped that this organisation will become fully operational this year.

Markets and Marketing

Japan is by far the biggest market for NZ produced foliage. Other markets include Hong Kong, Taiwan, Korea and North America. It will be no surprise then that the Asian economic crisis is causing some concern. It is particularly worrying since growers laboured under adverse conditions during the previous year when the NZ$ was overpriced. This latter condition caused lower returns to growers in local currency.

Other than Asia, the USA and Canada form the next largest market. It is hoped that with the reduced value of the NZ$ an opportunity to extend this market may exist.

In an effort to consolidate existing markets and establish new markets the NZPGA has joined with other specialist grower organisations in supporting the Flower Exporters Association's Market Development Committee. The PGA participates in the deliberations and supports marketing efforts financially and with donated product. Projects last year were directed at raising the profile of NZ flowers in the Japanese market. Flower design demonstrations and semi-permanent displays were arranged. Proteaceae and other foliage were a prominent feature of the displays. Prominent members of the Japanese flower trade were entertained in New Zealand during which time they visited various flower producing properties including foliage production plantations.

It is intended to continue work with the Market Development Committee during the coming year. It is hoped to extend the range of activities this year.

Outlook

There are a number of problems facing the industry in New Zealand. Apart from the economic uncertainty in our main export markets, there are problems competing on overseas markets. Some of these have been touched on in this report; high airfreight costs, high labour costs, little or no support from Government and so forth. In addition there are problems of tariff and non-tariff barriers which are difficult to overcome.

It appears that diversification of markets and in the range of species grown may provide some relief but a continuation of our current strategy of high quality niche marketing will probably prove to be the underlying remedy for the current malaise.

REGIONAL REPORT - SOUTH AFRICA

Submitted by Maryke Middelmann

Number of Growers

We have shown a steady increase in membership. We now have just over 400 (almost double the number of 1996) members of which approximately 20 are overseas growers/importers from Australia, California, Holland and elsewhere. There are still people involved in the industry who have not joined our Association, mainly involved with harvesting from the wild for the dried flower trade.

Markets and Marketing

The USA market has now opened to us under very strict regulations. To gain a foothold in this market is not easy. The science and technology agreement signed between USA and RSA led to a 3 week display and lectures at the National Arboretum in Washington in November 1997. This event received good publicity in the press there.

Exports, fresh	1996	3,300 tons (15.35% increase over previous year)
Exports, fresh	1997	3,579 tons (8.2% increase over previous year)

Statistical information supplied by exporters show that there is a definite trend away from flowers such as *P. repens* and *P. compacta* to cultivar selections.

Unfortunately prices realised have not been as good as the previous season, due to continued over-production of all types of flowers in general, recession in Europe and warm weather experienced in Europe at the height of our selling season. Also, the weather pattern in South Africa put us into direct competition with our neighbours, Zimbabwe

Dried flowers sales have remained stable but here also profitability has eroded.

Survey

According to a survey done in 1997, we have a total of 330 ha under intensive cultivation:

Proteas	207
Leucospermum	66
Leucadendron	12
Bruniaceae	45

This includes white repens, compacta, platyspermum, strictum, salignum, sabulosum and rubrum.

Crops which are broadcast sown - to a large extent for the dried flower industry are not included in this figure.

Genebank

The Genebank is slowly but certainly getting in some money. Largely due to royalties received from Hawaii and Australia on plant material supplied under plant breeders rights. Efforts to raise money from the general public brought virtually no results.

Publications

During 1997 another important book was published: Southern Overberg: No. 8 in the series on South African Wildflower Guides. This deals mainly with plants found in the region from Hermanus to Infanta. SAPPEX has also produced a striking colour leaflet which has been used at the Washington Exhibition and at the Aalsmeer flower show. Some of our members are using it for their own promotions. The "Cape Flora" brochure is being updated and will be ready in time for

the new export season. Dried flower and fresh flower posters, as well as a disease poster have been made available to the Industry.

Future Outlook
A number of progressive farmers will survive in this highly competitive business. There are still "chancers" who have not yet put the necessary structures in place and who lack the professionalism to make it in the long term. The shake-out we have promised is closer than most people think.

U S A - CALIFORNIA

Submitted by Dennis Perry

Number of Growers & Concentration by Region, Soils & Climate
1000 Acres 3.6 Million $ ±10% reported

Industry estimates of protea acreage are near 1000 acres planted and plantations in development should validate the estimate soon. All or, at least, 99% of plantings are irrigated, most with low volume systems. Official state income figures are 3.6 million US$; industry sources suggest this may be only one-third of true income. Some 200 growers are spread up and down the state. Thirty of these growers account for 50% or more of the total production and twenty wholesale shippers produce 60% of the sales. The bulk of production remains in North San Diego County (+/- 70%), growing in decomposed granite soils on hot-warm steep frost free slopes. Santa Barbara and Ventura Counties have established plantations that account for 15%+ of production in primarily shale and sandy soils on warm frost free hills. Monterey and Santa Cruz region has established production that may account for 10% of the total. Production is in sandy acid soils on cool, relatively frost free hills. At least three new, potentially large plantings are started in this region. For all regions, disease problems are generally focused in the roots (quick die-back) or flowers (botrytis). Nutritional problems are the
cause of most foliage blemishes, and nematodes may exist in non-virgin soils.

Area Planted by Varieties and Origin of Varieties
40 % seedling, 30% local selections, 30% overseas selections.

Most genera are uniformly planted up and down the state with specific selections in local favor only because of availability.

Allied Crops
Leptospermum, Wax, Rice, New Australian Introductions

Fully 70%+ of protea plantations have allied crop production. Total acreage of Leptospermum, Chamelaucium, Erica, Boronia and many new "Allied Crops" exceeds that of protea in California.

Local Conditions, Infrastructure, & Labor
1 hour from large floral distribution centres. Farm worker pool. All of the protea growing regions are in established floral production areas. Access to agricultural labour with floral skills is good, economic transportation is available, and a network of wholesalers and shippers is obtainable. Water is of some concern, especially in San Diego where cost and dissolved salts are considerations. An EC of 3.2 was recorded from the delivery line and an acre-foot of water can cost $ 800.00 (proteas require ~ 1 acre-foot/acre/year).

Markets and Marketing
Local vs. Export Destinations, Direct Markets, Auctions, Shippers, Wholesalers

California market absorbs < 35%, US & Canada 45%, 10% overseas. The twenty wholesalers that control 60% of the protea sales, account for most of the out of California shipping and a fair portion of California. Auctions are not a large outlet for California protea, most sales go out through shipper-wholesalers to regional-wholesalers throughout the U.S. and Canada. Some growers have tapped the high margin, direct to florist, direct to consumer markets, but volume is limited.

Promotions
24 Ads, 10 Articles, 24 Trade Missions by C.C.F.C., 24 Floral, Seminars,
Floral Care for Proteas in English and Spanish, California Protea Wall Chart

The California Cut Flower Commission (CCFC) has been promoting California flowers throughout the USA using targeted trade missions with plenty of floral support of proteas grown in California. California Protea Association(CPA) has organized the donation of flowers to this and many other worthy floral marketing promotions. Flowers were sent to South Africa's floral gems exhibition at the U.S. National Botanical Garden in Washington DC. A web site at ***www.californiaprotea.com*** has been an ongoing 'hit'. Recently a CPA produced wall chart of California protea was well accepted and gone to a second printing. Photographic equipment has been purchased by CPA to provide for the web site and ongoing advertising promotion for seasonal arrangements that reflect seasonal production in florist magazines. Holidays are the "life blood" of the floral industry and promotions for the proteas in bloom at specific holidays have been a success! Care instructions are often not targeting the staff that unpacks the boxed protea after shipping so CPA produced these instructions in Spanish as well as English.

Future Outlook
New plantings of protea and allied Mediterranean plants follow the economy and interests of international transplants to California. New cut flower operations are starting up in Monterey, Santa Barbara, and San Diego Counties and expansion of existing plantings continues in all regions. New plantations had been flat to marginally increasing for ± 8 years but émigrés and profits from the local sector have fuelled a potential increase, nature willing. Demand for selected cultivar material will continue to increase as new planting and replanting continue. More marketing tools are in development that are focused on the designer and customer (buying public).

REGIONAL REPORT - HAWAII

Submitted by Carver Wilson

Overview
Just over 20 years ago Hawaii's first commercial Protea farms were established. Hopes were high as our growers sought to reap the rewards from Hawaii's advantages - excellent climate, distinct blooming periods for leucospermum and a very marketable name association with the islands. Today, growers are still planting, although with recognition of Hawaii's disadvantages - climate suitable for diseases, long distances to our customers and the difficulty of creating a differentiated product in the world marketplace. For some, the challenges have proven too great to continue or time has not allowed them to, but for others they have been met with enthusiasm.

Statistics:
According to official statistics gathered from the Department of Agriculture, 30 producers operating on 129 acres sold US$ 1.167 mil worth of Protea flowers at the wholesale level in 1997. The table below indicates official statistics for the period 1989-97

Year	Acres	1,000 blooms	$ Price/stem	Total value ($1000)
1989	125	1,690	0.70	1.184
1990	145	1,343	0.73	0.976
1991	132	1,125	0.68	0.766
1992	107	1,228	0.59	0.732
1993	100	1,260	0.57	0.721
1994	126	2,080	0.42	0.869
1995	137	1,877	0.57	1,071
1996	166	1,758	0.70	1,224
1997	129	1,413	0.83	1,166

While the number of producers remained constant during 1996-97, the cultivated land area declined to 129 acres from 166 acres. Unofficially, several producers are forecasting additional plantings. This should total approximately 15 - 25 acres per year for the next two years. However, some of the new acreage will be replacement planting.

Growing Regions

Production on the Island of Maui is in the Kula/Olinda areas, near the Kula Agricultural Experiment Station. The climate is temperate due to the 1,000 meter elevation. Rainfall is primarily in the winter, with dry summers, although the summers of the last years have been somewhat rainy. Total rainfall can range from 15 inches to 65 inches (378^{mm} - 1638^{mm}). Drip irrigation is used on most farms. Our temperatures peak at approx. 80ºF with a low in the 40's. Soil type is loamy and decomposed from the volcanic origin. Big Island locations are near the Kona area. The actual growing region stretches north to Waimea and to South Point. The conditions are also varied as on Maui. Soil conditions tend to be rocky.

Hawaii has a variety of micro-climates. Growers have found that certain varieties are best grown in areas that are most favourable for those specific varieties.

Varieties

Official statistics for each variety planted do not exist for the industry. However, we do know that farmers generally plant Cynaroides, several varieties of Leucospermum and several different varieties of Neriifolia, Eximia, Niobe, Pink Ice, etc. The foliage planted is primarily Safari Sunset with only very small quantities of other Leucadendrons. Most Protea growers in Hawaii are not planting other crops - they concentrate on Proteas.

Growers have been planting Cynaroides and Leucospermum varieties in fairly large numbers. Disease problems have plagued the other types of Protea, resulting in a gap in production. Additionally, the Neriifolia types have been arriving with the "black leaf" at distant markets.

Research

We are very fortunate to have the University of Hawaii's assistance in developing the Protea industry. In addition to the hybridizing being conducted at the Kula Agriculture Experiment Station, disease identification projects are also being undertaken. Every year we hold a grower's workshop/field day in Kula and Kona to display the research. Since 1994 over 2,200 Leucospermum hybrid seedlings have been evaluated with more than 30 identified for future release. Also, approximately 21,000 selected cuttings have been released to the growers during the same period. Currently disease screening trials are underway for certain diseases. The idea is to find cultivars with genetic resistance to breed with.

Marketing

The values in the tables above reflect sales at the farm gate. Many of the smaller farmers sell to companies that specialise in consolidating floral production for sales to retail flower shops or to

distributors in other areas. If the consolidators grow flowers of their own then they are called growers/shippers. Of these, most are growing anthuriums as their largest crop.

Hawaii's proteas are sold in several markets. Below is a table describing the most common markets. Since the government does not keep records of this activity, these are estimates.

Destination	Estimated % of crop	Use
Hawaii's local market	20 - 25%	Resorts, flower shops, supermarkets
US Mainland + Canada	40 - 50%	Flower shops, wholesale distributors
International (Asia/Europe)	20 - 30%	Importers / auctions (10% of export)
Gift boxes	5 - 10%	Direct to consumer

Large commercial shipments to the wholesale trade on U.S. Mainland, Canada and to International markets generally consist of Kings and Pincushions. The other, more speciality flowers have been used primarily in the local market and gift boxes.

Transport

Very little of our floral production is sold on the island in which it is grown. With Hawaii being the most remote location on earth (the farthest from a continent) air freight is the primary mode of transport. Honolulu is our closest major market with a population of over 200,000 people and is serviced via two local airlines from Maui and the Big Island of Hawaii. Honolulu has direct air service to the U.S. Mainland, Canada and Japan via several airlines flying primarily wide-body aircraft. Maui and Kona have limited direct service so much of the freight transfers in Honolulu.

Federal Express (FexEx), United Parcel Service (UPS) and the U.S.Postal Service provide small package delivery favoured by the gift box shippers or those seeking door-to-door service.

The cost of freight and transit time are the two largest obstacles for us.

In summary, this report is designed to give some unofficial insight into our current situation and our future. We have a wonderful group of individuals and organisations assisting in the development of the Industry still regarded as very young, with potential for growth.

ZIMBABWE

Submitted by Conrad Archer

PAST, PRESENT & FUTURE OF PROTEA GROWING IN ZIMBABWE - HUMPTY DUMPTY

The Harare I.P.A. Conference in October 1993 marked the end of the first decade of commercial Protea growing in Zimbabwe. The conference was characterized by optimism on the part of Zimbabwean growers who could look back with pride on their achievements over the previous ten years. Growers believed that the basic groundwork had been completed and they would now start to reap the rewards of ten years of trials, errors and learning. In this period an industry which was 90% seedling based, primarily on Protea species, had changed to a 95% cultivar-based industry with a high percentage of imported Leucadendron and Leucospermum cultivars. There were several competent propagators in the country to ensure the continued growth of the industry, selections of superior local material had been made, pioneering work had been undertaken on fertilizer and water requirements, pruning methods on the various varieties were being refined. Irrigation, especially drip with fertigation, showed great promise. Efficient marketing organizations were in place. Zimbabwe was able to show delegates a plantation of Pink Ice of exceptional health and productivity. The future of the Industry looked very bright indeed. We were floating on air, practically walking on water and believed this was just the beginning.

Since 1980 Zimbabwe had experienced an exceptionally dry period, culminating in the 1991/92 drought but by 1993 we had even survived that and were re-building our plantations. What more could be thrown at us? There were signs that the present Government appreciated the valuable foreign currency earned by flower exports and it was even said that proteas were President Mugabe's favourite flowers.

The industry had been built up without any financial support from Government and was holding its own without the recently abolished export incentives. Zimbabwean protea growers had proved their ability to thrive independent of support and that they were flexible and innovative enough to survive in the modern world. What could they not overcome?

At the end of 1997 Humpty Dumpty fell off the wall. Two successive wet seasons had brought back typical sub-tropical conditions. Varieties that had loved our drought conditions hated the cloudy humid weather. Pincushion varieties like luteum and our vestitum selections started exhibiting hitherto unseen fungal problems. Leaf diseases became virtually uncontrollable. Protea Pink Ice was particularly susceptible. This variety also was hit heavily by insect pests. Whilst still reeling from fungal attack a vicious little borer found Pink Ice much to its liking. Black moth became the Black Death. While fungal and insect pests above ground made products unsaleable, pests and fungi below ground killed off plants. Many young plants succumbed to white grubs, larvae of the Msasa beetle, while high water tables, high temperature and high soil moisture content seemed to cause an explosion of soil pathogens. Throughout the country plant death's escalated - samples sent in for analysis pointed to many different fungi with Fusarium levels especially high but Armillaria, Phoma, Rhizoctonia and the dreaded big 'P' were also isolated. Plantations which were thriving two years ago were sometimes completely wiped out. Expensive chemical treatments merely slowed down, but did not prevent deaths. Available biological controls were equally unable to help. The trend has continued this year with the newly discovered Elsinoe scab being widespread on Proteas as well as pincushions.

Towards the end of last year Protea growers were dealt further devastating blows. Labour unrest of a violent nature was followed by a compulsory 40% wage increase to farm workers. Meanwhile Government had designated for re-settlement a number of farms. Finally, the Zimbabwe Dollar collapsed and the cost of nearly all inputs doubled in price.

Such then is the current scene. Humpty Dumpty is battered and bruised and while I do not believe his injuries are terminal he is much humbled and no longer walks on water. His confidence is shattered and he is not yet confident or fit enough to sit on the wall. He now believes that there may be some truth in what in 1993 he thought was a myth, namely it is difficult to grow Proteas successfully outside the Cape.

Old time poultry farmers are familiar with a phenomenon arising from keeping poultry on the same land for a long time. Such land is regarded as being "fowl sick". It is believed the same ill health can be seen with regard to Proteas. Land under Proteas for a long time can sometimes, but not always, become Protea-sick. Replants invariably die in a short time. The answer may be to rotate the land under Proteas and only refill for the first few months after planting.

In future we shall recommend that areas to be planted to Proteas should be sterilised. This may be achieved at first with methyl Bromide or Basamid but in future is more likely to be by steam or even fire. Phytophthora could be reduced by the use of plastic sheeting and solar energy, perhaps in two treatments, before and after ploughing. The aim will be to bring plants into early bearing and to reduce losses before maturity.

In the first five years of commerical Protea production in Zimbabwe, there was a heavy emphasis on Proteas, especially Repens, Neriifolia and Cynaroides. In the succeeding five years this imbalance was corrected with extensive plantings of Leucospermum and Leucadendron cultivars. Certain Neriifolia, Repens and baby Proteas, mostly of local seedling origin, are being bulked up. Our selections are increasingly made on good commercial qualities, especially disease-resistance,

productivity and vase-life, rather than exceptional flowers. Such flowers rarely possess good commercial attributes. Lacking funds for research our future hybrids will come from farmers themselves. Farmers will be asked to place a single plant in amongst a block of plants with which it is desired to make a cross and forwarding the flower heads or seeds to a specialist nursery. Bulking up Protea cultivars is a much longer process than with leucospermums or even Leucadendrons but it can be done with a fair amount of confidence if selections are made from satisfactory mature plants grown locally.

Growers no longer clamour for new, imported varieties simply because they are new or imported but rather want something that has been tested locally and found to be disease-resistant and productive. Of the approximately 130 cultivars that are presently being tried only about 20 are currently widely grown. Some, like Harry Chittick, High Gold, Lineare, Riverlea and Patersonii are very specific in their growing requirements and highly successful in only a few areas, while others such as Tango, Scarlet Ribbon and Safari Sunset are in danger of being over-produced because they present fewer problems in cultivation.

More than any other factor the future success of our industry will depend on the caliber of our Protea growers. A prospective grower is now warned of all the pitfalls. He needs to be mentally tough with the will to perservere. He needs sufficient financial resources to survive bad times. He has to be prepared to encounter and deal unaided with numerous problems and find that no-one has satisfactory answers to most of his questions. This is not to say he is given no assistance. His site and soils are examined to ensure that the site is away from the vicinity of pines and eucalyptus that could carry root-borne pathogens, that it is relatively frost-free, that inspection pits reveal good drainage. His soils and irrigation water are subjected to full analysis before he is encouraged to embark upon two or three proven varieties suitable for his soil type and micro climate. He is given details for the pre-planting fertilizer to be incorporated three months before planting and any pesticides that will be needed for termites, ants, grubs or nematodes. He is encouraged to send his staff for training in planting, irrigation and pruning in the first year. Early pruning in particular is critical if maximum productivity is to be achieved. He is given advice on planting densities and encouraged to ensure good water and air drainage by planting on ridges. Growers in the various areas are encouraged to hold regular field days at which their problems can be discussed and solutions suggested by more experienced growers. Persons knowledgeable in various fields, such as agronomists are invited to attend these field days. In these ways we hope that the new grower will at least have a good foundation on which to build his future success.

In our situation where the bulk of our plantings come from two or three nurseries a great deal of responsibility is placed on local propagators. It is imperative that the highest levels of hygiene are maintained in their nurseries and that they do not propagate from material that is diseased, in over-supply on the market, or unsuitable for our conditions simply because it is easy to propagate. Those in charge of our Protea nurseries need to emulate Elsenburg which ensures that the material it exports is as disease-free as possible by, for example, exporting a high percentage of terminal cuttings.

Z.P.A. is currently sponsoring a scheme whereby exceptional material of local origin is bulked-up in propagation facilities set aside for this purpose in order that this material is available in commercial quantities as soon as possible. By this means a revolving fund will be created for the importation of material from other countries but, at present, the emphasis is on local cultivars with good commercial attributes. Local cultivars presently only account for about 10% of our plantings but it is anticipated that this figure will rise to about 40% over the next five years. I do not anticipate that grafted root stocks will be widely used in our industry in the near future unless a truly phytopthora resistant Leucospermum rootstock is developed. Somewhere in the wild, Proteas are growing in phytopthora-infested soils. These Proteas need to be sought-out for our future rootstocks.

Zimbabwe will be heavily dependent on other more advanced countries for the research necessary to combat pests and diseases. Meanwhile, we shall continue to concentrate on developing

resistant varieties and hope that the more effective strains of beneficial fungi, like Trichoderma, will be developed.

Humpty Dumpty in Zimbabwe. There is no help from the Kings' horses or the King's men. Only Zimbabwe Protea farmers themselves can put Humpty together again.

RESEARCH PROJECTS

Project - Fertilization Trial

Project Manager	Miriam Kawisi
Site	Horticultural Research Center - Marondera
Consultants	K. Percival (Zimflora)
	S. Shepard & R. Munroe (Windmill)
Funding	IPA Australian Bursary for one year,
	Z.P.A., Windmill, Zimflora

Objective 1.
To obtain information which will be of help in guiding fertilizer practice on Protea in Zimbabwe. Fertilizer trial being done on Protea Pink Ice : N:P:K - 3 x 3 x 3 combination.
432 Pink Ice planted on flat (9/1/98) & 432 planted on ridges (12/2/98). Unfortunately many plants have been ring-barked around the roots by white grub. May have to consolidate plants onto one site (either flat / on ridges).

Objective 2.
Observation trial on the following cultivars on mounds (raised basins) and on the flat:

Leucospermum	Leucadendron	Protea
Erubescens	Safari Sunset	Tsitsikamma
Scarlet Ribbon	Red Gem	Pink Ice
Saxosum No. 1	Inca Gold	Fiery Duchess
Vestitum No. 1,2,3	Wilson's Wonder	Sylvia
Caroline	Maui Sunset	
High Gold	Discolor (M)	
Sunscar	Fireglow	
Tango		
Luteum		
Sunrise		

Project - E.U.

Project Manager	Katy Percival (Zimflora)
	Dr Rufaro Madakadze (University of Zimbabwe - Crop Science)
Site	Juliasdale (Eastern Districts)
	Darwendale (Makonde)
	Karoi (Northern Districts)
Funding	EC funded
	Donations of equipment or chemicals from:
	Agricura, Windmill, ImpHort, Cyanamid, SprayQuip, Bayer

Objective 1.
Evaluate *Proteaceae* hybrids to see if these cultivars have improved floricultural and horticultural characteristics over the three different sites. (Rootstock from Elsenburg, South Africa).

Objective 2.
Identify pests and diseases on new hybrids/cultivars, to ascertain possible management systems to control these to ensure a better end product.

Objective 3.
Improve efficiency of vegetative propagation of hybrids.

Duration
Project started November 1997 and is aimed to be completed over 4 years.

Local Conditions

Infrastructure

- Road infrastructure good.
- Telecommunication is poor.
- Air space availability is reasonable, but difficult for destinations other than Europe. Average freight cost o Europe between October '97 & end April '98 was S$ 2.26.
- Chemical, implements and equipment availability is reasonable.

Main Diseases: Elsinoe (scab on pincushions, Leucadendrons & Proteas)
Fusarium (localised)
Phytophthora (localised)
Pestalosiopsis
Drechslera

Pests: Black Moth (Agyroploce sp.) - on Proteas, esp. Pink Ice & Sylvia.
Tortrix on Leucadendrons
White grub in new lands

Labour: Most plantations have an average of 3 labourers per hectare. Average plant density per hectare 2,600 plants. Present labour costs are Z$ 539/month. Present exchange rate is Z$ 17.5 : US$ 1.00.

Markets and Marketing

Companies
There are four marketing companies selling Proteas out of Zimbabwe. Zimflora is by far the largest, exporting 80% of all Proteaceae produced. Less than 3% of growers export directly. A vast majority of growers are contracted to supply in exchange for plants, consultancy etc.

Destinations
75% to the Dutch Auction floors. The remainder is exported directly to consumer countries, i.e. Japan, Hong Kong, Taiwan, United Arab Emirates, Kuwait, Belgium, United Kingdom, Switzerland and USA. The percentage of direct exports has risen rapidly in the last year and is expected to rise to approximately 40% of the next year. Only 4% of production is sold locally. Approximately 6% of total production is rejected on farm.

Promotions

Local: EFGAZ Protea poster.
Updated Protea Guidelines, written by Derek Archer.
ZPA will be represented at Agriflora International Flower Show 1998 in Harare.

International- Zimbabwe was represented at the Aalsmeer International Flower Show 1997. Zimbabwean Leucospermum Hybrid "Sunbird" won a gold medal for new products in the exotic category.

Number of Growers

Total number of growers + 125. There are 5 Wards:

Centenary - Centenary/Concession/Mvurw
Central Watershed - Enterprise/Harare/Headlands/Marondera/Rusape/Ruwa
Eastern Districts - Chimanimani/Chipinge/Juliasdale/Penhalonga/Troutbeck/Vumba
Makonde - Darwendale/Lions Den/Norton/Trelawny
Karoi - Karoi/Tengwe

	No. Growers	Resettlement Growers	Area (Ha)
Centenary	7		11
Central Watershed	15		26
Eastern District	62	22	134
Makonde	15		69
Karoi	4		26
TOTAL		125	266

Watering Method

Drip Irrigation:-	58%
Other:-	22%
Non-Irrigated:-	20%

Soil and Climate

Centenary, Makonde, Karoi:-
These regions have deep, well-drained sandstone derived soils.
Climate warm - often resulting in enhanced vigor of plants.

Eastern Districts:-
The soil is granite derived, with a high quartz content. It is a coarse medium. Nutritional content is low. Irrigation and fertigation is extremely important in this region. Plants do not have the same vigor as above mentioned regions, but do tend to have a longer productive life span, possibly due to a 3-8°C lower temperature. Frost susceptible areas.

Central Watershed:-
Many different soil types, from sandstone derived soils to heavy red clays. The heavy red soils cause many nutritional problems, and usually drainage is impeded. Frost is a concern in and around Marondera, where temperatures can get low.

Varieties and Mix

Proportion of Proteas (% of Total per region)

	Leucadendron	Leucospermum	Protea	Others*	Total Plants
Centenary	30.4	43.9	23.4	2.3	60.142
Central Watershed	40.3	30.3	25.8	3.6	72.817
Eastern Districts	20.6	29.1	37.4	12.9	285.371
Makonde	30.8	35.8	32.4	1.0	221.837
Karoi	59.0	34.8	6.2	0.0	36.450
TOTAL	36%	35%	25%	4%	676.617

* - Others include Banksia, Mimetes, Serruria and Waratah

TOP FIVE VARIETIES GROWN

	Area (Ha)	Source
Safari Sunset	48.0	New Zealand, Australia
Cynaroides	36.8	South Africa
Pink Ice	27.6	New Zealand

Scarlet Ribbon	15.9	South Africa
Waratah	15.2	Australia and New Zealand

Main Leucadendrons Grown:	**Area (Ha)**	**Source**
Sarari Sunset	48.0	New Zealand, Australia
Inca Gold	11.0	New Zealand
Wilson's Wonder	5.7	New Zealand
Argenteum	3.3	South Africa
Silvan Red	2.3	New Zealand

Main Leucospermums Grown:	**Area (Ha)**	**Source**
Scarlet Red	15.9	South Africa
Saxosum	13.2	Zimbabwe
Cuneiforme	10.2	HB selected in Zimbabwe
Tango	7.9	South Africa
Erubescens	5.7	South Africa

Main Proteas Grown:	**Area (Ha)**	**Source**
Cynaroides	36.8	South Africa
Pink Ice	27.6	New Zealand
Sylvia	5.5	South Africa
Neriifolia	4.5	South Africa
Repens	3.4	South Africa

Other Proteaceae Grown:	**Area (Ha)**	**Source**
Waratah	15.2	Australia and New Zealand

Wednesday 12 August

07.00 - 08.00	Speakers prepare in Exhibition Hall
07.30 - 08.00	Late **Registration** and Day delegate Registration
08.15 - 08.45	**Opening Ceremony:** Welcome by Barrie Gibson, *President of IPA* Response by Maryke Middelmann, *Chairman of IPA and SAPPEX* Opening by Mr. L.H. Fick, *Minister of Agriculture and Finance, Western Cape*
08.45 - 09.30	Prof. R.M. Cowling, *Institute for Plant Conservation, University of Cape Town* "Conservation of the Cape Flora: Strategies for the Future"
09.30 - 10.00	Dr. K. Dixon, *Kings Park and Botanic Garden, Perth* "Saving the Flora of the Southern Hemisphere - can we rescue the horticultural potential?"
10.00 - 10.15	Dr. J.H. Coetzee, *ARC-Fynbos Unit, Elsenburg* "Exploitation of Indigenous Knowledge Systems"

10.15 - 10.45 Tea served in Exhibition Hall

10.45 - 11.00	Mr. G. von Mansberg, *The Cargo Connection* "Air Transportation - an airline perspective"
11.00 - 11.15	IPA Chairman: IPA Restructuring Report
11.15 - 12.30	Panel Discussion with Representatives from Protea production areas around the world. Topics include: Number of growers — Area Planted Research Projects — Markets and Marketing Promotions — Local conditions

12.30 - 14.00 Lunch at Stonebreakers - Group photo at venue to be advised

14.00 - 17.00	Guided visit to Kirstenbosch National Botanic Gardens
18.00 - 19.00	**IPWG/IPA Research Meeting**, Breakwater Lodge Lounge
	Dinner own arrangements

CONSERVATION OF THE CAPE FLORA: STRATEGIES FOR THE FUTURE

Richard M Cowling
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With 8 500 species (68% endemic), 193 endemic genera and six endemic families crammed into a mere 90 000 km^2, the Cape Floristic Region is a botanical treasure trove. Over the past 350 years, this remarkable region has supplied plant genetic material, in the form of ericas, freesias, gladioli, pelargoniums and proteas, for the horticultural industry world-wide. But all is not well in the botanical ark. Since the first Dutch settlers established a toe-hold on the southern tip of Africa, much of the indigenous fynbos and renosterveld vegetation has been destroyed. Agricultural practices have reduced renosterveld and lowland fynbos to 20% and 50% of their original extent, respectively. Alien trees and shrubs have invaded over 36% of both mountain and lowland fynbos. Large areas of natural habitat have also been affected by urbanization and poor veld management practices. Although about 16% of the Cape Region is conserved, 95% of this land is in the mountains where the threats are lowest. Despite this somewhat gloomy picture, there have been several recent initiatives that are likely to result in a significant improvement in the conservation status of the region. These include the establishment of new reserves in the lowlands; the removal of alien plants under the auspices of the Working for Water Project; and the development of a strategic implementation plan, funded by the Global Environmental Facility, for the conservation of the Cape Flora. These positive developments will be elaborated in this talk. Their successful implementation has implications for the survival of a valuable horticultural resource.

SAVING THE FLORA OF THE SOUTHERN HEMISPHERE - CAN WE RESCUE THE HORTICULTURAL POTENTIAL?

Dr. Kingsley Dixon
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The Southern Hemisphere represents an astonishing ark of continental floral diversity. Having escaped much of the glaciation and human impacts of the Northern Hemisphere, the Mediterranean zones of the Southern Hemisphere contains in excess of 25,000 species, approximately 10% of all known flowering plants. There Mediterranean zones also embody the cradle of the early gondwanan plants and coupled with the geological stability of the region has resulted in explosive speciation only eclipsed by rainforest floras. This floral diversity is now providing the powerhouse for horticultural development with species for row cropping for foliage and flowers, potted colour and amenity horticultures. But is the lag time for research and development of these plants matched by conservation? Looking at the history of exploitation of the flora of south west Western Australia as an example of conservation of biodiversity, in 200 years of European occupation, 31 species are extinct, 1700 species are in need of conservation attention and a further 300 species are likely to be extinct in the next decade. Similar scenarios are being reported in other Mediterranean zones. So what can be done to preserve this outstanding biodiversity? National Parks and nature reserves contain less than one quarter of the critically endangered plants of the Southern Hemisphere so innovation in ex situ conservation practices will be needed. This presentation will explore the new technologies now being used in the fight to stem the tide of plant extinctions. Horticulture is set to benefit from these botanical genebanks and genetic archives as species habitats decline and vanish at an increasing pace.

EXPLOITATION OF INDIGENOUS KNOWLEDGE SYSTEMS

Cobus Coetzee, Emmy Reinten and Elton Jefthas
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In South Africa the economic exploitation of the 22 000 species of indigenous plants has, as yet, only occurred on a limited scale. The trade in traditional plants for cultural and medicinal use has developed into a relatively large local informal industry. With the exception of the indigenous *Protea* industry, rooibos (*Aspalathus)* and honeybush (*Cyclopia)* tea, buchu (*Agathosma)*, waterblommetjie (*Aponogeton*), thatching reed (*Thamnochortus*) and the *Aloe* industry, no other successful industries have been established. Foreign countries have in the past profited financially from exploiting South African plants with floricultural potential. Freesias, strelitzia, gladioli and gerbera are examples.

South Africa today realises the value of the large variety of plant genetic material and actual attempts are made to protect and develop these natural resources to the advantage of the inhabitants. The problem is to prohibit illicit exploitation of plant material, as well as other prejudicial actions. At present there is no official legislation, but a proposed law known as the "Protection of Indigenous Knowledge Act" is being prepared to advance the promotion and protection of indigenous knowledge. In the proposed act, reference is made to the illicit use and exploitation of indigenous food and medicinal plants, but floricultural products are not specifically mentioned. However, the act does not prohibit the exploitation of plants, on the contrary, the act attempts to promote and develop the use of indigenous plants. The primary aim is to ensure that the lawful owner is recognised in the development.

The proposed legislature will contribute to documenting indigenous knowledge, as the act makes provision for manners and customs, to be documented without giving away ownership. The law will in co-operation with existing laws protect genetic plant resources. This aspect is invaluable in ensuring that the cultural heritage is conserved for generations to come. In South Africa free trade is allowed in plant genetic material as agreed under the World Trade Organisation (WTO). With the proposed new act, this arrangement may change, adhering to the Rio Summit declaration on indigenous knowledge, in conjunction with existing legislature.

It is necessary to develop a model where genetic material (resources) is still available for world wide use and application, but that South Africa can share in the advantage of this exploitation. A possible answer is the proposed model where new cultivars are cultivated under license.

AIR TRANSPORTATION - AN AIRLINE PERSPECTIVE

Gerd von Mansberg
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Not so many years ago the conveyance of perishables to airlines constituted a problem, a pain, was not profitable and was a high risk claim business. How the thinking has changed! Rates are high and profitable to airlines. Many freight charters are flying north from the southern hemisphere exclusively for perishable products: flowers from September to March and exotic produce from April to August.

The profitability of transporting passengers is under pressure. Airlines are changing equipment i.e. from the old B474-200/300 to AB340. Offering longer range more economical flights but with very little freight capacity. Older DC10, A300B4, L1011 and B747-200 aircraft are being converted to full freighters. Costings of freighters are higher as there is no cabin above with "bums on seats" to subsidise the lower deck cargo.

Freight costs are on the up and up. You, the exporter, can demand better service. Agents and airlines are investing in infrastructure i.e. better cold chain management.

The flower auctions are overflowing with volumes. The yield per stem is going down. Your costs are higher, your yields lower --- QUO VADIS?

Thursday 16 August

If the weather does not allow for the farm visit to Protea Heights and the Nursery/Genebank visit at Elsenburg, buses will depart for a tour of a Winery.

08.00	**Bus departs from hotels** for Stellenbosch
08.00 - 08.30	**Day delegates registration** at ARC-Fynbos, Elsenburg
08.30	Day delegates bus departs for Protea Heights
09.00 - 10.00	Farm Visit: Protea Heights, Manager: Kobus Steenkamp
10.00	**Buses depart** for ARC-Fynbos Research Unit, Elsenburg
	Tea on arrival
11.00 - 13.00	Tour of Nursery and Genebank

13.00 - 14.00 LUNCH

14.00 - 14.10	Welcome	
14.10 - 14.50	Mr. D. Mathews, AUS	The Protea Nursery
14.50 - 15.10	Mr. D. Ontong, RSA	From Harvesting to Cultivation
15.10 - 15.30	Mr. P. Dorrington, RSA	The challenges of growing *Protea magnifica*

15.30 - 16.00 TEA

16.00 - 16.20	Dr. J.H. Coetzee:	New cultivar releases
16.20 - 16.45	Growing experiences in different climatic regions of South Africa	
16.15 - 16.25	Mr. Pierre Taljaard	Southern Cape region
16.25 - 16.35	Mr. Petrus Roux	South-western Cape region
16.35 - 16.45	Mr. Koos de Wet	Summer rainfall region
16.45 - 17.20	The ARC-Fynbos Unit present:	
16.45 - 17.00	Gail Littlejohn	Do we need Germplasm? - functions of the Genebank
17.00 - 17.10	Lizeth Swart	Proteaceae disease control
17.10 - 17.20	Mark Wright	Improving insect management on Proteaceae - understanding the ecology of pests

B-B-Q 1st bus departs 20.30
2nd bus departs 22.00

THE PROTEA NURSERY

David Mathews
Address: Proteaflora Nursery, P.O. Box 252, Monbulk, Vic. 3793, Australia
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Cut flower growers depend on nurseries for their production stock. The nurseries may be commercial production wholesale nurseries external to the flower grower or on-site as part of the flower growing operation.

The plants from the nursery are a critical component in the success of the flower growing business but, relative to other costs of flower growing and relative to the plants' lifetime, production value is a very small cost.

Identifying quality plants is difficult. It may be easier to start by assessing the nursery and then the plants. A good nursery is well laid out, has few weeds, little evidence of pest and disease, a disease free water supply, uniform plants, a clear labelling system and a systematic approach to plant hygiene where the major risks have been identified and managed.

Plant quality is related to nursery management and design. From a Protea growers point of view, the characteristics of a good quality plant are:

- genetic stock appropriate to market needs
- low disease risk
- well shaped plant
- correct nutrition
- trueness to type

Proteaflora Nursery has addressed these plant quality issues in a number of ways:

- Membership of the Nursery Industry Accreditation Scheme Australia which provides a nursery hygiene management system that is externally audited. Disease risk for customers is reduced with assurance by audit.
- Linkages with research institutes and other breeders provide Protea growers with the best available genetic material.
- Our management systems meet international best practice and are audited to ISO 9002 standard. This provides an assurance of reliability.

For many growers there is no professional nursery able or willing to supply Protea plants. In this case you must set up your own nursery to supply your needs. Evaluation of plant quality is often very difficult as you are having to judge your own product. Your own on farm nursery can provide a number of advantages provided that it first addresses the plant quality issues. The advantages are confidentiality and protection particularly if introducing new varieties or special selections, exclusion of unwanted pests and disease and in some cases lower costs.

Protea growers' nursery requirements are very similar in all growing regions. The specifics of plant quality may vary slightly, particularly the appropriate genetic material, but good nursery practice is universal.

PROTEA MAGNIFICA: FROM HARVESTING TO CULTIVATION

Mr Derek Ontong
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Phone: 0233 – 22508

Firstly, I will present my experiences as a harvester of *Protea magnifica* from the wild, including problems, limitations and good points. Secondly, I will relate my experiences in attempting to become a cultivator of *Protea magnifica*, using genetic material from the wild as a source of superior plants.

THE CHALLENGES OF GROWING PROTEA MAGNIFICA

Peter Dorrington
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Protea magnifica, known in the trade as "Barbigera" have traditionally been harvested in the mountains of the Western Cape to the point where the variety was placed under severe pressure for its survival. The transition from this practice to commercially planted orchards became a necessity.

Market requirements dictated certain quality levels that could not be attained without turning the cultivation of Protea "Barbigera" into an exact science. Factors affecting this process are:

Climate	Soil types	Water requirements
Nutrition	Plant material	Clones vs. Seedling populations
Crop protection	Harvesting practices	Markets: current and future prospects

DO WE NEED GERMPLASM: THE FUNCTION OF THE FYNBOS GENEBANK

Gail M. Littlejohn, LM Blomerus & A Robyn
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The fynbos genebank of the Agricultural Research Council provides the backbone of all further research at the Fynbos Unit. The initial steps in creating a genebank were taken by Dr Marie Vogts during the 1960's. The purpose of the initial screening of samples of wild collected seed was to identify superior populations to use as a seed sources for cultivation, and no attempts were made to preserve the samples. With the inception of the breeding program in 1974, more specialized collection of individual plants was undertaken. The

purpose of the collection was to develop a gene pool for use in breeding and selection. Superior genotypes were retained as living plants in the genebank. In many instances collected material could not be kept alive indefinitely in the field genebank and some genotypes were lost. The difficulties encountered in making inter-specific hybrids also meant that rare hybrids were maintained in the genebank as they could not be repeated. Today, the genebank consists of over 2000 accessions of woody plants of the fynbos, considered to have floriculture merit, or rare and endangered. A collection of bulbous plants is also maintained. Interestingly, according to some world authorities, the current field genebank is considered *in situ* conservation, as it is maintained within its habitat of origin, subject to the disease and insect pressures of the region. The merits and difficulties in maintaining the genebank will be highlighted.

PROTEACEAE DISEASE CONTROL

Lizeth Swart
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The export market of Proteaceae is restricted by the presence of fungal pathogens on cut-flowers, causing damage to the foliage and flower heads. This results in rejection of entire batches of exported flowers. Diseases must receive attention since the limitations on export can result in serious problems for the fynbos industry. Today, more is known about the diseases of the Proteaceae than 30 years ago. In South Africa, research was done since the early 1970's on proteaceous pathogens and today research is also being done by the University of Stellenbosch on diseases of the Proteaceae. Since the development of Proteaceae as a crop plant is in a relative early phase compared to other cut flower crops, control measures are still poorly researched – not only in South Africa, but also elsewhere in the world where they are cultivated. Disease control is still based on general control strategies for diseases rather than specific actions for specific diseases. Chemical recommendations are based on fungicides registered for the control of ornamental plant diseases. Only two chemicals are registered for the control of soil borne diseases of the Proteaceae, namely fosetyl- Al and furalaxyl. Conditions favourable for infection and disease development, as well as plant susceptibility to specific diseases must be known in order to act preventatively. Chemical control must be integrated with effective sanitation practices, optimum cultural practices and plant resistance to ensure that high quality flowers are exported to the overseas markets.

IMPROVING INSECT MANAGEMENT ON PROTEACEAE - UNDERSTANDING THE ECOLOGY OF PESTS

Dr. M.G. Wright
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Tel. 021-808 5430 Fax: 021-808 5440 e-mail: mark@igs5.agric.za

The control of insect pests on Proteaceae in South Africa currently depends on the use of a small range of pesticides registered for use on ornamental crops in most cases, and Proteaceae specifically for only three pests. These products are all considered to be environmentally harsh, with the exception of *Bacillus thuringiensis* var. *kurstaki*. This

reports on work conducted on Proteaceae pests, with the aim of reducing dependence on these pesticides. Achieving an understanding of insect-host plant relations, natural enemies of pests and the identification of pests as disease vectors, has the potential to improve the efficacy and environmental compatibility of pest management on Proteaceae.

Research on the ecology of borers associated with Proteaceae has shown that the occurrence of these insects is profoundly influenced by host-plant characteristics. Certain plant species are less susceptible to certain borers, and judicious combination of crops should contribute to reducing pest incidence. This work also indicated that degree of exposure to parasitic insects was an important determinant of abundance of borers, showing that these insects can play a valuable role in reducing pest numbers. Pesticide applications will have to be reduced to enhance this benefit, however.

Investigation of insect pathogens as potential biological control agents has also shown that pathogenic fungi are present on Proteaceae pests in South Africa, and these pathogens may have potential as biological control agents. The use of pest-specific control measures can contribute to enhancing natural biological control by reducing applications of synthetic pesticides.

A long-standing problem in South Africa, witches broom, has been investigated using molecular techniques. This has shown conclusively that this condition is caused by phytoplasma. Identification of the arthropod vector of the disease by the same methods will provide the information required to apply targeted control measures to prevent the spread of witches broom.

These studies have contributed to elucidating the interactions between insects and their host plants and natural enemies of Proteaceae. Careful application of these findings will lead to enhanced pest management on Proteaceae.

07.15 - 08.00	Speakers prepare in Exhibition Hall		
07.30 - 08.00	Day delegates registration		
08.15 - 08.30	Prof. G. Jacobs, RSA		Fynbos Research:- a future perspective
08.30 - 09.00	**Session 1: Diseases of Proteaceae -** Chairman, Dr. G.M. Littlejohn, South Africa		
08.30 - 08.45	Dr. J.E. Taylor		Fungal diseases of Proteaceae - an integrated approach combining mycology and plant pathology to combat disease
08.45 - 09.00	**Posters:**		
	Ms. L. Swart, RSA	-	*Elsinoë* spp. associated with Scab disease of Proteaceae
	Ms. R.J. Newton, RSA	-	An investigation into the spread of Witches Broom disease in Proteas
	Ms. S. Denman, RSA	-	*In Vitro* screening of fungicides against the *Botryosphaeria* stem canker pathogen of Proteaceae
		-	Screening Leucospermum species for resistance to *Phytophthora cinnamomi* using the stem inoculation technique
	Dr. M.G. Wright, RSA	-	Fungal pathogens isolated from borers found on Proteaceae in the Western Cape region, and their potential as biological agents
09.00 - 09.45	**Session 2: Nutrition and Plant Management** Chairman, Prof. A.H. Halevy, Israel		
09.00 - 09.15	Mr W.J.H. Eigenhuis, RSA		A review on the nutrition status of Proteaceae
09.15 - 09.30	Ms. C. Poole, RSA		Nutrient composition of selected commercial Proteaceae species
09.30 - 09.45	Posters:		
	Dr. J.A. Rodrigues Perez, TEN		Influence of cutting position, wounding and IBA on the rooting of Leucospermum 'Sunrise' cuttings
	Mr. W.J.H. Eigenhuis, RSA		Irrigation requirements of young commercially cultivated Proteaceae
	Ms. Z. Soomar, RSA		The use of grafting Proteaceae

09.45 - 10.45 Tea in Exhibition Hall

/ ... Friday Session 3 cont. at 10.45

10.45 - 12.00	**Session 3: Cultivar development and selection** Chairman, Dr. L. Turnbull, Australia	
10.45 - 11.00	Prof. M. Sedgley, AUS	Selection of Genetic material
11.00 - 11.15	Dr. G. Littlejohn, RSA	Mixing and Matching Proteaceae genes
11.15 - 11.30	Dr. K.W. Leonhardt, HI	Leucospermum cultivar development at the University of Hawaii
11.30 - 12.00	**Posters:**	
	Prof. M.Sedgley, AUS -	Breeding biology of *Dryandra*
	Dr. G. Littlejohn, RSA -	Does Protea breeding pay?
	-	Genetic resources, sampling and conservation
	Dr. N.A.C. Brown, RSA -	New South African Restios with potential for horticulture and the wildflower industry
	Ms. L. Blomerus, RSA -	Controlled pollination techniques for Protea, Leucadendron and Leucospermum
	Dr. K.W. Leonhardt, HI -	Breeding for the future

12.00 - 13.10	**Session 4: Pruning and Manipulation** Chairman, Dr. J.A. Rodrigues Pérez, Tenerife	
12.00 - 12.15	Ms. A. Gerber, RSA	Pruning of Proteas: from scientific trials to field use
12.15 - 12.30	Dr. P. Allemand, FRA	Flowering pot plants production from Leucospermum hybrid cv. 'Scarlet Ribbon'
12.30 - 12.45	Dr. M. Montarone, FRA	How to produce protea cut flowers evenly distributed over time
12.45 - 13.00	Mr. H. Hettasch, RSA	Developing vegetative complexity in young protea cv "Sylvia" plants
13.00 - 13.10	**Posters:**	
	Dr. G.J. Brits, RSA	Protea flowering pot plant R & D by ARC-Fynbos
	Mr. D. Wolfson, ISL	Growth retardants to prevent flower by-pass in Geraldton Wax

13.10 - 14.30 Lunch at Stonebreakers

14.30 - 16.00	**Flower arranging demonstration** in Exhibition Hall Mrs. Lea Liebenberg (AIFD) in co-operation with Mrs. Emmy Pabst, and Mrs. Joan Pare	
	Delegates free to explore Cape Town	Dinner own arrangements
16.15	**IPA Board Meeting** in Breakwater Lodge Lounge	

FYNBOS RESEARCH, A FUTURE PERSPECTIVE

Prof. G. Jacobs
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The diversity of the South African fynbos in terms of families, genera and species complicates the decision-making process of allocating limited funds for research. Economic and biological considerations in setting research priorities will be discussed.

FUNGAL DISEASES OF PROTEACEAE: AN INTEGRATED APPROACH COMBINING MYCOLOGY AND PLANT PATHOLOGY TO COMBAT DISEASE

Dr. Joanne E. Taylor, Pedro W. Crous, Sandra Denman
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Fungal diseases which affect members of the Proteaceae can be broadly categorised into two groups: those of the roots and stems which are debilitating and often cause death of the plant; and foliar diseases which can cause loss in plant productivity or aesthetic value of the cut flowers. These diseases, and in particular the former, have obvious economic implications resulting in great losses for the producer. Furthermore, with the increasing production for the export market, which demands consistency in supply and quality, and due to strict phytosanitary regulations, the production of disease-free products has become essential.

Therefore a research programme has been developed at the University of Stellenbosch to study these diseases. The aims of this programme are to identify important plant pathogenic organisms of phytosanitary significance in different countries. A further aim is to determine which fungicides are most appropriate for disease control. Ultimately, a compendium will be produced in which disease descriptions and control measures are outlined which will enable producers, quarantine and extension officers to identify diseases and apply the correct management practices. In terms of disease management strategies, a programme of integrated control is being investigated involving fungicide applications, cultural practices (e.g. sanitation) and the screening of different genotypes for resistance. Progress to date includes the identification of new diseases, a re-examination of common pathogens and new records extending known distributions and host ranges of many of these common pathogens. New fungicides have been tested for efficacy, and alternative control methods are being devised. The effect of stress on plants and the consequence on disease development is currently being investigated. Studies are also being undertaken to determine the epidemiology and infection processes of certain pathogens.

Thank You !

SAPPEX and especially the organising committee would like to thank the following sponsors. Without their enthusiastic support and financial contribution it would have been extremely difficult to bring you this event.

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We thank, in particular our SAPPEX members and exporters and the ARC-Fynbos Research Unit, Elsenburg for the flowers supplied and naturally all speakers for their valuable contribution.

Thank you all for participating in this Conference and Workshop.
We wish you a safe journey home!

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STRATEGIES FOR SUCCESS

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Success may mean different things to different people. Every business has a different structure and set of circumstances. We therefore have to tailor each of our strategies to meet those differences. To work 18 hours a day, 365 days a year will not guarantee success. We have to take correct business decisions and make the right marketing moves.

We discuss why industry unity can only be taken so far and the belief that a united industry is no longer possible, but how working "in harmony" makes sense. Recognising the very competitive nature of the flower business is central to this address.

The realisation that Intellectual Property is now of the highest importance and commercial value. With confidentiality an issue, funding on a 'user pay' basis will be the new direction. With the flower business world wide experiencing enormous change, the issue and effects of change and how we deal with change are highlighted.

The impact globalisation will have on our ability to succeed, as we approached the new millenium, how urgent it is we understand and know what business we are in, determine the future and plan.

The address acknowledges the air of complacency, the lack of crop knowledge, business skills, market intelligence, post harvest facilities and erratic quality control as destabilising influences.

Marketing and promotion are highlighted and include reasons for narrowing the focus, projecting an image, name recognition, branding and building flexibility into the business. Market dominance, reliability, uniqueness or exclusivity are integrated values based on the relationship between the product, the customer and the world around them. These are prioritised along with communication.

The most important ingredient for success is Leadership and the few things leaders have in common are discussed.

PROTEA PRIDE IS GROWING

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A slide presentation demonstrating the infrastructure and methods used in the production of fresh cut flowers. This will include the following:

Plant Material	Land Preparation	Planting
Irrigation	Fertilization	Spraying
Pruning	Picking	Machinery and Equipment
Pack shed	Transport	

PROTEA ECONOMICS: HOW DO YOU DETERMINE WHICH PLANTS MAKE MONEY?

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As a rank amateur I realised that I must learn about the idiosyncrasies of the product to survive. The only practical way is to gather data. A good spreadsheet to record data was the tool used to gather information not only on production blocks, but also information on harvesting and sales. This enables me to identify plants that are not viable and find out the production cycle of different species. This information can then be manipulated to produce reports, and to track sales.

By keeping proper records, it is possible to determine the average net income per bloom, the average number of blooms per plant and the average income per plant.

Data gathering, if done regularly is not too cumbersome, but is invaluable when making decisions as opposed to educated guesswork.

PACKSHED MANAGEMENT

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In order to be a successful fresh flower exporter, it is necessary to have the necessary facilities to ensure that harvested flowers and greens receive the best possible treatment. It is not the facilities alone which determine the viability of protea exports. Management of the pack shed does not only take in account optimum workflow, but personal supervision is all important. But, even that is not enough, you also need to have the necessary administrative back-up.

A brief explanation will be given on how we at Mountain Range have developed our pack shed and grown with the Industry.

USING THE INTERNET FOR BUSINESS

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In spite of its seemingly simple structure, the Internet works completely differently to anything we have encountered so far. Just putting up a web page may not do your business any good, and might harm your business's image. This talk looks at how to use the Internet to take advantage of its capabilities, and what some of the common pitfalls of Internet presence are.

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The Cape Floral Region possesses the richest temperate flora in the world. The dominant vegetation of the Cape Floral Region is the fynbos, which is typified by the presence of members of the Restionaceae (Cape reeds and grasses), the Proteaceae (Sugarbushes, pincushions and conebushes), Ericaceae (Cape heaths) and a number of other families, including the Asteraceae (Everlastings). Many of these fynbos wildflowers are of outstanding horticultural potential. However many species have dormant seed and are difficult to propagate without specific environmental cues for germination. In fynbos, fires are a natural feature of the environment and heat and smoke from fires provide the major cues for germination of seed.

Everlastings, from the family Asteraceae, produce colourful inflorescences or flower heads, which are harvested and dried for the wild flower industry. At present most flowers are harvested from plants in the wild. However, the new seed propagation techniques, involving plant-derived smoke, enable plants to be propagated from seed. The availability of flowers from cultivated plants would reduce the pressure on flower collecting in the wild. Amongst the species of Cape Asteraceae studied were: (i) S*yncarpha vestita* (Cape Everlasting; Sewejaartjie); (ii) *S. speciosissima* (Cape Everlasting); (iii) *Edmondia sesamoides* (Strawflowers); (v) *Helichrysum patulum,* (v) *H. foetidum* (Yellow Everlasting) and (vi) *Phaenocoma prolifera* (Red Everlasting).

POSTER:- PROTECTING CULTIVARS LEGALLY

G.M. Littlejohn, J.H. Coetzee
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The ever escalating costs of breeding, selecting and evaluating clones suitable as commercial cultivars, as well as the desire for developing countries to protect their indigenous plant genetic resources requires the use of legally efficient methods of protecting the cultivars released to the industry, both locally and internationally. The method that exists to help in protecting the rights of the breeder and to enable a breeder to reap a return on the investment of breeding a new cultivar is the protection with plant breeder's rights (PBR's). Supplementary to PBR's, trade-marking, distribution through certified nurseries and contractual agreements regarding levies on production from protected cultivars can be used. Each of these will be discussed.

MANAGERIAL ASPECTS OF A DRYFLOWER PACKSHED

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The dry-flower industry in South Africa is well-developed. While most harvesting is done from natural stands, on private and state-owned land, industry guidelines promote harvesting on a sustainable basis. Volumes used in the industry are large, and exporters now have well-developed structures and production management systems in place.

We sketch how Honingklip has developed over the years, and what systems we have in place in order to cope with farming, raw material purchases, product management, and social services.

POSTER: - RESEARCH AND TECHNOLOGY TRANSFER OF PROTEACEAE BY ARC

Dr E.Y. Reinten, J.H Coetzee
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The availability of new Proteaceae cultivars for the cut flower trade requires not only a breeding programme, but the required techniques of cultivation and pest and disease control needs to be investigated. In order to facilitate this, a living genebank was established to provide material for diversification of genetic properties for the breeding programme, material for crop science trials and plant material to investigate certain methodologies of pest and disease control and prevention. Plant material to supply the ARC:Fynbos nursery with propagation material for release to the industry is also maintained.

Technology transfer is an important component of the Fynbos Unit of ARC. This is achieved by means of scientific research papers, popular articles, training courses, open days and farmer days. Consultation services, visitors to the unit being in groups or as individuals, written and telephonic replies to inquiries are part of the technology transfer component. Interaction between all role players is encouraged.

A visual display of the various activities and interaction between involved parties is presented.

POSTER:- INTERNATIONAL PROTEA REGISTER: A REPORT

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The International Protea Register (IPR)provides for registration of cultivar names of the South African genera *Aulax*, *Leucadendron*, *Leucospermum*, *Mimetes*, *Orothamnus*, *Paranomus*, *Protea* and *Serruria*. The register was officially started in 1980. Since then, the number of registered cultivars has increased from 19 to 86, while the number of cultivar names in the checklist has increased from 143 to 292. In 1992 a publication was initiated containing both the register and the checklist. This is distributed to more than 100 producers, originators and interested persons in 15 countries annually. A start has been made with the collection of herbarium specimens for the registered cultivars; these specimens are accommodated by the National Herbarium, Pretoria (PRE). The way forward for the register is to continue with international promotion of the IPR to encourage originators to register their cultivar names and to expand the herbarium collection so as to have specimens of all registered cultivars included. It has also been decided to make the international Protea Register available in electronic format by publishing on a website on the Internet.

POSTER:- PLANT-DERIVED SMOKE PROMOTES SEED GERMINATION OF CAPE EVERLASTINGS

N.A.C. Brown and P.A. Botha

SAFCOL is able to invest in research in the fynbos industry and to help set standards for the production of fynbos products. SAFCOL has made its facilities available for training of new small scale producers of fynbos and can invest in ventures with neighbouring communities through the application of CSI funds. The SAFCOL production areas are also open to the public and other producers with no "secret areas" where access is not allowed.

THE ROLE OF GRAFTING IN THE PRODUCTION OF PROTEAS

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Proteas are now grown around the world over a wide range of latitudes, in soils and climates very different from those in which these plants originated. The transition from a bush picked product to a cultivated crop has utilised information, methods and practises successfully used in the production of other woody perennial crops. However, grafting, a technique commonly used to overcome adaptation limitations in many species, has had only limited acceptance by the international protea industry.

Grafting may be used to overcome propagation difficulties and in species with a lengthy juvenile phase, reduce the time to the first flowering. Grafted rootstocks can be used to overcome soil borne limitations from the presence of pathogens or other unfavourable conditions such as alkalinity and salinity. Information on the existence of such problems within the protea industry has been well documented. Similarly, research into suitable rootstocks, compatible scions and production and survival of grafted plants has been undertaken in many protea producing countries.

Although the benefits appear to be well known, commercial production from grafted protea plants remains limited world-wide. The cost of producing grafted plants is high, relative to that of a seedling or cutting grown plant. Yet this cost may be retrieved in the first year of harvest. Failure of the industry to adopt grafting as a technique to overcome specific production problems may be due to inadequate demonstration of the benefits of the use of grafted plants in each production environment.

PRODUCER STUDY GROUPS IN SOUTH AFRICA

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Producer study groups are a relatively new phenomena in South Africa. There are currently four study groups and one product group active in the Western and Southern Cape regions. These groups have formed roughly around geographical areas as well as according to varieties grown and level of production inputs. The activities of the study groups and the value thereof will be discussed.

PROTEA PITFALLS - CULTIVATING PROTEAS IN AN EXOTIC SUBTROPICAL LOCALITY

Robin Yule
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With 30 years experience in forest research, the cultivation of Proteas on red podsolics of volcanic origin at Goomboorian near Gympie, Queensland seemed a relatively simple task. Unfortunately it was not to be, and six years later, I am planning my final assault on successfully achieving this goal.

The literature would suggest that Proteas are not suited to the climate and soils at the location I had chosen. Nevertheless I embarked on the project with my eyes open, determined to succeed.

The initial plantings were sourced from an accredited nursery and the species/cultivars chosen on the recommendations of experienced growers, supported by my own literature searches. Being aware of potential problems, the initial plantings were treated as "trial plots" with 10 - 20 specimens each of 15 species/cultivars. Almost all the plants used were propagated from cuttings. Early growth was spectacular in most cases, giving no indication of trouble ahead and for two years the plantation was expanded. At this point, six years down the track, I have a quite vigorous plot of Pink Ice, and few *Protea cynaroides*, two *P. neriifolia,* one *P. lacticolor,* some *P. eximia* and some "Inca Gold" leucadendrons.
The first problem to occur was caused by the inherent high soil levels of manganese. The second problem was caused by the soil pathogen *Phytopthora cinnamomi.*

This "non-scientific" paper discusses these problems and outlines the next and final step in my aim to become a Protea flower grower.

WHY DOES A LARGE COMPANY GET INVOLVED IN PROTEAS

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The South African Forestry Company Ltd (SAFCOL) was formed in September 1993 to manage the commercial forestry resource of the Dept. of Water Affairs and Forestry. Other avenues, related to forestry, could be followed to effect the maximum utilisation of the land under SAFCOL's control. Some of the projects that were started include the flower project at Longmore (Eastern Cape), Rumohra ferns grown under intensive cultivation under pines at Lottering (Eastern Cape), avocados at Frankfort (Mpumalanga North) and a deciduous fruit farm at Grabouw (Western Cape).

The principle reason why a big company gets involved in anything, is to generate more profits. Through research done in the fynbos industry it was established that SAFCOL could benefit financially from getting involved in the industry as well, mainly via synergy with existing operations, and effect other beneficial spin-offs. These include the creation of jobs in the rural areas where SAFCOL plantations are situated and the creation of management positions where previously disadvantaged people could be accommodated.

07.30 - 08.00	Speakers prepare [illegible]	
[illegible]	[illegible]	
08.30 - 08.45	[illegible]	Protea Pitfalls: cultivating proteas in an exotic subtropical locality [illegible]
08.45 - 09.00	Mr. [illegible], RSA	[illegible]
09.00 - 09.15	[illegible]	The role of [illegible] production [illegible]
09.15 - 09.30	Mr. [illegible]	Producer Study Groups in South Africa
09.30 - 10.00	**Posters**	
	Dr. E.Y. Reinten, RSA	Research technology transfer of Proteaceae by the ARC
	Ms. J. Sadie, RSA	International Protea Register: A report
	Dr. N. Brown, RSA	Plant-derived smoke promotes seed germination of Cape Everlastings
	Dr. G.M. Littlejohn, RSA	Protecting Cultivars Legally

10.00 - 11.00 Tea in Exhibition Hall

After tea exhibitors can remove their displays/posters. Removal to be completed by 5pm

	Session 3: From Harvesting to [illegible] Sale Chairman: Mr. R. [illegible]	
11.00 - 11.15	Mr. R. Middelmann, RSA	Managerial aspects of a dryflower packshed
11.15 - 11.30	Mr. R. Nagel, USA	Protea Economics: How do you know which plants make money?
11.30 - 11.45	Mr. H.B. Gibson, RSA	Packshed management
	Session 3: Marketing Chairman: Mr. [illegible]	
11.45 - 12.00	Mr. [illegible] Oertel, RSA	Using the Internet for Business
[illegible]	Panel Discussion with industry Mr. [illegible] Archer, Zimbabwe [illegible] [illegible] South Africa [illegible]	
[illegible]	[illegible] for speakers	
[illegible]	[illegible]	Strategies [illegible]
	[illegible]	Protea [illegible]
	[illegible] General Meeting [illegible]	
	[illegible]	

length is artificially shortened, or when autumn temperatures are relatively high. This talk describes an attempt to reduce the extent of "by-passing" by various methods.

The varieties "White", "Purple" and "Wendy" showed no response to any of the materials at any dose. The variety "Orchid-multi-buds" showed good response to Paclubotrazul (Cultar) at a concentration of 0.05% in early application or at a concentration of 0.15% in late application. "Snow flakes" and "Lady Stephanie" were highly responsive to CCC, where the best results in reducing "by-pass" phenomena were obtained by combining CCC with Magic, however this treatment caused damage to the next year's crop.

These are only preliminary results of a few sets of field trials. Before application under different conditions, a small-scale trial must be conducted and as results vary between years, it is recommended to conduct small-scale trials over a few consecutive years.

POSTER:- PROTEA FLOWERING POT PLANT RESEARCH AND DEVELOPMENT BY THE A.R.C.

Dr G.J. Brits
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Requirements for protea flowering pot plant production are specialised, since proteas are mostly grown for cut flowers from large, slow-growing woody plants with unique nutrient requirements, in contrast to the general characteristics of most internationally grown flowering pot plant types.

Intensive research and development on protea flowering pot plants were initiated in 1993, on *Leucadendron*, *Leucospermum*, *Protea* and *Serruria*, by the Fynbos Research Unit (Agricultural Research Council) and this was preceded by a ten-year *ad hoc* project of selection of plants with potential as pot plants. Technology development focused on nutrition (especially overcoming the "dumping" problem of controlled-release fertilizer), pot growing medium, effective protocols and time schedules for the propagating and growing of individual pot plant types, their shaping (manual and chemical branching and pruning of plants), maximizing the mass and quality of flowers in pots, extending the flowering period of pot plants, and effective plant protection procedures.

Hybridization, selection and commercial evaluation of new pot plants, obtained from a gene bank of ca. 200 selection, continued concomitantly. An alternative potted product was developed, flower protea standards of *Leucospermum* and *Leucadendron*, which are popular as accent and unusually architectured plants. To economise production schedules, plants were selected that root rapidly under outdoor conditions, with and without bottom heating, and plants that shortened the growing cycle to 6 - 8 months.

Currently, competitive and novel pot plants are produced from this programme in collaboration with a private developer-producer in South Africa. A successful commercial venture was launched and eight new pot plant cultivars were recently introduced to industry, totalling the pot plant cultivar range to 20. Cultivars were also tested for use as garden subjects, extending their use after the potted phase (southern hemisphere). Present important gaps in R&D are:

- the problem of commercial introduction of this commodity to Europe;
- inadequate control over plant shape and flowering period;
- a lack of genetic types that require less manipulation, provide a broader flowering spectrum and show greater disease tolerance as protea flowering pot plants.

POSTER: - GROWTH RETARDANTS TO PREVENT FLOWER "BY-PASS" IN GERALDTON WAX

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Geraldton Wax Flower is one of the major cut flower crops exported from Israel. Second quality branches result from a variety of causes, one of which is the vegetative growth on top of flowering branches, known as "by-pass" By-passing can reach 20cm. in length. Preliminary experiments have indicated that the use of a growth retardant may prevent or reduce by-pass development.

By-pass phenomena are observed most years, but not every year. Late varieties will show by-passing after a cold winter followed by a warm spring, and early varieties when the day-

Proteaceae could be a good opportunity for Southern French horticulture to have diversified cut flower production.

Their climatic and edaphic requirements imply that they have to be grown in a shelter, in soilless conditions and with cultivation techniques adapted to the species. With those points in mind, several pruning experiments have been carried out. The mother stems of *Protea eximia* and of its hybrids 'Sylvia' and 'Cardinal' cultivars, were pruned to different heights (cut back on the 1st, 2nd or 3rd flush) at the end of May and mid-June. This experiment shows the following results:

1. The mother stems pruned the usual way on the 1st flush provide few potentialities in comparison with the longest mother stems (i.e. cut back on the 2nd or 3rd flush) which give longer and more numerous branches.
2. Some of them (specifically those in position 2), dominate the other stems and slow up their growth.
3. Flower initiation and flowering are earlier if pruning is carried out earlier than usual, i.e. just before plant growth begins again (in February/March at our latitudes).
4. Early pruning also facilitates the development of flushes, and hence longer stems.

Therefore, by managing the way and timing for pruning, it seems feasible to produce cut flowers evenly distributed over time.

DEVELOPING VEGETATIVE COMPLEXITY IN YOUNG *PROTEA* CULTIVAR SYLVIA PLANTS

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The high establishment cost of growing proteas under intensive cultivation has necessitated young plant management to attain an economically viable crop as soon as possible after planting. Rooted cuttings of *Protea* cv. Sylvia, a *Protea eximia* x *Protea susannae* hybrid, were planted and shoots were pinched and topped at various growth stages to increase the vegetative complexity of the plants during the first growing season. One year old plants of *Protea* cv. Sylvia were pruned in early spring, and the resultant regrowth thinned to between three and six shoots per bearer. Plants not pinched or topped during the first growing season, grew a single stem, pinching after the spring flush resulted in two to three shoots forming while not pinching the spring flush, but topping after the summer flush resulted in five to six shoots forming in late summer. One year old Sylvia plants, pruned in early spring, produced an average of 5.5 shoots per bearer. If all the shoots are left, some become dominant and the remainder become weak, spindly, non-flowering shoots. By thinning to four shoots per bearer, the maximum number of flowering shoots of the required length are produced.

PRUNING OF PROTEAS - EXTRAPOLATION FROM SCIENTIFIC FACTS TO FIELD USE

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Pruning experiments have shown that it is possible to manipulate the time of flowering and size of harvest of protea flowers. Scientific research, by necessity, focuses on one or two specific cultivars, and reports on detailed results relevant to those cultivars. The ways in which specific results can be applied to a broader range of cultivars will be presented, together with information from field trials carried out to test the application.

FLOWERING POT PLANTS: PRODUCTION FROM LEUCOSPERMUM HYBRID VC. 'SCARLET RIBBON'

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If the main usage of Proteaceae is the cut flower, the production of flowering pot plants has equally been studied for several years. All the species and varieties cannot be used for this goal on account of their growth and size of their flowers. Also, it is mainly from Leucospermum varieties that trials were realised.

The authors have used the cultivar 'Scarlet Ribbon' which is cultivated for cut flowers and is well-known for its floribundity. The different techniques of propagation, growth, pruning and pinching are explained. The results show, according to the type of prepared plant (2, 3, 4 or 5 branches), that the number of flowers is more or less important on each axis and that the life time of each flower is dependant on the number of flowers on the axes. The adjusted growth technology allows production of flowering pot plants in 9 months from the rooting of the cuttings and the time of flowering spreads out 2,5 months from mid-March to the end of May. The best results are obtained with 3 or 4 branched plants.

HOW TO PRODUCE PROTEA CUT FLOWERS EVENLY DISTRIBUTED OVER TIME

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A Restio Garden has been established at Kirstenbosch to provide a unique showcase for South African Restionaceae. The Garden is designed to make the public aware of members of this family and to serve as a trial area for the selection of species with potential for horticulture and the wildflower industry. It also provides seed for research and for distribution to gardeners and the horticultural trade.

POSTER:- CONTROLLED POLLINATION TECHNIQUES FOR *PROTEA, LEUCADENDRON* AND *LEUCOSPERMUM*

Louisa Blomerus, GM Littlejohn and A Robyn
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The development of Proteaceae cultivars were initiated in the early 1970's with the growing demand of the European markets for better quality flowers. A better product can only be produced in an intensive agricultural system. These expensive production methods require cultivars with higher income value per hectare than pure species from the wild to make it profitable.

New cultivars are developed at the ARC Fynbos Research Unit at Elsenburg through an intensive breeding program. Hand pollination techniques were developed for the three Proteaceae genera with most economical value. Different techniques are used for *Protea*, *Leucospermum* and *Leucadendron*.

The protocols for *Protea* and *Leucospermum* include 3 days of preparation. At first an inflorescence is chosen on which anthese just started, these flowers are removed and the inflorescence is covered. One to two days later the pollen is removed from the stigma platforms of the florets in anthese. The inflorescence is covered again and one to two days later the florets are pollinated with the selected male parent. The florets not used during pollination are removed from the inflorescence. Only a limited number of florets are pollinated per inflorescence. Since *Leucadendron* has male and female plants no emasculation is necessary in the protocol. The covered inflorescences are left on the plants until the seeds had reached full maturity.

POSTER:- BREEDING FOR THE FUTURE

K. Leonhardt [2], Shingaki, P. [1], D. Oka [1] , and S. Ferreira [3].
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This poster depicts the geneology of Leucospermum UH hybrid No. 74, which was selected in 1997 as the best of our first generation *L. reflexum* hybrids. Its other parent is L. UH hybrid No. 36 which is a tri-specific hybrid involving the species *L. lineare*, *L. conocarpodendron*, and *L. cordifolium*. L. UH hybrid No. 74 has, among its outstanding characteristics, long, straight, strong, and light weight stems, small leaves, vigorous growth, high yields, and a large dark apricot colored flower. It has been increased for distribution to Hawaii growers, with the initial release targeted for November 1998.

program. A socio-economic assessment of the costs and benefits of the program were carried out using a randomized sample of the protea farmers of South Africa. Ultimately, the only measurement obtained from the farmer survey which could be used for the determination of the cost and benefits was the past, current and proposed establishment of plantations from vegetatively propagated cultivars. The program showed a positive rate of return on the investment, using only this parameter. This positive rate of return implies that the benefit from every one Rand invested in research is well worth while. Despite initial problems within the program with the transfer of the product (cultivars) to the farmers as well as the information on the efficient cultivation of the cultivars, the underestimate of the benefits is still positive.

POSTER:- GENETIC RESOURCES, SAMPLING AND CONSERVATION

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The fynbos genebank has its origins in the collection of superior seed samples of species in the 1960's. Today, over 2000 accessions of woody fynbos are maintained, as well as over 500 bulbous accessions. The genotypes are maintained as living plants either in a field genebank, or in pots in a nursery. These maintenance methods are costly and fire and drought could totally decimate the collection. Currently, research is focusing on the establishment of a seed genebank maintaining representative samples of the species of floriculture merit. The seed bank material would be used to conserve the species and provide material suitable for disease screening, while the field genebank would maintain superior hybrid genotypes. This would increase the efficacy of the genebank.

POSTER:- NEW SOUTH AFRICAN RESTIOS WITH POTENTIAL FOR HORTICULTURE AND THE WILDFLOWER INDUSTRY

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The Restionaceae is a family of evergreen rush-like plants. Three hundred species are endemic to the Cape floral region. Plants from this family have long attracted the attention of horticulturists around the world on account of their sculptural form and their attractive long-lasting seed heads. Restios have potential as bedding plants, as accent plants in landscaping and their foliage is also of value to the cut flower industry. In the past, the wildflower industry has used the foliage and dried inflorescences of many different species collected from the veld. Some examples are *Elegia capensis, Ischyrolepis subverticillata, Thamnochortus insignis, Restio bifarius* and *Ceratocaryum argenteum.*

For many years only a few species were in cultivation and available commercially due to the extremely poor germination obtained in most species. The recent discovery that plant-derived smoke is the germination cue for many species has led to a wider range of species becoming available for cultivation.

Since 1994 over 600 crosses have been made, and over 2,200 seedlings have flowered and have been evaluated for their commercial potential. Thirty-one seedlings have been selected for advanced testing, mother bed production, and possible release and distribution to growers.

A selection of *L. saxosum* identified as highly resistant to Elsinoe disease has produced hybrid seedlings which appear to have inherited its resistance. The species *L. reflexum* has been effectively used to produce hybrid seedlings with excellent leaf and stem characteristics and flowers larger than either parent. Outstanding seedling individuals have been inbred to their parents and/or siblings to produce the next generation of seedlings for observation.

POSTER:- BREEDING BIOLOGY OF DRYANDRA (Proteaceae)

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The genus *Dryandra* is confined to the south west portion of Western Australia, a region renowned for its rich endemic flora. Of its 90 species the majority have yellow flowers. However, within the genus there is an impressive range of leaf shape and form. To date the breeding system of *Dryandra* has not been investigated, most studies have concentrated on its taxonomy or pollination ecology. At least 4 species are grown commercially for cut flower production. To further develop this industry, knowledge of their breeding system is essential. This project aims to shed light on some aspects of the breeding system of two commercial species, *D. quercifolia* and *D. formosa*. Hand pollinations have been used to investigate their mating system, the rate of pollen tube growth and timing of stigma receptivity. Pollen tube and seed set data indicate that both species have a mixed mating system, cross pollen preferred, self pollination possible. Pollen tubes reaching the base of the style approximately 7 days after pollination. A combination of hand pollinations and observation of fresh styles in the Environmental SEM (ESEM) were used to investigate stigma receptivity. Most pollen tube growth occurred 2-3 days post anthesis (perianth split). However, it was not confined to these days, pollen tubes were still observed following pollination 12 days post anthesis. *D. quercifolia* consistently had high pollen tube numbers than *D. formosa*. Observations of fresh *D.quercifolia* styles in the ESEM indicate that an exudate is produced and that the groove in which the stigma is housed opens with time post anthesis.

POSTER:- DOES PROTEA BREEDING PAY?

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The Proteaceae breeding program of the Agricultural Research Council of South Africa has been in existence since 1974. It has concentrated on developing inter-specific hybrids of *Protea*, *Leucospermum*, *Leucadendron* and *Serruria* for the selection of cultivars suitable for cut fresh flower production. Eighty-nine cultivars have thus far been released from the

SELECTION OF GENETIC MATERIAL

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Selection of superior genetic material is an essential support to the industry, as it provides the best available germplasm for cultivation of highest quality blooms. This is required for the industry to attain and maintain a competitive edge in both the domestic and export markets. This review addresses the *Banksia* genus. in terms of genetic variability, hybridization and selection criteria. The principles outlined, however, apply to any cut flower commodity.

MIXING AND MATCHING PROTEACEAE GENES

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We, as South Africans, are justifiably proud of our Proteaceae. They constitute the basis of the indigenous flower industry, provide national sports emblems and occasionally grace our gardens. Yet, Proteaceae remain awkward partners in cultivation, never quite outgrowing their reputation of being difficult to grow. The job of the plant breeder is to mix and match the genes within the gene pool to enable rapid adaptation to the cultivated conditions as well as to improve the aesthetic appeal of the flowers. In the breeding process, once again "Proteus" rears his head. More questions arise as we get partial answers to other questions relating to the dynamics of reproduction and hybridization. The results within the breeding project on the pollination, seed set and taxonomic relatedness, and the production of complex hybrids is presented, highlighting ongoing research.

LEUCOSPERMUM CULTIVAR DEVELOPMENT AT THE UNIVERSITY OF HAWAII.

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Leucospermum is the most widely grown Proteaceae genus for cutflower production in Hawaii. Commercial growers require cultivars with disease resistance, high yields, long, strong, and slender stems, small leaves, and an extended flowering season in order to effectively compete in the world flower trade. Breeding at the University of Hawaii is designed to produce new cultivars with these desirable characteristics.

In wounded cuttings, two ranks of callus nodules appeared along the edges of each incision. Roots emerged associated with the ranks of callus nodules, but they also emerged through the bark in non wounded areas between the incisions.

POSTER:- IRRIGATION REQUIREMENTS OF YOUNG COMMERCIALLY CULTIVATED PROTEACEAE.

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Currently irrigation guidelines for Proteaceae, a rapidly expanding cut flower industry, are drawn from information obtained for other horticultural crops. Water consumption of young *Leucadendron* cv. Inca Gold *(L. laureolum x L. salignum)*, *Leucospermum* cv. Succession II *(L. lineare x L. cordifolium)* and *Protea* cv. Cardinal *(P. eximia x P. susannae)* plants under drip irrigation was determined in a field trial in the Western Cape region of South Africa during the 1996/97 and 1997/98 seasons. The control treatment was dry-land cultivation, whereas three other treatments were irrigated at 60%, 40% and 20% depletion of plant available water (PAW), respectively. Leaf water potential values showed that plants under dry-land cultivation and irrigation at 60% depletion of PAW were subjected to higher water stress from February until April. Irrigation of *Protea* at 20% depletion of PAW resulted in significantly longer shoots compared to drier treatments. Furthermore, irrigation at 20% PAW depletion resulted in the highest *Protea* establishment percentage. In the case of *Leucospermum*, irrigation at 20% PAW depletion also resulted in the longest shoots, although they were not significantly longer than those obtained with irrigation at 40% depletion. Different soil water depletion levels did not have a significant effect on the shoot growth of young *Leucadendron* plants. Water consumption of three year old *Leucadendron*, *Leucospermum* and *Protea* plants was approximately 845 mm, 852 mm and 982 mm, respectively, during the 1997/98 season, based on a third of the total surface area.

POSTER:- THE USE OF GRAFTING PROTEACEAE

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Grafting, as a propagation method is used for various reasons in the Proteaceae. The problem of low rooting success in the vegetative propagation of certain species can be overcome by using grafting techniques.

Limited material of endangered species are also grafted on rootstocks. The use of rootstocks adapted to a wider range of soil conditions normally required for Proteaceae cultivation, enhances the possibilities for cultivation. A wide range of rootstocks are tested and compatibility studies for various scions are undertaken.
These research results are briefly indicated.

different vegetative and reproductive stages during a growing season. Today it seems absolutely necessary to take stock of what is known about the very precise nutrition requirements of Proteaceae.

NUTRIENT COMPOSITION OF SELECTED COMMERCIAL PROTEACEAE SPECIES

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Fertiliser requirements for Proteaceae are becoming important due to increasing commercial cultivation and demand for high quality products on the international markets. A greater environmental awareness also requires that pollution is prevented through sensible fertiliser applications. Although Proteaceae are known to grow on nutrient poor soils, large amounts of biomass are removed from the cycle each year as marketable flowers as well as from pruning. This may gradually deplete soil reserves, which then need to be replaced through fertilisation. Nutrient content of plant organs are generally considered an aid to determining fertiliser needs but not much data on the nutrient contents has been published for different Proteaceae cultivars.

This paper presents data on the nutrient concentrations in the different parts of a three Proteaceae genera. This indicated that differences exist between genera and cultivars, implicating the need for different norms for individual cultivars. By determining the nutrients removed, the amount that should be replaced was estimated and fertiliser guidelines are proposed.

POSTER:- INFLUENCE OF CUTTING POSITION, WOUNDING AND IBA ON THE ROOTING OF LEUCOSPERMUM 'SUNRISE' CUTTINGS

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Although some commercial nurseries use basal cuttings for the propagation of *Leucospermum spp.* with good results, terminal cuttings are usually recommended. *Leucospermum* 'Sunrise' (*L. cordifolium x L.patersonii*) is easy to propagate from terminal cuttings, but no data have been reported using basal cuttings.

In order to study if wounding (two shallow and opposite incisions) alone or combined with IBA treatments (0, 2000, 4000 ppm) could improve the rooting process, during winter/spring a trial was carried out in which terminal and basal cuttings were rooted with bottom heat (22°C ±2°C) and macrojet irrigation.

Satisfactory rooting from the commercial point of view (86.7%) was obtained 8 weeks after planting, when using wounded basal cuttings treated with 4000 ppm of IBA. After 12 weeks nearly all treatment in which IBA was used showed 80% rooting or higher. Lack of hormonal treatment significantly reduced rooting in wounded and unwounded basal and terminal cuttings. Wounding alone, or combined with IBA did not improve rooting significantly compared with hormonal treatment alone.

POSTER:- FUNGAL PATHOGENS ISOLATED FROM BORERS FOUND ON PROTEACEAE IN THE WESTERN CAPE REGION, AND THEIR POTENTIAL AS BIOLOGICAL CONTROL AGENTS.

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Proteas are grown in various parts of the world, and have been a commercial success for many years. Insect pests such as stem borers and leaf feeders, which reduce plant quality and flower production, and act as vectors for plant diseases, result in large economic losses, particularly in South Africa. The control of such pests is therefore of great importance. Since Protea pests like borers cannot be controlled with chemical applications, alternative control measures are being sought. Biological control is one such approach. We are investigating the use of insect pathogens such as viruses, fungi and bacteria for the control of pests on various crops. The combination of biological control with chemical pesticides could form part of successful integrated pest management programs (IPM). Biological control is also an environmentally friendly approach to pest management. The aim of this project is to identify insect pathogens that have potential as biological control agents of insect borers attacking cultivated Proteas.
Numerous regions within the Western Cape have been sampled to isolate fungi -infected pests on proteas. Thus far, a number of *Beauveria bassiana* isolates have been collected from insects on Proteaceae. *Beauvaria* isolates have been collected from areas with different climatic conditions, and isolates have even been obtained from very dry areas. Insects yielding isolates were *Sphenoptera* sp. (flat headed Protea borers), *Argyroploce* sp. (black moth) and unidentified larvae, possibly *Tinea* sp. These isolates have been shown to be pathogenic to *Orophia ammopleura* larvae (spotted Protea borer), resulting in 100 % mortality of insects in laboratory trials.

A REVIEW ON THE NUTRITION STATUS OF PROTEACEAE

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Whenever a plant is studied, its cultivation begins with the nutrition and its requirements. With regard to Proteaceae and their requirements, a lot of data is available in specialised articles and reviews. However, it is clear that the nutrition requirements are not very well known and only concern some elements and species in particular. The effect of salinity or the effect of an element on plant growth and development has been studied in various trials. Most work is with phosphorous which is said to be 'sensitive' element for good growth. Soil with a high phosphorous content can be detrimental to the cultivation of proteas.

The amount and concentration, but also the ratios of elements in soils or solutions are critical for good plant growth. Each specie has its own requirements that also differ during the

pathogen populations. Fungicide application must also be implemented in combination with pruning and general sanitation, as part of an integrated control programme.

POSTER:- SCREENING LEUCOSPERMUM SPECIES FOR RESISTANCE TO PHYTOPHTHORA CINNAMOMI USING THE STEM INOCULATION TECHNIQUE

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Phytophthora cinnamomi (Pc) is the most serious root pathogen of Proteaceae in South Africa. Species of *Leucospermum* and *Leucadendron* are particularly susceptible. An important aspect of integrated disease management of root rot caused by Pc is the use of resistant rootstocks. It is necessary to develop a method of testing as many different plants as possible in order to stand a chance of finding a resistant individual. The technique used to screen possible candidates must be reliable, cost-effective in terms of labour and space and must produce results in as short a time possible. Stem innoculations were carried out on six species, viz. *Leucospermum cordifolium* vc. Pink Star, *Leucospermum conocarpodendron*, *Leucospermum tottum x formosum* cv. Spider, *Leucospermum cordifolium x patersonii* cv. High Gold. *Leucospermum glabrum* cv. Helderfontein and *Leucospermum reflexum* cv. Luteum.

Three depths of inoculation were tested: surface inoculation on a wound made by removing a leaf; inoculation below the bark; and a deep inoculation on the xylem (pith). Inoculated stems were kept at 20°C ± 3°C. Inoculations were conducted during winter (mid-May to end July) and were repeated during the summer (end November to end January). Lesion lengths were recorded at three levels, on the surface, below the bark and on the xylem, six days after inoculation and stem diameter and bark thickness were also measured. Bark thickness and stem diameter are important co-variates and therefore must be included as part of the data set. There was significant three-way interaction (season x depth of inoculation x cultivar for all the variables measured (surface lesion below bark lesion and pith lesion). Analysing the season's data separately it was shown that reading the surface lesions of the winter inoculations there was no cultivar x inoculation depth interface, but interaction did occur with the deeper inoculations. There were significant cultivar x inoculation depth interactions in all the summer inoculation data. These findings thus suggest that surface inoculations carried out in late autumn and winter might be the best way to make these tests. The relative resistance placing of the cultivars tested with the surface inoculations in winter trials is as follows: Luteum and Pink Star (smallest lesions); Helderfontein, Spider and *L. conocarpodendron*; High Gold (biggest lesion lengths, i.e. most susceptible). Field observations confirm this relative positioning of the cultivars. The overall conclusions of this work are that first attempts at using the stem inoculation technique give promising results, but the technique is far from being accepted as a standard.

appears in a field, it spreads rapidly, is difficult to control, and is rarely eradicated. Assumptions underlying disease control guidelines are that the disease is localized to a portion of the plant, and that the infection spreads rapidly from a point source. These assumptions were tested by studying witches' broom infection in both natural and agricultural populations at different spatial and temporal scales, in order to obtain a fuller understanding of the characteristics, transmission and spread of the disease. Two types of disease spread were identified, questioning the first assumption of disease control guidelines. The disease appears to either spread very slowly at a localized scale within the plant or between neighbouring plants, or disperse over a long distance between isolated populations. The second assumption, that the disease is localized and not systemic, is partially correct. However this localization is from the point of disease infection, rather than symptom expression, which may not necessarily correspond. Unfortunately it is not currently possible to determine the point of disease infection. In view of these findings, it is suggested that farmers remove the whole stem of a plant with witches' broom, and completely remove heavily infected plants.

POSTER:- IN VITRO SCREENING OF FUNGICIDES AGAINST THE BOTRYOSPHAERIA STEM CANKER PATHOGEN OF PROTEACEAE

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Botryosphaeria species cause leaf blotch, stem cankers, branch die-back and ultimately the death of certain Proteaeae farmed in South Africa. This results in serious economic losses, and disease control is, therefore, regarded as imperative. One aspect of integrated control is the use of fungicides. A number of new agrochemical products have become commercially available and their efficacy, both as preventative and curative treatments, needs to be evaluated. The aim of this study was to screen a range of currently available fungicides *in vitro*, to determine baseline sensitives of the *Botryosphaeria* sp. associated with stem cankers. Based on these results, promising compounds will be selected for field trials. Then fungicides, namely, benomyl, bitertanol, carboxin, chlorothalonil, fenarimol, iprodione, mancozeb, prochloraz, strobilurine and tebuconazole were tested at concentrations ranging from 0.005 to 5μg/ml a.i. The EC_{55} (effective concentration at which 50% of the mycelial growth is inhibited) and EC_{95} values were calculated. The best results were obtained with bitertanol and tebuconazole, which inhibited mycelial growth completely. The next best group at which inhibition occurred at very low concentrates (EC_{95} < 0.8 μg/mL) included fenarimol and iprodione. Benomyl and prochloraz were moderately effective (EC_{95} < 2.7 μg/mL) but mancozeb and chlorothalonil were only effective at high concentrates (EC_{95} >70 μg/mL). Carboxin and strobilurine were entirely ineffective at reducing mycelial growth. These in vitro tests hold great promise for producers, but the efficacy of the test compounds and the phytotoxicity risk must be assessed under field conditions before recommendations for commercial use can be made. Furthermore, frequent use of the potentially promising fungicides might lead to the build-up of resistant pathogen populations. They should, thus, not be used without consideration of strategies aimed at preventing this from happening. The frequency of fungicide application and alternation of various types of fungicides are important aspects of programmes aimed at preventing build-up of resistance in fungal

POSTER:- *ELSINOË* SPP. ASSOCIATED WITH SCAB DISEASE OF PROTEACEAE

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Scab disease of Proteaceae, which was initially observed on pincushions in South Africa in 1981, has subsequently been reported on these hosts from Australia and Hawaii. The disease, commonly known as corky bark or scab, is associated with severe losses to commercial plantings of *Leucospermum*, and has also been collected from leaves of *Protea cynaroides* in South Africa, and from species of *Protea*, *Serruria*, *Mimetes* and *Banksia* in Australia. The causal agent was determined to be a species of *Elsinoë*, which has not been formally described. The aim of the present study was to elucidate the taxonomy of the species of *Elsinoë* associated with scab disease of Proteaceae in South Africa and Australia using general morphology and RAPD profiles. Ascus and ascospore morphology of collections from *Leucospermum*, *Protea* and *Banksia* suggest that they represent three distinct species. These findings are corroborated by the distinct RAPD banding patterns generated using ten different primers. Furthermore, results obtained using this technique suggest that the *Leucospermum* isolate from South Africa and the *Leucospermum* and *Leucadendron* isolates from Australia are representative of the same species. The isolate of *Elsinoë* from *Serruria* may be yet a fourth species. Results obtained doing sequencing of the ITS1 and ITS4 region of the isolates gave patterns that distinguished between the isolates from the different hosts in correlation with the RAPD banding patterns. More isolates from *Leucospermum*, *Leucadendron* and *Serruria* from South Africa, from *Leucospermum* from California, and from *Leucospermum* and *Protea* from Zimbabwe will be included in future molecular studies in order to resolve the *Elsinoë* species complex. The importance of this disease cannot be over emphasized. In Zimbabwe entire *Protea* plantations are destroyed and being taken out because of scab disease.

POSTER: - AN INVESTIGATION INTO THE SPREAD OF WITCHES' BROOM DISEASE IN PROTEAS

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Witches' broom is a visible fasciation occurring in many proteas, believed to be caused by a mycoplasma. The vector is thought to be the mite *Aceria proteae*, which is commonly found in witches' brooms.

Witches' broom is a problem for Protea farmers in the cut flower industry. Once the disease