CONTENIDO DEL INFORME TÉCNICO

Fecha de entrega del Informe
17 de Agosto de 2007
Nombre del coordinador de la ejecución
Paola Alejandra Yánez Corvalán
Firma del Coordinador de la Ejecución


1. ANTECEDENTES GENERALES DE LA PROPUESTA

Nombre de la propuesta
Participación en el "VI International Symposium on New Floricultural Crops"
Código
FIA-FP-C-2007- 1- A - 021
Entidad responsable
Universidad de Talca
Coordinador(a)
Paola Alejandra Yánez Corvalán
Fecha de realización (inicio y término)
9 de Junio de 2007 a 18 de junio de 2007

2. RESUMEN DE LA PROPUESTA

Resumir en no más de ½ página la justificación, resultados e impactos alcanzados con la propuesta.

El desarrollo de nuevos cultivos ornamentales es de gran interés en el mundo de la floricultura moderna. En este simposio se discutieron temas son de gran relevancia para el desarrollo de la industria ornamental por lo que se planteó esta iniciativa. Los principales logros alcanzados con la participación en este simposio fueron obtener información actualizada de la situación actual y tendencias del mercado mundial de ornamentales, adquirir conocimiento sobre sistemas de producción y postproducción de ornamentales, conocer experiencias en el mundo de uso sustentable de recursos genéticos nativos y las estrategias utilizadas en otros mercados para introducir nuevos productos, y finalmente establecer vínculos y contactos con investigadores, empresarios y/o productores extranjeros. En el corto y mediano plazo se espera utilizar el conocimiento adquirido en la generación de ideas de proyectos dirigidos a desarrollar nuevos negocios para la horticultura ornamental del país, transferir el conocimiento adquirido a agricultores y profesionales relacionados con el área de la Floricultura tanto a nivel académico como productivo y poder colaborar con el conocimiento adquirido en la incorporación de nuevas especies nativas como cultivos ornamentales

3. ALCANCES Y LOGROS DE LA PROPUESTA

Problema a resolver, justificación y objetivos planteado inicialmente en la propuesta

El desarrollo de nuevos cultivos ornamentales es de gran interés en el mundo de la floricultura moderna. En este simposium se discutirán temas tales como, la importancia del germoplasma nativo, el uso sustentable de la biodiversidad en la industria de la floricultura y el paisajismo, estrategias de producción, tendencias del mercado y la comercialización, tecnología de la producción, cosecha y poscosecha de cultivos ornamentales. Todos estos temas son de gran relevancia para el desarrollo de la industria ornamental en nuestro país, y en especial de gran interés para nosotros como profesionales ligados al sector. Establecer contacto con investigadores provenientes de países con una industria florícola desarrollada, como es la floricultura europea, conocer las nuevas tendencias en el mundo de la floricultura y en los mercados externos, conforma un cúmulo de valiosa información para la generación de conocimiento e ideas de negocios por parte nuestra como profesionales del área y que colaboren con el desarrollo del rubro ornamental en Chile. Es necesario que los nuevos investigadores del área, sobre a todos aquellos que hacemos extensión, obtengamos herramientas para mejorar el trabajo en el rubro de la floricultura, incorporando nuevas tecnologías y nuevas especies que se encuentren mejor adaptadas al medioambiente local, tanto para flores de corte, acompañamiento, plantas en maceta o para jardín. En base a lo anterior, el objetivo general planteado en la propuesta fue:

Participar en VI International Symposium on New Floricultural Crops para conocer el estado actual de la investigación en el desarrollo de nuevos cultivos ornamentales, las tendencias del mercado de la horticultura ornamental en el mundo y establecer contacto con investigadores que trabajen en el desarrollo de nuevos productos y el uso de los recursos genéticos nativos.

Objetivos alcanzados tras la realización de la propuesta

Consideramos que se cumplió el objetivo general propuesto, debido a que durante nuestra participación en el simposio, logramos adquirir información técnica y económica del rubro ornamental. Además se pudieron conocer experiencias de proyectos e investigaciones desarrolladas en otros paises y establecer contacto investigadores relacionados con el área.

Resultados e impactos esperados inicialmente en la propuesta

1. Información actualizada de la situación del mercado mundial de ornamentales
2. Adquirir conocimiento sobre sistemas de producción y postproducción de ornamentales
3. Conocer experiencias en el mundo de uso sustentable de recursos genéticos nativos
4. Conocer las estrategias utilizadas en otros mercados para introducir nuevos productos
5. Establecer vínculos y contactos con investigadores, empresarios y/o productores extranjeros

6. Nuevas ideas de negocios para la horticultura ornamental del país
7. Transferir el conocimiento adquirido a agricultores y profesionales relacionados con el área de la Floricultura tanto a nivel académico como productivo.

8. El conocimiento adquirido utilizarlo para incorporar nuevas especies nativas como cultivo ornamentales.

Resultados obtenidos

Descripción detallada de los conocimientos y/o tecnologías adquiridos. Explicar el grado de cumplimiento de los objetivos propuestos, de acuerdo a los resultados obtenidos.

1. Ámbitos de la situación del mercado mundial de ornamentales

En el simposio se presentó el caso particular de Estados Unidos, donde ha habido una disminución progresiva de la importancia del rubro flores de corte, en comparación a otros que han incrementado su participación en el mercado de ornamentales, tales como plantas en maceta, plantas de jardín anuales y perennes, y la producción de material vegetal no terminado como esquejes y plántulas. Este aspecto podría ser importante de considerar cuando buscamos o pensamos en nuevos productos para exportar a Estados Unidos.

También se entregó algo de información respecto de la situación en Europa, donde las tendencias tienen algunas similitudes, porque aunque el consumo de flores de corte es mucho más alto en Europa, que en Estados Unidos, ha habido un fuerte crecimiento del rubro plantas en macetas y plantas de jardín.

2. Ámbito de los sistemas de producción y posproducción

Aunque este no fue un tópico muy desarrollado dentro del simposium, se conocieron metodologías productivas desarrolladas en diferentes países con varias especies para planta en maceta, tales como *Tabebuia* (Argentina), Iris negro (Jordania), Iridáceas sudafricanas (Sudáfrica), *Viscum* sp. o muerdago (Dinamarca) y *Plumeria rubra* como planta de jardín (Hawai). También se presentaron estudios de poscosecha en *Dodonea* sp utilizada como follaje (Israel), *Leonothis leonorus* para flor de corte (Israel).

3. Ámbito del uso sustentable de recursos genéticos nativos

Durante el desarrollo de la propuesta fue posible conocer las experiencias en el trabajo con especies nativas de lugares tan diversos como Sudáfrica, Australia, Kenya, Jordania y Nueva Caledonia entre otros. Algunos ejemplos destacables fueron:

- Uso de retamos nativos como planta de jardín (Italia)
- El proyecto Biociudad del Estado de Curitiba en Brasil, un proyecto fundamentalmente de gestión ambiental, que reúne los esfuerzos del gobierno local y las universidades, para la restauración de la biodiversidad mediante la protección, conocimiento y uso sustentable de la flora nativa. Este proyecto financiado con recursos del gobierno local se sustenta sobre tres ejes principales:

la educación ambiental dirigida especialmente a niños y jóvenes, el estudio y uso de plantas nativas y finalmente el desarrollo de proyectos de espacios público. Este proyecto promueve el uso y conocimiento de la flora nativa mediante el rescate de especies en extinción, la búsqueda y estudio de especies nuevas para la ciencia y el estudio y uso de plantas nativas con potencial ornamental en los espacios públicos (parques y jardines).

- Centro para la Floricultura Nativa de Australia (The Centre for Native Floricultura) cuyo objetivo es el desarrollo de especies nativas Australianas para el mercado mundial de la floricultura. El centro tiene tres áreas fundamentales: el área económica que maneja un programa de investigación de mercado y cadenas de comercialización tanto a nivel local como internacional, el área de floricultura cuyo objetivo de investigación es la identificación y desarrollo de nuevas especies, y finalmente un área de transferencia centrada en un programa de capacitación dirigido a la industria florícola.

- La experiencia del Instituto de Floricultura de Argentina en el desarrollo de especies nativas para su introducción en la floricultura local. Durante el simposium se mostraron los resultados del mejoramiento de dos géneros nativos de Argentina, *Tabebuia* y *Calibrachoa*, para su uso como planta en maceta y de jardín, respectivamente.

- Un proyecto italiano de evaluación de mezclas de especies silvestres de plantas anuales y bianuales, para ser usadas en las áreas verdes públicas, principalmente en carreteras y áreas de servicios. El objetivo fundamental del proyecto era encontrar plantas que fueran una alternativa para las áreas verdes públicas, que presentaran menores requerimientos de manejo hortícola y por lo tanto, significaran un menor costo de construcción y mantención para los gobiernos locales.

4. Ámbito de las estrategias de introducción de nuevos productos al mercado

En este aspecto se conoció la situación actual en Estados Unidos, donde los costos de desarrollo e introducción de nuevos productos (cultivares) se han elevado y la vida útil en el mercado de un nuevo producto se ha reducido. Esto obliga a las empresas o a los mejoradores contar con equipos especializados de apoyo para el desarrollo comercial de los productos. La idea fundamental es que paralelo al desarrollo del producto en si mismo se debe construir una estrategia de mercado que permita asegurar un nivel de ganacias adecuado en un corto tiempo. Como esta área del desarrollo de nuevos productos ha tomado tanta importancia se debe contar con equipos capaces de realizar este trabajo en forma eficiente, porque de nada sirve tener un muy buen producto, una nueva especie muy promisoria si finalmente no se puede vender. La reflexión fue que desafortunadamente muchas veces los mejoradores o los investigadores no tienen las capacidades para desarrollar esta área, por lo deberían realizarse alianzas con el mundo privado o con organismos que si las tengan.

También se conoció la estrategia que el Reino Unido implementó a nivel local para aumentar el consumo de flores de corte. Esta consideró entre otros aspectos una campaña publicitaria muy atractiva, que trató a las flores como otros productos de consumo masivo, dirigido fundamentalmente a las mujeres, ya que un estudió demostró

que ellas eran las principales compradoras de flores. También se trabajó en el mejoramiento de los estándares de calidad y de las cadenas de comercialización. Otro aspecto importante fue la incorporación masiva de los supermercados en la cadena de comercialización como una forma de reducir los intermediarios involucrados. El resultado de toda esta estrategia fue que el consumo interno de flores se triplicó en los últimos 10 años.

5. Contacto con investigadores extranjeros

Se estableció contacto con investigadores de Argentina, Brazil, España, Italia, Portugal, Croacia y empresarios de Estados Unidos.

6. Difusión de los conocimientos adquiridos

En el corto plazo se realizaron dos charlas de difusión, una para agricultores de la zona de San Clemente (VII región) y otra para académicos, alumnos y público en general en la Universidad de Talca.

Resultados adicionales

Describir los resultados obtenidos que no estaban contemplados inicialmente.

Una experiencia interesante que pudimos conocer fue en relación a las de estrategias de conservación de la flora nativa desarrolladas en la Isla de Madeira, que si bien no se centran en su uso para fines ornamentales, le asigna un valor a la flora como un recurso local que se complementa con otra área del desarrollo económico, como es el turismo. Mediante estrategias que integran la promoción y conocimiento de las especies, tanto nativas como invasoras, se favorece el el resguardo de la biodiversidad. La flora nativa y su expresión en las distintas formas vegetacionales típicas de la isla se promueven como uno de los atractivos turísticos del lugar.

En este plan de promocción de la flora nativa el conocimiento e información de las especies es un componente importante, asi existe gran cantidad de material de difudión del tema, como por ejemplo atractivos adhesivos con la foto y la identificaión de la especie, gigantografias de especies nativas con su identificación en los buses de turismo. Además, hay una incorporación de la flora y la biodiversidad como atractivos del lugar en la promoción turística y actividades como tours y excursiones en torno a ellas (Anexo 1).

Aplicabilidad

Explicar la situación actual del sector y/o temática en Chile (región), compararla con las tendencias y perspectivas presentadas en las actividades de la propuesta y explicar la posible incorporación de los conocimientos y/o tecnologías, en el corto, mediano o largo plazo, los procesos de adaptación necesarios, las zonas potenciales y los apoyos tanto técnicos como financieros necesarios para hacer posible su incorporación en nuestro país (región).

A nuestro juicio, hay mucho por hacer tanto en el ámbito del estudio y desarrollo de nuevos cultivos como en el desarrollo y diversificaión del mercado local y en la búsqueda de nuevos mercados para la exportación. Experiencias cercanas como la del Instituto de

floricultura de Argentina nos muestran que es posible utilizar los recursos genéticos nativos no solo mirando al exterior, sino que también para potenciar el mercado local.

Actualmente, la investigación se encuentra restringida a unas pocas especies, las cuales representan un bajo porcentaje de las especies nativas y endémicas existentes en nuestro país.

Por otro lado es claro que el uso que se les puede dar a estas especies es mucho más amplio que solo pensar en usarlas como flor de corte o de maceta. El paisajismo urbano es una buena opción para el mercado de las plantas nativas ornamentales, ya que estas se adaptan mejor a las condicones locales.

También, es importante resaltar la importancia de la educación para la conservación. En nuestro país no existe una política educacional asociada al conocimiento de las plantas nativas, el cual sería muy interesante de incorporar en los actuales planes de estudio.

De igual manera, rescatar el aprovechamiento de la flora nativa como un recurso portenciador del turismo, tenemos una flora rica y diversa, y aunque hay algunos esfuerzos por sacar provecho de ello, no hay una política o estrategia global que fomente su valorización y explotación como recurso turístico local.

Por último, el conocimiento adquirido en experiencias como este simposio es un recurso también valioso, que esperamos poder aplicar y transmitir para el desarrollo de la floricultura en nuestra región y país, lamentablemente esto no depende sólo de nosotros mismos sino también de las oportunidades laborales y de desarrollo personal que tengamos. En este sentido agradecemos a la Fundación de Innovación Agraria por la confianza depositada en nosotros al permitirnos participar en esta actividad.

Detección de nuevas oportunidades y aspectos que quedan por abordar

Señalar aquellas iniciativas que surgen como vías para realizar un aporte futuro para el rubro y/o temática en el marco de los objetivos iniciales de la propuesta, como por ejemplo la posibilidad de realizar nuevas actividades.

Indicar además, en función de los resultados obtenidos, los aspectos y vacíos tecnológicos que aún quedan por abordar para ampliar el desarrollo del rubro y/o temática.

Creación de un centro para el fomento de la floricultura y el estudio de la flora nativa

Desarrollo de estrategias para la conservación del patrimonio genético por ejemplo programas de educación ambiental que fomenten a nivel masivo el conocimiento y protección de las especies nativas.

El desarrollo de estrategias de marketing para posicionar mejor estas especies en el mercado, tanto local como internacional, desarrollar el concepto de "producto".

Creemos que el rubro ornamental es una actividad muy incipiente, que se está comenzando a difundir y en esa perspectiva todas las acciones que se tomen serán beneficiosas, existen muchos vacíos tecnológicos, ya que son especies en su mayoría aun no estudiadas, además existen numerosas tecnologías estudiadas en otros países que aun no han sido aplicadas en el nuestro. Tal vez el vacío más importante sea la falta de investigadores especialistas en esta área.

4. ASPECTOS RELACIONADOS CON LA EJECUCIÓN DE LA PROPUESTA

Programa Actividades Realizadas

Nº	Fecha	Actividad
1	9 de junio	Viaje desde Talca
2	11 a 15 de junio	Participación en VI Symposium on New Floricultural Crops
3	18 de junio	Regreso a Chile

Detallar las actividades realizadas, señalar las diferencias con la propuesta original. Resumir y analizar cada una de las exposiciones.

La única diferencia con la propuesta original fue en el viaje de ida, ya que por factores ajenos a nuestro control el vuelo de Chile a Madrid se retrasó 7 horas, lo que significó la pérdida de los vuelos a Lisboa y Madeira y finalmente nuestra llegada a Madeira fue un día más tarde de lo planificado con un costo adicional para nosotros de aproximadamente $150.000 por persona por concepto de multas por cambios de vuelo y alojamiento en España. En las demás actividades no existieron diferencias con la propuesta original. Por el gran número de exposiciones involucradas en este caso y lo extenso que resultaría analizarlas se adjunta el libro de resúmenes del simposio (Anexo 2).

Contactos Establecidos

Presentar los antecedentes de los contactos establecidos durante el desarrollo de la propuesta (profesionales, investigadores, empresas, etc.), de acuerdo al siguiente cuadro:

Institución Empresa Organización	Persona de Contacto	Cargo	Fono/Fax	Dirección	E-mail
Instituto Agronómico (IAC)	Antonio Fernando Caetano Tombolato	Investigador	551932415188	Avenida Barao de Itapura 1481 Campinas, Brasil	tombolat @iac sp g ov.br
CNR, Istitute for Ecosystem Study	Francesca Bretzel	Investigadora	0039 050 3152485	Via G. Moruzzi 1 56124 Pisa Italy	Francesca .bretzel@i se.cnr.it

Instituto de Floricultura INTA	Gabriela Facciuto	Investigadora	54 11 44 813864	Las Cabañas y Los Reseros S/N Castelar CP1712 Buenos Aires Argentina	gfaciutto @cnia.int a.gov.ar
Departamento de Ingeniería. Producción y Economía Agraria Universidad de la Laguna	Juan Alberto Rodríguez-Pérez	Investigador	34 92 2318521	Carretera de Geneto 2 38200 La Laguna, Tenerife. España	jarodrip @ull es
Universidad Católica de Córdoba	Leila Imhof	Investigadora	035 764 23977	Camino de Alta Gracia Km 7,5 Córdoba, Argentina	leimhof@ hotmail.c om
Instituto Canario de Investigacio-nes Agrarias	Miguel Apeles Díaz	Investigador	34 92 247 6334	ICIA Apdo 60 38200 La Laguna, Tenerife, España	madiaz@ icia es

Material elaborado y/o recopilado

Entregar un listado del material elaborado, recibido y/o entregado en el marco de la propuesta. Se debe entregar adjunto al informe un set de todo el material escrito y audiovisual, ordenado de acuerdo al cuadro que se presenta a continuación.

También se deben adjuntar fotografías correspondientes a la actividad desarrollada. El material se debe adjuntar en forma impresa y en un medio electrónico (disquet o disco compacto).

Elaborado

Tipo de material	Nombre o identificación	Preparado por	Cantidad
Presentación en Powerpoint	Presentación Charla de difusión	Equipo participante	2

Recopilado			
Tipo de Material	**Nº Correlativo (si es necesario)**	**Caracterización (título)**	
Artículo			
Material de difusión	Anexo 1	Flora nativa y plantas invasoras de Madeira, información turística	
Libro	Anexo 2	Libro de Resúmenes del Simposio	
Fotos	Anexo 3	Presentación de posters	
Diapositiva			
CD			

Programa de difusión de la actividad

En esta sección se deben describir las actividades de difusión de la actividad, adjuntando el material preparado y/o distribuido para tal efecto.

En la realización de estas actividades, se deberán seguir los lineamientos que establece el "Instructivo de Difusión y Publicaciones" de FIA, que le será entregado junto con el instructivo y formato para la elaboración del informe técnico.

Para la difusión de esta propuesta se realizaron dos charlas. La primera de ella fue dirigida a pequeños productores de plantas ornamentales, fundamentalemente de flores de corte de la comuna de San Clemente (VII Región). La segunda charla fue dirigida a estudiantes, académicos y público en general interesados en el tema y fue desarrollada en la Universidad de Talca.

5. PARTICIPANTES DE LA PROPUESTA

Nombre	**Paola Alejandra**
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Apellido Materno	**Corvalán**
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Fono y Fax	**071- 970234**
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Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	**Universidad de Talca**
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	**70.885.500-6**
Cargo o actividad que desarrolla	**Investigador Posdoctoral**
Rubro, área o sector a la cual se vincula o en la que trabaja	**Floricultura**

5. PARTICIPANTES DE LA PROPUESTA

Nombre	**Alejandra Andrea**
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RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	**70.885.500-6**
Cargo o actividad que desarrolla	**Investigador Asistente**
Rubro, área o sector a la cual se vincula o en la que trabaja	**Floricultura**

5. PARTICIPANTES DE LA PROPUESTA

Nombre	**Pedro Pablo**
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Apellido Materno	**Nomez**
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Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	
Cargo o actividad que desarrolla	**Estudiante de posgrado**
Rubro, área o sector a la cual se vincula o en la que trabaja	**Agricultura**

6. PARTICIPANTES EN ACTIVIDADES DE DIFUSIÓN

NOMBRE	FONO	E-MAIL	REGION	CARGO O ACTIVIDAD QUE DESARROLLA

Participación Charla "Participación en el VI Simposio de Nuevos Cultivos Florícolas"

Fecha actividad: 22 Julio 2014 Lugar: Salón Municipal, comuna San Clemente

Nombre	Ocupación	Institución	Correo Electrónico	Firma
Rosa Pizarro Rojas	Agricultora			
Carla Villalobos	"			
Mercedes Rojas	"			
Francisca Morales	"		[illegible]	
Daniela Henríquez	"			
Gerardo González	"		gerge.351@hotmail.co.	
Rosa San Martín	"		rosasee_17@hot...	
Victoria Amigo	"			
Pamela Palma Lepayan	Agricultora			
Karina Díaz Pérez	Agricultora			

Asistentes a charla ... "Participación en el II Simposio de Nu... Cultivo ..."

Fecha actividad: 25-Julio-2007   Lugar: Auditorium Fac. Cs. Agrarias, Univ. de Talca

Nombre	Ocupación	Institución	Correo Electrónico	Firma
Flavia Schiappacasse	Ing. Agrónomo PS.	Univ. de Talca	fschiap@utalca.cl	F.SA
Elton Aguayo Romero	Estudiante	U. de Talca	e.alfonso2@gmail.com	[illegible]
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Eglantina Flores	técnico	"	egflores@utalca.cl	[illegible]
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Herminia Vogel	Ing. Agr. Profesora	UTalca	hvogel@utalca.cl	[illegible]
María Arenas	Estudiante		mt arenas_1988 hotmail	[illegible]
Steffen Hahn	Ing.	U-Talca	shahn@utalca.cl	S. [illegible]
Fernando Contreras	Agrónomo		leo.herna@vtr.net	[illegible]
Mª Alejandra Carreño	Agronomía	UTAL	mariaalecv@Gmail.	[illegible]
Esteban Basoalto	"	"	ebasoalto@utalca.cl	Basoalto
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Cristián Muñoz	"	UTAL	cmunoz@utalca.cl	[illegible]
Karina Rojas Boza	Est. agronomía	U tal	karina@rb@hotmail.com	K Rojas B.

7. EVALUACIÓN DE LA ACTIVIDAD DE DIFUSIÓN

a) Efectividad de la convocatoria (cuando corresponda)

Satisfactoria

b) Grado de participación de los asistentes (interés, nivel de consultas, dudas, etc)

Bueno. Los asistentes en ambas charlas mostraron interés en los temas expuestos, realizaron consultas y emitieron comentarios respecto de las experiencias relatadas. Los agricultores de San Clemente plantearon la reflexión sobre la poca valoración de la flora nativa como recurso local, ya que esta comuna cuenta con una rica flora nativa y áreas silvestres.

c) Nivel de conocimientos adquiridos por los participantes, en función de lo esperado (se debe indicar si la actividad contaba con algún mecanismo para medir este punto y entregar una copia de los instrumentos de evaluación aplicados)

No se midió el nivel de conocimiento adquirido, pero la participación de los asistentes fue buena

d) Problemas presentados y sugerencias para mejorarlos en el futuro (incumplimiento de horarios, deserción de participantes, incumplimiento del programa, otros)

8. Conclusiones Finales de la Propuesta

El rubro de ornamentales en Chile está aún en un estado incipiente, pero es posible desarrollar iniciativas que fomenten su desarrollo.

El desarrollo de nuevos productos ornamentales requiere que el desarrollo científico y comercial sean paralelos y complementarios, no siempre los investigadores son los mejores promotores de sus productos. Un fuerte vínculo investigación – industria es indudablemente fundamental en el desarrollo del rubro ornamental, en forma similar a otros rubros.

El uso de los recursos genéticos nativos es una tendencia mundial, las grandes empresas de mejoramiento de plantas ornamentales y los países líderes en la generación de nuevos productos ornamentales ya no estan mirando tanto al exterior, sino a su propia flora nativa en búsqueda de productos más adaptados a las condiciones locales.

El contacto y conocimiento de experiencias externas es fundamental en el desarrollo de estrategias locales.

ANEXO 1

Material de difusión de plantas nativas e invasoras de Madeira
e información turistica


Conhecer para Conservar
Sorbus maderensis - Sorveira

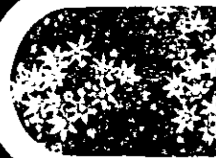

Conhecer para Conservar
Jardim Botânico da Madeira


Jardim Botânico da Madeira
Jasminum azoricum - Jasmineiro branco


Orchis scopulorum - Orquídea das rochas

Conservação de espécies vegetais prioritárias e raras da Madeira

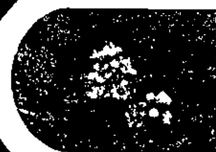
O Jardim Botânico da Madeira contribui para a conservação de espécies vegetais prioritárias e raras do arquipélago da Madeira e para a recuperação de habitats naturais, de modo a salvaguardar os recursos genéticos vegetais de uma forma integrada.



Aichryson dumosum

Pittosporum coriaceum
Mocano

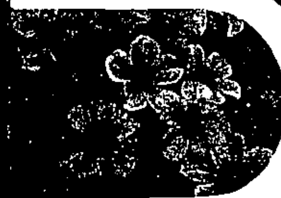
Cheirolophus massonianus



Chamaemeles coriacea
Buxo da rocha

O projecto "Conservação de especies vegetais prioritarias e raras da Madeira" (LIFE 99 NAT/P/006431), que decorreu de Outubro 1999 a Setembro 2004, foi financiado a 75% pela União Europeia e a 25% pelo Governo Regional da Madeira.

Projecto Life 99 Nat/P/006431



Geranium maderense
Gerânio da Madeira

Convolvulus massonii
Corriola

Andryala crithmifolia

Jasminum azoricum
Jasmineiro branco

Inventariação e monitorização

[illegible]

Recolha de sementes

As sementes podem ser conservadas a médio e longo prazo em *bancos de sementes, constituindo um recurso importante para a salvaguarda do património vegetal.*
A recolha de sementes e o seu armazenamento no Banco de Sementes do Jardim Botânico da Madeira é efectuado de modo a não afectar a espécie na natureza e a conservar o máximo de variabilidade genética.

Divulgação e sensibilização

Visitas guiadas, exposições temáticas, acções de sensibilização nas escolas, palestras, conferências e percursos pedestres em áreas naturais, são algumas das acções desenvolvidas pelo Jardim Botânico da Madeira para dar a conhecer a flora e vegetação da Madeira, com destaque para as plantas endémicas, [illegible] e raras, alertar para as ameaças às populações naturais, e demonstrar as medidas de conservação implementadas.

Estudos de ecologia e de biologia reprodutiva

[illegible]

Estudos de morfologia e de variabilidade genética

[illegible]

Propagação de espécies

A propagação de plantas através de sementes é determinante para a manutenção da diversidade genética das espécies ameaçadas de extinção. A utilização de técnicas de cultura in vitro [illegible] ultrapassar dificuldades reprodutivas, nomeadamente taxas de fertilidade [illegible] reduzidas, a ausência de [illegible] germinativa.

Reforço e reintrodução de espécies

Os programas de reforço e de reintrodução de populações são prioritariamente dirigidos para as espécies que apresentam populações na natureza com baixo número de indivíduos, ou que apresentam sinais de decréscimo do seu efectivo.

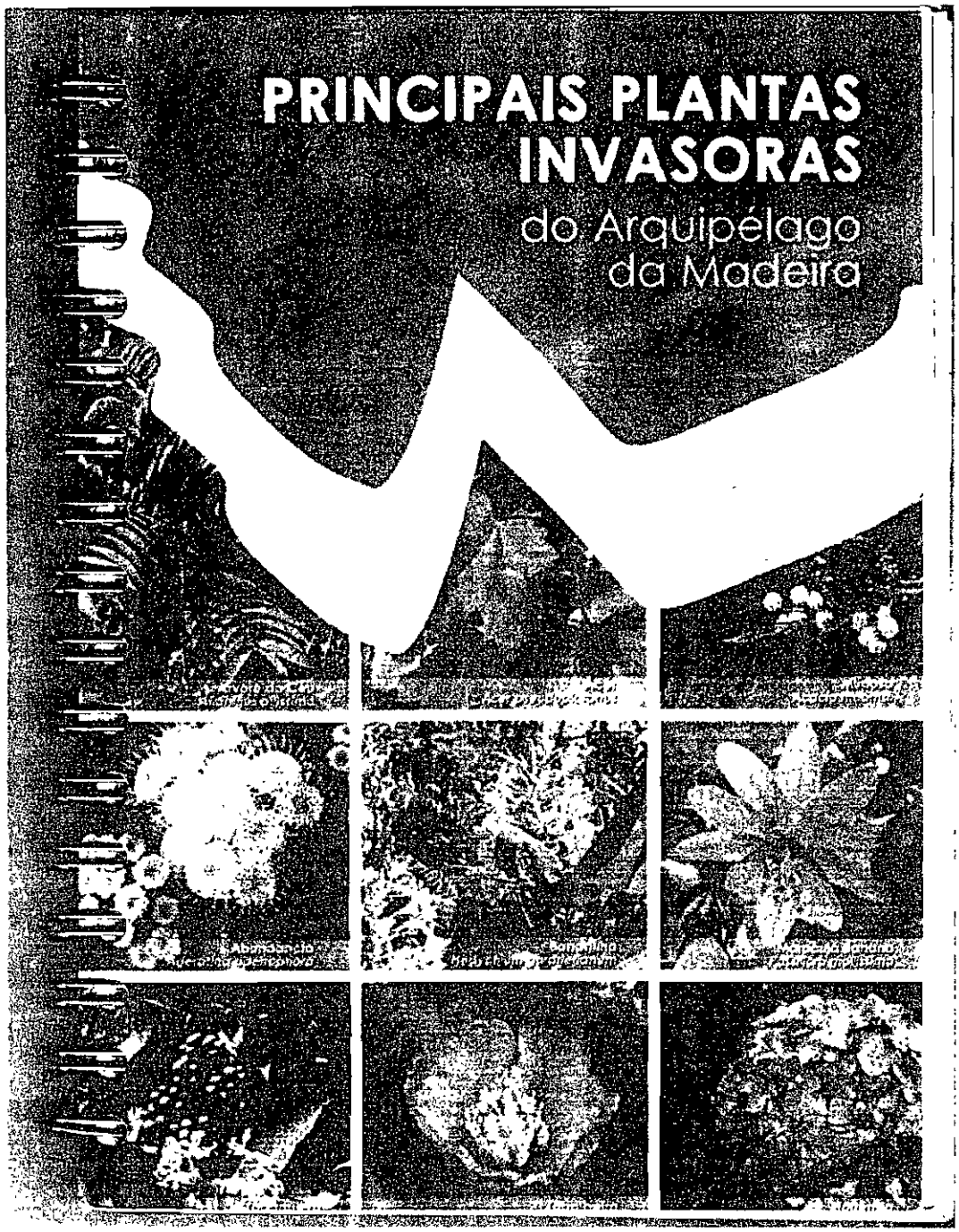
Recuperação do coberto vegetal do Pico Branco (Porto Santo)

O Pico Branco é o único sítio do Porto Santo onde existem redutos da flora indígena bem conservados, com elevada endemicidade, essencialmente refugiados nas escarpas pouco acessíveis.

O [illegible] Florestal do Pico Branco [illegible] a implementação de [illegible] que visam a recuperação do seu coberto vegetal, utilizando apenas material proveniente de plantas deste sítio. A casa e os viveiros do Pico Branco foram recuperados com vista a apoiar a propagação de plantas e a sua reintrodução, a monitorização do processo de recuperação, e a realização de estudos científicos.

PRINCIPAIS PLANTAS INVASORAS

do Arquipélago da Madeira



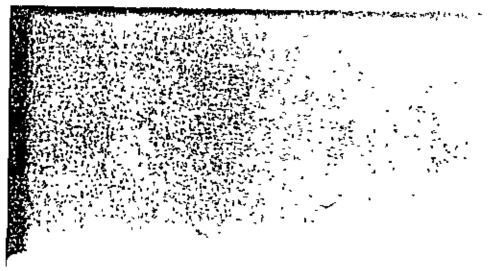
LAURISSILVA DA MADEIRA

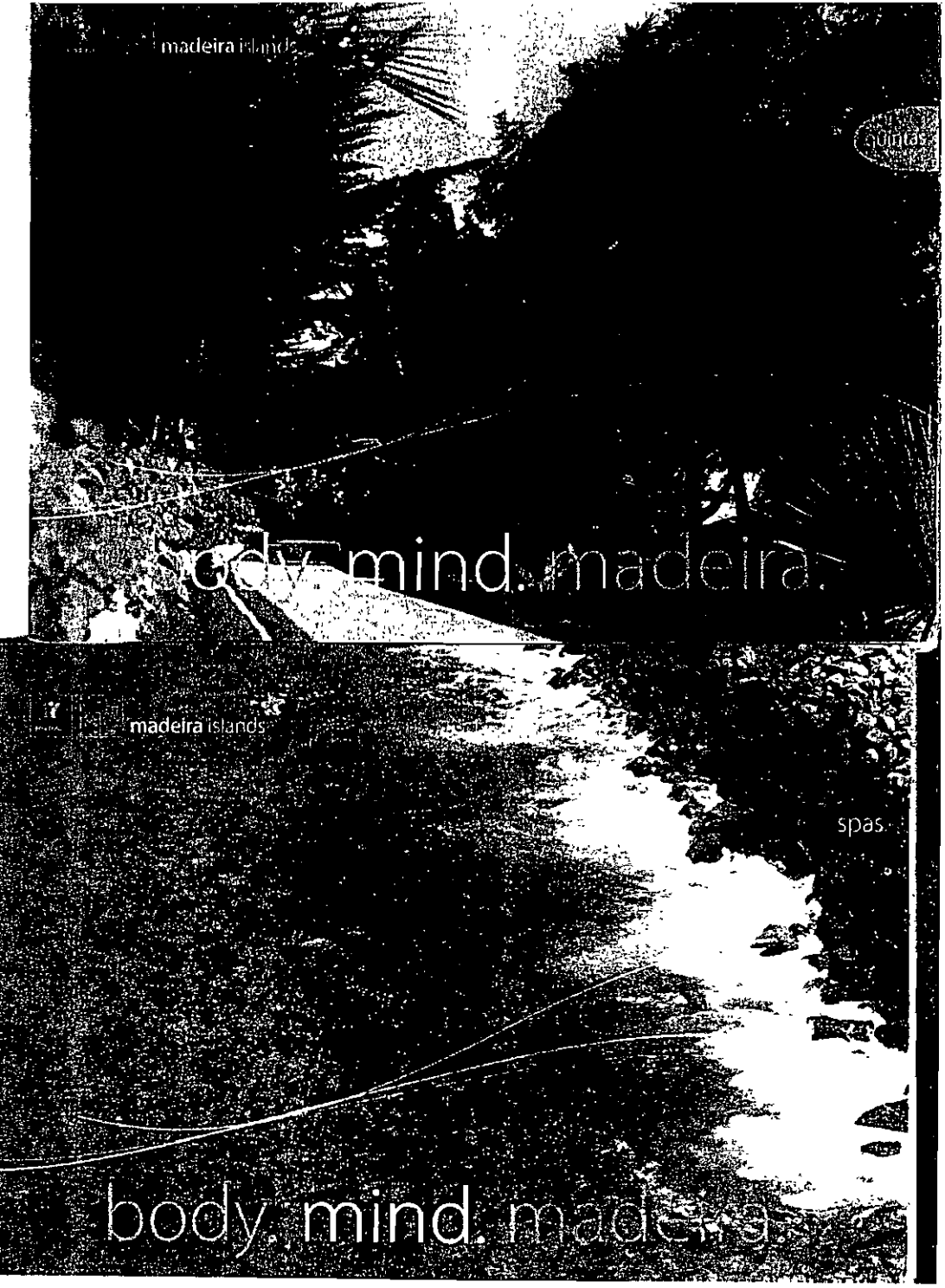
Património Mundial Natural

A floresta Laurissilva da Ilha da Madeira constitui o remanescente de um coberto primitivo que resistiu a cinco séculos de humanização. Segundo narrativas contemporâneas da descoberta (1420), toda a ilha era ocupada por denso arvoredo, razão pela qual recebeu o nome de "Madeira".

Trata-se de uma floresta de características subtropicais, húmida, cuja origem remonta ao Terciário, tendo-se extinguido da Europa e sobrevivendo apenas nos Açores, na Madeira e em Canárias. Ocupa, na Madeira, 15 000 ha (20% do total da Ilha), revestindo, de forma luxuriante, as vertentes escarpadas do Norte e os profundos vales do interior, sendo a mais extensa e melhor conservada das ilhas atlânticas.

Esta floresta encontra-se sob o estatuto de protecção de Parque Natural [illegible] integrada na rede de Reservas Biogenéticas do Conselho da Europa, integra a Rede Natura 2000 [illegible] Património Mundial Natural da UNESCO em Dezembro de 1999.




madeira islands
quintas
body. mind. madeira.

madeira islands
spas
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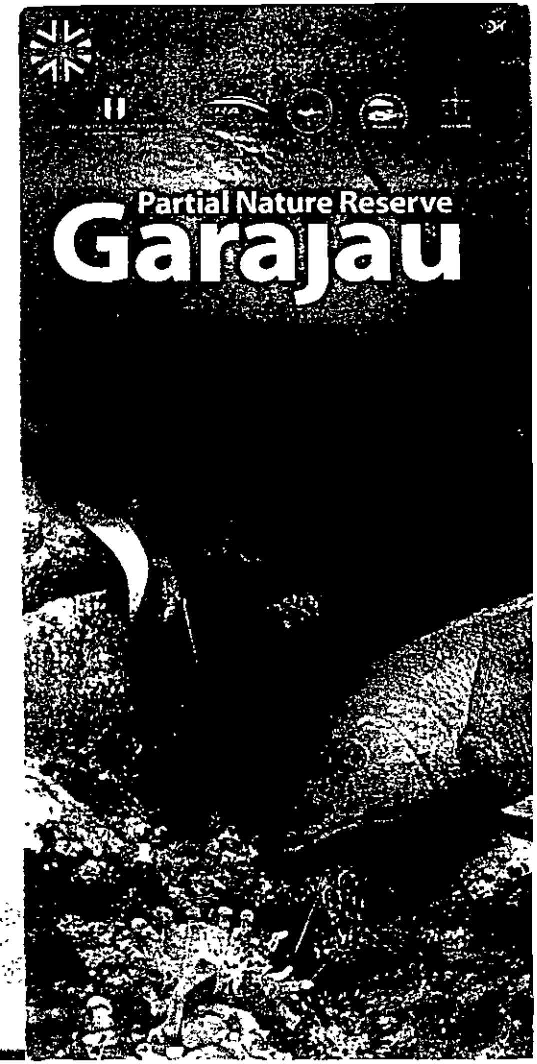
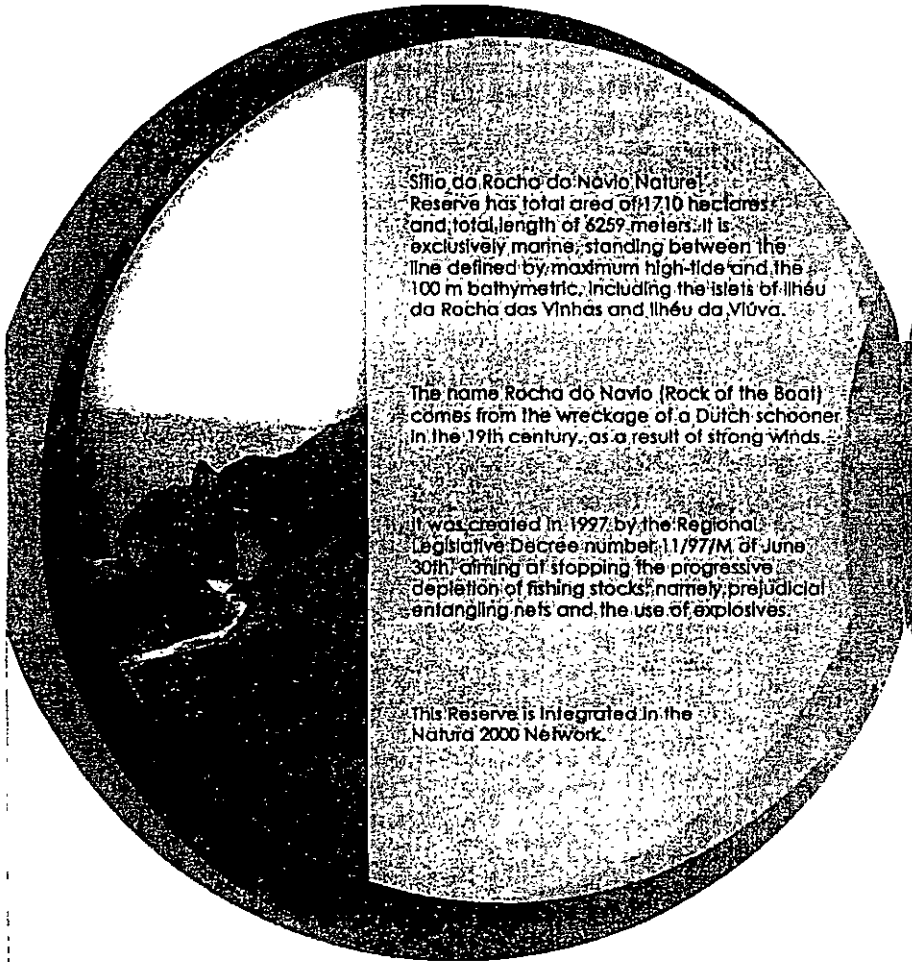

Partial Nature Reserve
Garajau

Access to the sea is free in the Nature Reserve and sport and live-bait fishing are allowed. The use of entangling nets or other nets is totally forbidden. The practice of amateur diving and non-motorized nautical activities is allowed. Underwater hunting and diving to pick limpets and topshells are forbidden in the whole area of the coast. The Reserve includes the zone of highest high tide and [illegible] limpets and topshells is allowed there.

The access of persons to the terrestrial part of the islets of Rocha do Navio and Vinhas is forbidden, as well as any human activity 10 meters from the respective lines of high tide. Exceptions are made to persons authorized and accredited by ENM.

FEOGA

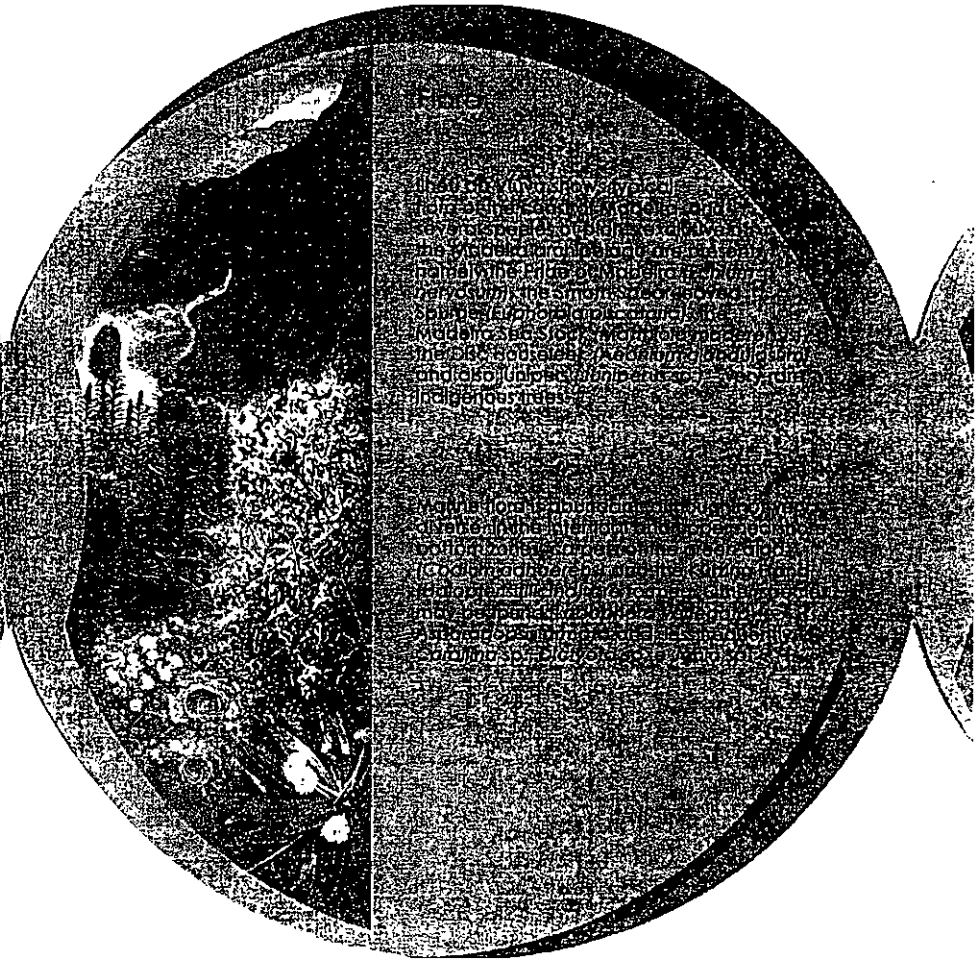


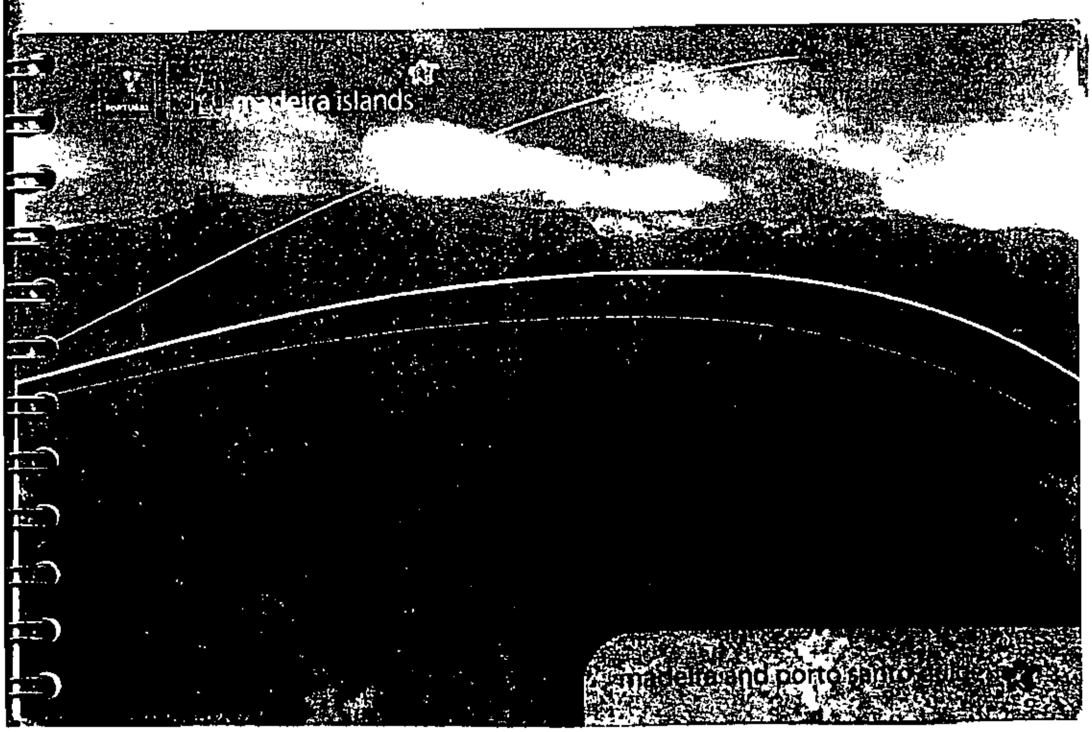
Sítio da Rocha do Navio Natural Reserve has total area of 1710 hectares and total length of 6259 meters. It is exclusively marine, standing between the line defined by maximum high-tide and the 100 m bathymetric, including the islets of Ilhéu da Rocha das Vinhas and Ilhéu da Viúva.

The name Rocha do Navio (Rock of the Boat) comes from the wreckage of a Dutch schooner in the 19th century, as a result of strong winds.

It was created in 1997 by the Regional Legislative Decree number 11/97/M of June 30th, aiming at stopping the progressive depletion of fishing stocks, namely prejudicial entangling nets and the use of explosives.

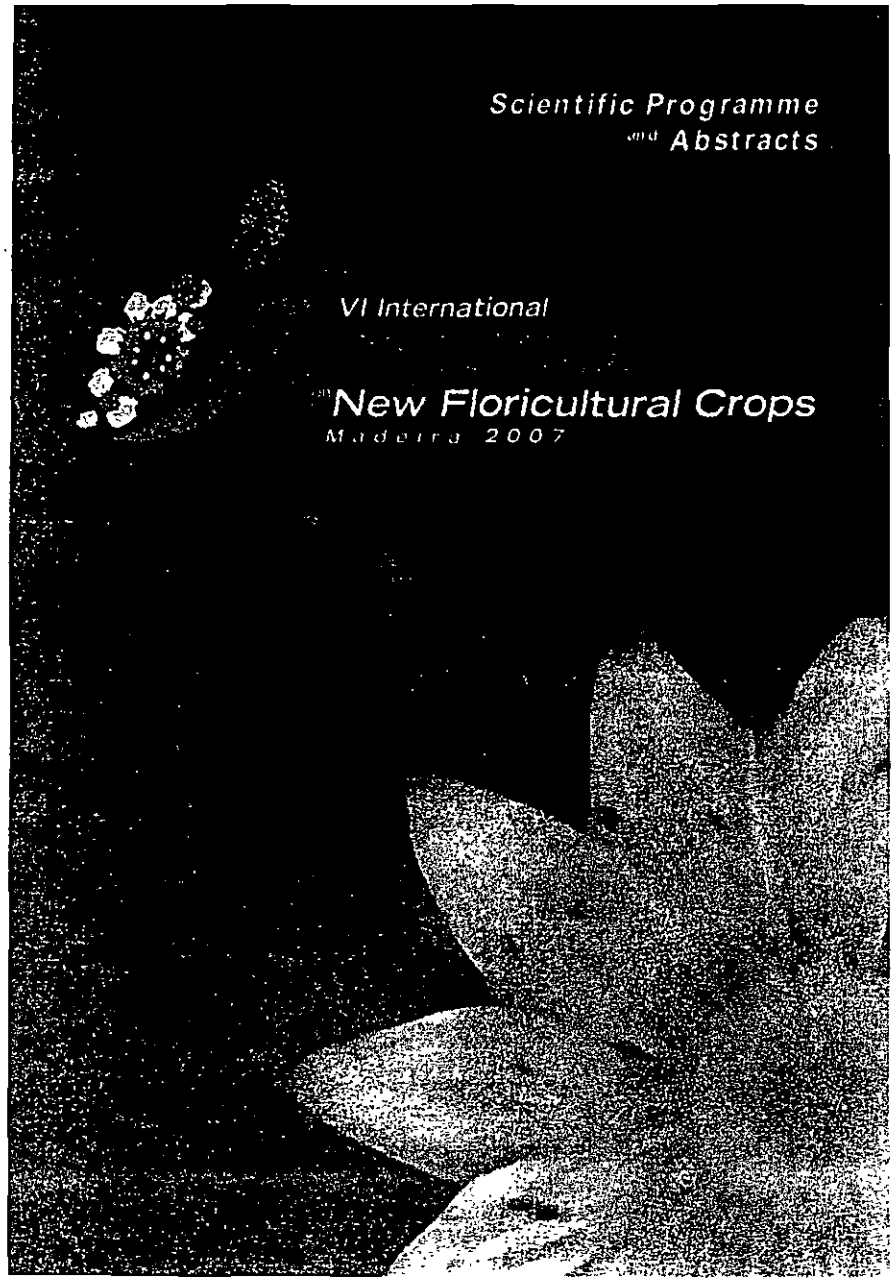
This Reserve is integrated in the Natura 2000 Network.




madeira islands
madeira and porto santo

ANEXO 2

Libro de resúmenes del Simposio


Scientific Programme
and Abstracts
VI International
New Floricultural Crops
Madeira 2007

VI International Symposium on New Floricultural Crops

Madeira

11 - 15 June 2007

SCIENTIFIC PROGRAMME AND ABSTRACTS

ISHS

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SECRETARIAT

Elsa Correia
Rita França

VI International Symposium on New Floricultural Crops
Madeira
11 - 15 June 2007

FOREWORDS

The International Society for Horticultural Science (ISHS) in conjunction with the Regional Secretariat of Environment and Natural Resources (SRA), and the Centre for Macaronesian Studies (CEM) of the University of Madeira (UMa), promotes the VI International Symposium on New floricultural Crops. The meeting is held in Funchal, Madeira, an island that exhibits an exuberant and diverse vascular flora, with high level of endemism, and with three types of vegetation: coastal, Laurisilva forest (declared in 1999 World Natural Heritage) and high altitude vegetation.

Nowadays, the increasing interest in new ornamental crops triggers the search and use of indigenous plants, more adapted to local conditions, and consequently with enormous advantages in the floriculture industry and landscape engineering.

The climatic changes occurring in the world are leading to alterations in the resources availability, especially water and nutrients; the use of plants that can tolerate or adapt to this new conditions became crucial.

This meeting is an opportunity to overview the aspects of sustainable use of biodiversity, as well as the strategies for introduction of this new plants, their marketing and market trends, and the recent developments in propagation and production of new crops.

Maria João Oliveira Dragovic
Chair of VI-ISNFC – Madeira – Portugal 2007

Madeira Island has one of the most attractive floras in the World. It is well known that its beauty, uniqueness and singularity, attracts the attention of many scientists, botanists and naturalists. In fact, the Madeiran flora endemisms, like the spectacular *Musschia aurea*, were already grown in Kew Botanical Garden (United Kingdom) and other European botanical gardens in the middle of the XVIII Century.

Madeira's biodiversity is internationally recognized, having the unique parcel of the Portuguese territory considered by UNESCO (1999) as Natural Heritage – Laurisilva Forest. Madeira is also, since 1999, a Biogenetic Reserve and the Desertas and Selvagens Islands (1992) a Nature Reserve, both by the Council of Europe.

Nature Preservation, according to the internal and international responsibilities, has been a priority for our Government, either in what concerns its preservation in nature, or its preservation in the Botanical Garden, where the most important works are done concerning preservation *ex-situ*

But the diversity of our flora is also an economic asset, in a wider scale unexplored, by the beauty of the unique species that we can find in every habitats of the archipelago, either the ones that belong to the laurisilva or the ones that surrounds Funchal. These species, besides constituting a biodiversity heritage, which is important to preserve, they are a potential economic asset, that should be explored, in a direct way, through its multiplication and commerce or indirectly, reinforcing the attractiveness of the Region, in its main economical sector – Tourism.

In conformity with the precious Natural Heritage of the Region and our will to preserve and value it, we have no doubt that this Symposium will be useful not only to show the quality work that is done here, in the Autonomous Region of Madeira, but also to exchange experiences. We will have the privilege of having among us internationally well-known scientists and also achieve valuable contributes for the future use of our floristic resources. We are certain that one of the results will be an enormous impulse in the private sector, especially in a time where its reinforcement is a fundamental goal of the regional policy.

In the Autonomous Region of Madeira, floriculture is an important and dynamic business area in permanent renovation. Flower companies and growers have always had the unconditional support of the Regional Government, either in technical, scientific or even financial terms. As good examples of this commitment we have the laboratories and services that give technical support to production and commerce.

In this occasion, we would like to thank to those who have organized this symposium and all the participants the greatest achievements in their relevant professional goals. We are very proud of Madeira Island's

contribution, in a scenario where it is very important to defend and protect the world biodiversity, promoting, at the same time, the economical progress and the quality of life of the populations.

Manuel António Rodrigues Correia
Regional Secretary of Environment
and Natural Resources

The mission of the Universidade da Madeira is much more than having a teaching/learning process of quality. It contains the creation of new knowledge, not only theoretical but also applied in different fields, from humanities and social sciences to sciences and engineering. It is impossible to have a teaching/learning process of quality without the complementarities with research - a University with no research is an empty body.

The Universidade da Madeira supports the research of its staff through incentives to the publication of articles in international journals with referee. There are also incentives to new research projects. The University is very proud of the research done at the Centre for Macaronesian Studies (CEM).

Biodiversity is a theme that has been researched in the Universidade da Madeira and CEM, not only the problem of keeping the biodiversity of the Island but also the study of plants and seeds and their conservation for the future. The introduction of new species is a danger which I am sure this symposium will address as nice flowers can hide potential dangers to the environment and the endemic flora.

I want to thank those who organized this Symposium and wish a very fruitful work to all the participants.

I end with an invitation to visit our University (virtual visit – www.uma.pt or http://www.uma.pt/portal/html/noticias/632/fundo_A_2007_final.pdf for a listing of the research done in 2004-2006).

Pedro Telhado Pereira
Dean of the University of Madeira

VI International Symposium on New Floricultural Crops
Madeira 2007

GENERAL INDEX


VI International
Symposium
on New Floricultural Crops
Madeira
11 - 15 June 2007

PROGRAMME

MONDAY, 11 JUNE

10:00	Delivery of documentation and poster affixation	
14:00	Opening Session	
15:00	Coffee break	
Session 1: Native plants and genetic resources Invited speakers/keynoters: Dr. Susana Fontinha and Dr. Roberto Jardim		
15:30	**Fontinha, S.:** Madeira's Treasure: Its Natural Heritage	p. 13
16:00	**Jardim, R.:** Flora and Natural Vegetation of Madeira	p. 14
16:30	**Gâteblé, G.:** New Caledonia and its potential for new floriculture crops	p. 23
16:50	**Daly, M.:** Evaluation of selected South African geophytes as winter-blooming houseplants for the Northern Hemisphere	p. 24
17:10	**Aprile, S.:** Investigations on some Sicilian autochthonous brooms and their potentialities in the floricultural sector	p. 25
17:30	**Seaton, K.:** Development of new varieties of Australian native plants for cut flower and pot plant markets	p. 26
19:30	Welcome reception – *Madeira de Honra* Instituto do Vinho, Bordados e Artesanato da Madeira	

TUESDAY, 12 JUNE

Session 2: Sustainable use of biodiversity for floriculture and landscape Invited speaker/keynoter: Dr. John Erwin		
09:00	**Erwin, J.:** Looking for new ornamentals: flowering studies	p. 15
10:00	**Bester, C.:** Development of new floriculture crops in South Africa	p. 34
10:20	**Orzek, S.:** Development of the Australian native wildflower *Ptilotus nobilis*	p. 35
10:40	Coffee break	
11:10	**Walganjo, M.:** Domestication of indigenous ornamentals and the crop protection challenges in Morbydick, *Asclepias* sp., in Kenya	p. 36
11:30	**May, Z.:** Demonstrating the potential of South African Restionaceae as new ornamental plants	p. 37
11:50	**Plummer, J.A.:** A new image from Western Australia for coastal gardens in Mediterranean-like climates	p. 38

12:10	**Mielke, E.:** Biocity project	p. 39
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Session 3 - Strategies for plant introduction, market trends and marketing Invited speaker/keynoter: Dr. Rick Schoellhorn		
14:00	**Schoellhorn, R.:** Strategies for plant introduction and market trends in the US	p. 16
15:00	**Karlovic, K.:** Introduction of ornamental native plants into commercial production in Croatia	p. 53
15:20	**Karam, N.:** Black iris: a potential new floricultural crop from Jordan	p. 54
15:40	**Borja, M.:** *Calibrachoa* breeding advances in Argentina	p. 55
16:00	Coffee break	
16:30	**Facciuto, G.:** Hybridization between pink and yellow *Tabebuia* species native to Argentina (Bignoniaceae)	p. 56
16:50	**Leonhardt, K. W.:** Production of tetraploid forms of eight landscape tree species	p. 57
17:10	**Ottosen, C.:** Towards novel autumn crops	p. 58
17:30	**Maloupa, E.:** A new theory – model strategy for new flower crops development	p. 59

WEDNESDAY, 13 JUNE

09:00	Tour to Laurisilva	

THURSDAY, 14 JUNE

Session 4: Propagation and production Invited speaker/keynoter: Dr. Kingsley Dixon		
09:00	**Dixon, K.W.:** Butenolide - A potent germination chemical found in smoke	p. 17
10:00	**Loges, V.:** Heliconia genotypes under partial shade: II. Evaluation of flowering stems	p. 82

10:20	**Ehrich, L.:** Growth rhythms of South African Iridaceae forced as pot plants	p. 83
10:40	Coffee break	
11:10	**Criley, R.A.:** *Plumeria rubra*: an old ornamental, a new crop	p 84
11:30	**Jørgensen, B.I.:** New method for propagation of mistletoes enables production as potted plants	p. 85
11:50	**Ziv, M.:** Enhanced bud regeneration and bulb formation of spring snowflake *Leucojum vernum* in liquid cultures	p 86
12:10	**Vanzie-Canton, S.D.:** *In vitro* callus induction and plantlet regeneration protocol developed for the oryzalin treatment of *Zamioculcas zamifolia*	p. 87
12:30	Lunch	
Session 5: Postharvest biology, technology and quality		
Invited speaker/keynoter: Dr. Michael Reid		
14:00	**Reid, M.:** Postharvest biology and technology for new floricultural crops	p. 18
15:00	**Chen, J.:** Abaxial and adaxial surfaces of spathe tissue of *Zantedeschia*, differ in their pattern of re-greening	p. 135
15:20	**Philosoph-Hadas, S.:** Improving water balance and vase life of new cut foliage branches of *Dodonea* by postharvest treatments	p 136
15:40	**Meir, S.:** Postharvest treatments to improve quality of new cut flowers following air or sea transport from Israel	p. 137
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16:30	Poster session	
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20:00	Symposium Dinner	

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09:00	**Savé, R.:** What is stress and how to deal with it in ornamental plants	p. 19
10:00	**Johnston, M.:** Phosphorus nutrition of the australian plant *Caustis blakei*	p. 143

10:20	**Kamenetsky, R.:** Ornamental geophyte *Ranunculus asiaticus*: annual changes in root cell structure during plant desiccation and rehydration	p. 144
10:40	Coffee break	
11:10	**Borys, M.W.:** *Echeveria* spp. – Rosettes tolerance to long-lasting water constraint	p. 145
11:30	**Bretzel, F.:** Wildflowers plantings to reduce the burden of urban gardens and roadsides management	p 146
11:50	**Iapichino, G.:** Original vegetation recovery of two degraded areas in the Mediterranean island of Marettimo	p. 147
12:10	**Rina Kamenetsky:** Dr. Halevy Memory	
12:30	ISHS presentation and closing of the Symposium	
13:00	Lunch and guided tour to Botanical Garden of Madeira	


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ABSTRACTS

INVITED SPEAKERS COMMUNICATIONS

INVITED SPEAKERS COMMUNICATIONS

Madeira's treasure: Its Natural Heritage

Fontinha, S.

Parque Natural da Madeira, Quinta do Bom Sucesso, Caminho do Meio, 9064-512 Funchal, Madeira, Portugal

The Madeira Archipelago, situated in the Atlantic as a point of intersection between the tropics, North America and Europe, is exceptional in its biodiversity. This Autonomous Region wishes to take on its conservation responsibilities for World biodiversity, with which it collaborates clearly more than the surface area of its territory. The main goals of the Nature Park of Madeira are the nature protection, the safeguard of biodiversity, the defence of landscapes and the fight against alien species. Its jurisdiction extends over the Nature Park and the Nature Reserves of Desertas and Selvagens Islands and the two Marine Reserves Garajau and Rocha do Navio. The Nature Park covers 77% of Madeira Island surface. Some of the most interesting ecosystems are the mountains of the Massif Central, rich in endemics, such as the plants *Parafestuca albida* and *Viola paradoxa* and the sea bird *Pterodroma madeira*; the Laurisilva Forest a World Heritage by UNESCO harbouring the highest percentage of endemics, as examples the plants *Musschia wollastonii* and *Isoplexis sceptrum* and the pigeon *Columba trocaz*; the peninsula of Ponta de São Lourenço with a typical flora including exclusive species namely *Helichryum devium*. The Desertas, a Biogenetic Reserve, contains an important population of Monk Seals, a significant number of sea birds and two exclusive plants namely *Sinapidendron sempervivifolium* and the foliose liverwort *Frullania sergiae*. The Selvagens certified with the European Diploma, keeps plants unique such as *Monanthes lowei* and *Euphorbia desfoliata*, being also inhabited by an fascinating community of sea birds. Amazingly the vegetation of Selvagem Pequena and Ilhéu de Fora comprises only native and endemic species.

We are enormously proud and strongly defend our Natural Heritage, the supreme treasure of Madeira.

Flora and Natural Vegetation of Madeira

Jardim, R.

Jardim Botânico da Madeira, Caminho do Meio, 9064-512 Funchal, Portugal.

Madeira has a rich and diverse flora and vegetation of great interest. In Madeira (archipelagos of Madeira and Selvagens) there are 1226 species of indigenous and naturalized plants. Of these species, 123 (10%) are endemic to the Madeira Islands, and 69 (6%) of these species are common to the rest of the archipelagos of Macaronesia (Azores, Canaries and Cape Verde). Furthermore, when taking into consideration the infra-specific categories (subspecies and varieties) and natural hybrids, the number of endemic plants from Madeira rises to 171.

Many Madeira endemic species have a horticulture use; *Echium candicans* (Pride of Madeira), *Geranium maderense*, *Jasminum azoricum*, *Argyranthemum pinnatifidum* and *Clethra arborea* (Lily-of-the-valley Tree), are some of the species cultivated in gardens of the island, but also in other regions.

The original and highly endemic natural vegetation of Madeira contains elements of sub-tropical Tertiary vegetation, being the forests communities the most impressive vegetation. Starting from sea level, the first forest community of Madeira is the "Zambujal", a low micro-forest of Madeira Olive (*Olea maderensis*) with shrubs such as *Maytenus umbellata*, *Chamaemeles conacea* and *Asparagus scoparius*. The second forest is a Laurisilva dominated by *Apollonias barbujana*, *Laurus novocanariensis*, *Myrica faya* and *Ilex canariensis*. The third forest, Ocotea Laurisilva, is the most remarkable, and it is a multi-stratified forest up to 30 m high, with tree-stratum dominated by *Ocotea foetens*, *Laurus novocanariensis* and *Clethra arborea*. Also frequent are trees such as *Picconia excelsa*, *Heberdenia excelsa*, *Persea indica*, etc This laurel forest has a very high diversity of shrubs, herbs, ferns, epiphytic plants and mosses. It covers very large stretches on both sides of the island (800-1450 m on S face and 300-1400 m on N face). The Madeira's Laurisilva forest, classified as Natural World Heritage by UNESCO, occupies an area of approximately 15 000 hectares, mainly on the northern slopes. Above 1400 m of altitude occurs the Tree Heath forest, dominated by *Erica arborea*.

Looking for new ornamentals: flowering studies

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An early step in determining whether a plant species has potential as a new ornamental crop is to identify what conditions promote reproductive versus vegetative development. Such information is critical to evaluate the ornamental potential (if flowering is desired), to propagate a plant for commercialization, and to produce a saleable product. Early experiments must include determining juvenile length, as well as, determining whether photoperiod, irradiance, and/or cool temperatures (vernalization and/or dormancy) are involved in flower induction, initiation and development. The significance of each of these processes in new crop development will be discussed, as well as, demonstrated using three case studies. Specifically, our research on herbaceous flowering spring crops, South African geophytes (*Watsonia*, *Gladiolus* and *Oxalis*), and selected cacti (*Rebutia*, *Lobivia*, *Gymnocalycium*, *Sulcorebutia*, *Echinopsis*, and *Echinocereus*) and succulents (*Kalanchoe*, *Sedum*, *Cotyledon*, *Echeveria* spp.) will be summarized in the context of the before mentioned flowering processes. How we prioritized experiments within each plant group, challenges we encountered, and future experiments will be discussed. Lastly, challenges we encountered and agreements/understandings we have with faculty in foreign countries when working with plant materials indigenous to their country will be discussed.

Strategies for plant introduction and market trends in the US

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The global search for commercial ornamental plants has increased steadily over the last 100 years. The market has undergone ups and downs but overall new variety releases have continued to grow at an escalating pace. As the marketplace becomes more articulated and issues like branding, patenting, and trade marking become more important there has been a refocusing of how plant introductions take place and a new emphasis on the importance of both private and commercial breeding programs. The impacts of increasing costs (royalties, patent processing, virus indexing and elite stock maintenance, as well as marketing fees) are still emerging as factors that determine the success or failure of a new crop on the market. Market-led selection of new plants can take pricing and profitability much higher than it has ever been in the past, however all marketing is only as good as the product itself. The lifespan of novel new products is shrinking as production methodologies advance. In the 1950's a new cultivar might dominate the market for ten or more years; however in the current marketplace product lifespan may be two to five years. As a result the search for new plants is now pushing into molecular genetics and genetic engineering in order to find the plants that can sustain a market presence long enough to be profitable. Value chains, new industry partnerships, and novel approaches to plant breeding are developing that allow for an extension of product lifespan as well protection of plant breeder's rights. Timelines for introduction, emerging trends, and tips for success in the ornamental plant market will also be discussed.

Butenolide - A potent germination chemical found in smoke

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Smoke, derived from burning plant material, has been shown to promote the germination of seeds of plant species from Australia, North America, South Africa and Europe. The identification of a novel compound from cellulose-derived smoke (a butenolide) that enhances seed germination to the same level observed for plant-derived smoke has opened up exciting possibilities for germination of a wide range of horticulturally significant species previously difficult to germinate as well as improving germination performance in many common horticultural plants. The butenolide induces germination in a comprehensive and indicative selection of species known to be smoke-responsive including native species from California, South Africa, Australia as well as species that are not normally subjected to fire in their natural habitat. Of note is that some weed species such as wild oats Avena fatua, respond to application of the chemical. Furthermore, activity of this compound has been shown at parts per trillion concentrations, illustrating its potent germination-promoting activity. For restoration activities this equates to about 2.5g (less than half a teaspoon) per hectare. Research is now focused on deriving analogs for more effective restoration opportunities as well as investigating the mode of action of the molecule in native and agricultural species. This discovery represents a highly significant advance in the natural, agricultural, conservation and restoration sciences and has appeal to the broader scientific community working in optimisation of seed germination protocols.

Postharvest biology and technology for new floricultural crops

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Although a large number of taxa are already used commercially as cut and potted flowers and foliage, they represent a tiny fraction of the species that have potential value as ornamentals, and the market is dominated by relatively few major crops. The importance of adequate postharvest performance to the successful introduction of a novel floricultural crop cannot be understated. The most successful 'new' crops that have been introduced in recent years are characterized by outstanding postharvest life as well as ease of production. In considering a new species as a target for introduction into commerce, a range of factors affecting postharvest performance need to be considered, including sensitivity to temperature, performance in low light, sensitivity to ethylene, and ultimate display life. Some wild species that may not appear to have good postharvest potential might be considered for introduction in the light of new technologies that can, for example, inhibit the effects of ethylene or delay leaf yellowing. Others may become candidates as we develop molecular tools to modify the postharvest performance of beautiful but short-lived species.

[IT-S6]

What is stress and how to deal with it in ornamental plants

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In these moments and in our global world it is very difficult to talk about ornamental plants because: what are these plants, what is their use, ...? And even a little bit more to talk about stress, what is the stress concept, is it the same in all plants and in all situations or uses of these plants?

In order to know which are or will be the stress situations for ornamental plants we will try to discuss the role that can play the study and knowledge of plant water relations of these ornamental species or varieties in relation to biotic or abiotic stresses. As biotic stresses we can find the edge effect on ornamental quality of old urban trees, grasses competitiveness, relationship between pest and plant, symbiotic effects of mycorrhiza on plants used in landscape restoration, etc. Examples of abiotic stresses are water management in nurseries, private houses, gardens and landscape restorations under water scarcity; effects of flooding; potential problems associated to the use of reclaimed water in old parks; grass covers and gardens; light levels into the houses and in the streets; equilibrium between fertilization and contamination; effect of marine sprays on vegetation as an example of new pollutants, etc.

From this basic information, plant water relations must be used as a tool in order to improve the productivity of ornamental plants in a wide range of environmental conditions.

VI International Symposium on New Floricultural Crops
Madeira 2007

SESSION 1:
NATIVE PLANTS AND GENETIC RESOURCES

SESSION 1
ORAL COMMUNICATIONS

POSTER COMMUNICATIONS

[S1-O1]

New Caledonia and its potential for new floriculture crops

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The flora of New Caledonia is rich and unique, but it has been poorly explored for new floriculture crops. Historically, the first explorers and botanists who came to New Caledonia brought back ornamental native plants to Europe for evaluation in greenhouses. A research program within the New Caledonian Agronomic Institute was developed, and several attempts were made locally and internationally to use the germplasm. A small number of New Caledonian native plants can be found in nurseries, garden centers, in landscapes and international botanical gardens include mainly *Schefflera elegantissima*, *Oxera pulchella* subsp. *grandiflora*, some palms and *Araucaria* pines. However, given the rich, genetic diversity of the flora New Caledonia many spectacular species remain unknown to the global ornamental trade. The three main ecosystems of New Caledonia are the dense evergreen rainforest, the sclerophyllous forest and the maquis minier (typical New Caledonian scrubland found on ultrabasics). These ecosystems in combination with a range of altitude from sea level to more than 1600 m offer a wide range of plant habitats yielding species that could be grown in different climatic zones. In 2003, a specific program on the domestication and introduction of ornamental native plants to promote their use in gardens and landscaping was established at the Vegetable and Horticultural Research Station part of the New Caledonian Agronomic Institute. This program has collaborations with a project funded to protect the endangered dry forest ecosystem and local nickel mining companies who fund studies on the propagation of rare and endangered species. A breeding program on the sub-endemic *Oxera* genus has been established. This paper will present an overview of the ecosystems of New Caledonia and highlight key genera for development of new floricultural species

SESSION 1 ORAL

[S1-O2]

Evaluation of selected South African geophytes as winter-blooming houseplants for the Northern Hemisphere

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For centuries bulbous plants have been grown indoors and forced into bloom at a time which is pleasing, convenient, or economically beneficial. While gladioli, freesias, and ornithogalums are commonly known, there is a wealth of South African geophytes whose horticultural qualities have not yet been discovered or marketed. The purpose of this research is to evaluate a selection of South African geophytes as winter-blooming houseplants. They were evaluated for foliage and flower qualities, habit, vigor, and bloom period. Part one evaluated 12 individually potted *Lachenalia* species and compared them to the standard forcing bulb, *Narcissus* 'Ziva'. Part two evaluated species and cultivars of *Babiana*, *Freesia*, *Ixia*, *Ledebouria*, *Ornithogalum*, *Oxalis*, *Sparaxis* and *Tritonia* potted in groups of 7-12 bulbs per pot. *Aristea africana*, *Drimiopsis kirkii*, *Veltheimia bracteata*, and 11 cultivars of *Watsonia* were grown singly. *Lachenalia viridiflora*, with its striking, turquoise-blue flowers, was the first to bloom, even blooming before *Narcissus* 'Ziva.' *L. viridiflora* is critically endangered--in the wild it is isolated to one area of privately owned land on the west coast (Duncan, 2002). Bringing endangered plants into cultivation through reputable resources helps conserve threatened plants. For centuries explorers brought plants back to their own countries where they were hybridized, marketed and popularized, and people profited from these plants. Today freesias and gerberas gross millions of dollars as cut flowers. South Africa has not benefited on such a large scale from its native plants because it doesn't have resources to hybridize, patent, and market its plants (Coetzee, 2001). One avenue toward profit could be through promoting cultivation of indigenous geophytes as houseplants for the northern hemisphere market. By selecting an assortment of plants with a range of bloom times, cold-climate gardeners can enjoy unique plants all winter when the weather forces them inside. South Africa must find ways to benefit from its genetic resources, perhaps in partnerships with international organizations, though only within the guidelines of the Convention on Biodiversity. Developing the South African bulb industry to benefit from international markets could become economically profitable for South Africa and would encourage global appreciation for South Africa's unique flora.

[S1-O3]

Investigations on some Sicilian autochthonous brooms and their potentialities in the floricultural sector

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The present work is based on one of the research lines of a wide project regarding the exploitation of some Mediterranean species from Southern Italy for introduction in the Floricultural sector (PRO.FLO.MER).

From a taxomonomical point of view the investigated species (*Genista aetnensis* (Biv.) DC., *G aristata* Presl, *G. aspalathoides* Lam., *G. cupanii* Guss , *G. demarcoi* Brullo, Scelsi & Siracusa, *G. gasparrinii* (Guss.) Presl, *G. madoniensis* Raimondo, *G. tyrrhena* Valsecchi, *Retama raetam* subsp. *gussonei* (Webb) Heywood, *Spartium junceum* L.) belong to the *Genisteae* (Adams) Benth. subfamily, and by a phytogeographical one are characterized by a high level of endemism and by a very restricted localization.

In order to reach a better knowledge of this Sicilian broom group, for each species, bibliographic, phytogeographical, autecological and biometric investigations are carried out. By a series of filed surveys, the regional distribution range was defined and fields phenological data were recorded. In *ex-situ*, through lab activities the propagation aspects were studied and a providing ground for germplasm observations was set up at Istituto Sperimentale per la Floricoltura - Sezione di Palermo.

The observed pleasant aesthetic effect (i.e. compact habitus and plentiful bloom) and the surveyed pioneer character suggest that some of these species are suitable as ornamental plants, especially in sites where the climate is dry and hot. The other ones require further studies to better value the morphological, phenological and autecological characteristics for ornamental use or environmental restoration, or both of them.

[S1-O4]

Development of new varieties of Australian native plants for cut flower and pot plant markets

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The introduction of new native Australian cut flowers is essential for the competitiveness of the Australian cut flower and pot plant industry. Australian native flowers, such as *Conospermum* (smokebush), *Pimelea physodes* (Qualup bell), *Darwinia*, *Dampiera*, *Verticordia* and *Chamelaucium* (waxflower) offer many colours, forms and types that have potential as cut flower and pot plants. These species have been targeted, by the Western Australian Department of Agriculture and Food. The selection process has involved; surveys, propagation, cultivation and postharvest evaluation. In the case of smokebush, out of the 53 species in the genus, 12 species were identified with cut flower and pot plant potential. Further evaluation and surveys narrowed these down to 5 species; including both blue and white smokebush (*Conospermum eatoniae* and *C. triplinervium*). Similar processes have been used for selecting other native Australian species.

Tissue culture techniques were necessary for successful propagation of blue smokebush as well as special cultivation techniques, such as trellising to manage stem production. Split irrigation application and the use of low nutrient fertilizers were required during establishment and production of many of these native flowers. Also hormonal techniques were used on various waxflowers to produce attractive pot plant forms. Vase life solutions were tested and ethylene sensitivity of cut flowers determined. Smokebush and Qualup bell appear not being sensitive to ethylene whereas waxflower and some *Verticordia* were sensitive to ethylene and required anti ethylene management

Test marketing has shown that blue smokebush is particularly suited to the ikebana industry whereas white can be used to highlight the blue colour in arrangements and as a filler flower. Qualup bell is more a feature cut flower as are some of the *Verticordia* with waxflower a filler flower. Potted waxflowers are being successfully marketed on the European and US pot plant and amenity or landscape flower markets.

The Centre for Native Floriculture: progress and opportunities

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The Centre for Native Floriculture (CNF) was established in May 2003 with the aim of developing Australian native species for global floriculture markets. The Centre was built on a foundation of conservation biology and had three Programs; a Marketing and Value Chain Management Program, a Floriculture Program aimed at identifying and developing new species, and an industry Capacity Building Program. This paper explores successes and opportunities of the Centre's first 3 years of operation (Stage 1) and plans for CNF Stage 2 (2006-09). In addition, some of the challenges for native floriculture, past and future, will be evaluated.

Value Chain Program staff conducted both domestic and international market research to aid flower growers to understand the markets to which their product is consigned and to assist the Floriculture Program ensure that its selection and breeding activities were market-led through an understanding of consumer perceptions. A 'model' value chain based on a new product, *Backhousia myrtifolia*, yielded substantial insight into both industry dynamics and the challenges of exporting a novel cut filler flower product. In the Floriculture Program, seeds of 70 species have been collected, processed and stored. Two breeding activities have been established, the major one being on *Ptilotus*. This is an endemic, diverse and highly ornamental genus of about 100 species. Several selections and breeding lines are currently being evaluated by Australian and overseas industry collaborators. The first releases from the selection and breeding activity are expected to be in July 2007. The Floriculture Program supports postgraduate students and visiting fellows who contribute to CNF research output. Projects include: clarification of taxonomic uncertainly using molecular methods, propagation, flowering physiology, phosphorus nutrition, management and control of soil-borne pathogens, postharvest physiology, and understanding plant water relations and the selection of native plants that are water use efficient. Australia is presently experiencing the worst drought in living memory. Thus, the development of 'water-wise' floriculture species has become a high priority. Industry capacity building and regional development continues to be a key priority for the CNF. Short courses will continue to be developed and delivered to regional areas. In addition, a series of self paced CD-ROM learning packages will be developed for use by industry members. Based on the experience of CNF Stage 1, new challenges and opportunities are likely to arise continually during the next Stage 2 of the Centre.

Impact of native ornamental plants in the Argentinean floriculture sector: a field trial survey

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Nowadays, garden trials are a succesful experience in the global ornamental industry to test and promote floriculture crops in different regions where the garden performance of annual bedding plants can be variable. Following this trend in the floriculture industry, the Argentinean Floriculture Institute, decided in 2003 to evaluate the performance of native ornamental plants as annual bedding plants as part of their breeding program. This was the first experience of the kind made in the country. In 2005, the field trial was first opened to specialized public - landscapers, nursery growers, researchers, floriculture technicians - to promote native plants as a floriculture product and to measure the public preferences. In order to reach the last objective, the first annual field trial day was organized in Buenos Aires, the most important production province in Argentina. The participants attending the event filled a preference survey form of the accesions showed in diferent parcels.

Finally in 2006, another challenge was encouraged: to evaluate the same selected clones of native accessions under different weather and soil conditions. Then, the second field trial day took place in two provinces: Córdoba and Buenos Aires in November and December, the *Calibrachoa* genus was chosen, and twenty two accessions were shown. The objectives of this research were: to evaluate the field performance of the accessions; to measure the impact in the specialized public of different grower regions and to promote native ornamental plants as a market product. One hundred and twenty five participants evaluated three accessions features: quantity of flowers, showiness and compacity. The evaluation statistical method consisted in an ordinal scale for each feature. Based on this scale, a ranking of preference for the accessions was constructed. The results of the survey were a complementary tool to the breeding program to consider the public level of preferences in the selected material shown

Characterization of the ornamental value of *Glandularia* native to Argentina

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Glandulana J.F. Gmelin (Verbenaceae) is a genus from South and North America. In Argentina, there are 42 species distributed through out the country. This genus has high ornamental and economic value due to the existence of many commercial varieties for pot plants and landscaping. Many species or genotypes of Argentinean flora are not used for breeding.

The objective of this study was to characterize the ornamental value of the *Glandulana* collection of the Catholic University of the Province of Córdoba, Argentina. A total of 19 accessions corresponding to three different species were considered: *G. glandulifera* (six accessions), *G. peruviana* (seven accessions) and G. *platensis* (six accessions).

The 15 characters of the UPOV descriptor DUS were used for morphological characterization. Some other characteristics such as % pot covering, presence of diseases or pest, number of flowers/pot, number of branches/pot, rooting capacity, vigor, capacity for budding after pruning and adaptation to irrigation and substrate were recorded after a three-month pot cultivation period.

Accessions were propagated by cuttings and cultivated in a greenhouse from mid-July to mid-October (end of winter). In September, all plants were pruned and ten plants were evaluated of each accession.

Shape variability was observed, in *G. glandulifera* erect and semierect plants were detected, while in *G peruviana* semierect and decumbent plants were characterized. Genotypes suitable for pot plant were selected. *G. glandulifera* covered more than 90% of the pot. In *G. platensis*, this percentage was less than 50 %, whereas *G. peruviana* presented an intermediate value.

G. peruviana had the largest inflorescence and corolla diameter. Color changes were observed in *G. glandulifera* during the floral phases. The best relation between number of flowers/pot and number of branches/pot was obtained in *G. glandulifera* (0.7). All accessions were sensitive to green fly and showed good regrowth after pruning, vigor and adaptation to irrigations and substrate used.

This study allowed us to obtain valuable information for breeding programs.

Breeding of *Cattleya* orchid using species in Centro de Floricultura in Madeira Island

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Madeira Island, as a popular tourist destination, provides a good market for orchid flowers. With adequate light intensity, favourable range of temperatures and relative humidity, this is an ideal place to grow *Cattleya* orchids. The Direcção de Agricultura, who started a program for Development of Floriculture in 1983 and Centro de Floricultura in Ponta do Sol, located in the privileged southern coast, were responsible for providing cheap orchid plants for local farmers. Some fine hybrids were imported from all over the world, and while the technique of multiplying of *Cattleya* by meristematic tissue culture has been improving, it has been unable to supply the demand for plants. A program of hybridization commenced using *Cattleya* species and imported hybrids in order to improve the adaptability of the plants. Two species of genus *Cattleya* (*C. amethystoglossa*, *C. bicolor*), one species of *Brassavola* (*B. digbyana*), were crossed with the famous hybrids: *Laeliocattleya* Royal Emperor, *Lc.* Gila Wilderness and primary hybrid *Cattleya* Barbara Kirch, with bright cherry flowers. When the fruits matured they were grown *in vitro* in sterile medium giving about, 18 to 24 months later, 1030 plantlets, that have been cultivated in an unheated greenhouse until flowering. It was compared the percentage of flowering from the plants resulted from the crossings with the flowering percentages of the species and hybrids involved, and it was concluded that after the first 3 years, the flowering percentage was lower for the imported hybrids and higher for the species and primary hybrids obtained. The quantity and size of all flowers have been recorded evaluating their colour and other characteristics. It was found out that five crosses produced at least 16 varieties that were worthy the vegetative multiplication 'in vitro'. We also obtained one albino form of *C. amethystoglossa*. The cross between *Cattleya* Barbara Kirch and *C. bicolor* was rejected as it did not agree with the evaluation criteria used.

SESSION 2:
SUSTAINABLE USE OF BIODIVERSITY FOR FLORICULTURE AND LANDSCAPE

SESSION 2
ORAL COMMUNICATIONS

POSTER COMMUNICATIONS

[S2-O1]

Development of new floriculture crops in South Africa

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South Africa is a country rich in indigenous flowers with many species unique to the Cape Floral Kingdom. Several of these species have been exploited by local and international scientist with some being under the top 10 crops on the European Floriculture market. The Agricultural Research Council had several breeding programmes on indigenous flower crops in the past 40 years with mixed success. Several lessons have been learned from the successes and failures. The successes and failures of breeding programmes on *Amaryllidaceae*, *Ericaceae*, *Hyacinthaceae* and *Proteaceae* are discussed. Lessons learnt include the importance of a whole product approach, the establishment of good co-operative relationships with commercial entities and the importance of marketing to ensure final success. New methods to develop the indigenous crops in South Africa are continuously investigated e.g. mutation breeding. The identification of new crops for future research and development are under investigation. However, the success of these new crops depends on the development of successful unique niche markets, sustainable funding and a multi-disciplinary research approach.

[S2-O2]

Development of the Australian native wildflower *Ptilotus nobilis*

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Australia's biodiversity and unique flora provides an array of species suitable for horticultural purposes. With over 100 species the genus *Ptilotus* was recognised for its potential use as a cut flower, potted colours and garden feature plant. *Ptilotus nobilis* has a proliferous flowering habit and shows an early transition from vegetative to reproductive growth which prevents successful vegetative propagation by cuttings and *in vitro*. This projects aim to investigate the time and signals involved in the transition to flowering.

Plant development was recorded under high, medium and low light intensities in a glasshouse, (900 µmol m^{-2} s^{-1}), and at lower light intensities by shading (400 µmol m^{-2} s^{-1} and 230 µmol m^{-2} s^{-1}). Visible bud stage, first floret opening, and spike maturity (when 2/3 of the florets are open) were identified cardinal events. Under high light, visible bud stage appeared in 23 days, first floret opening at 52 days and spike maturity 61 days after first true leaf appearance (>0.5cm). Under the lowest light intensity, all stages were significantly delayed. Visible bud stage was deferred 18 days, first floret opening 32 days and spike maturity 28 days. Observations indicated that plants can be classified into short and tall genotypes disregarding the environment. Data analysis supported this observation. Genotype and environment had a significant influence on stem height.

Floral initiation was defined by scanning electron microscope graphs. Six morphological stages of the shoot apical meristem were identified and meristem diameters and area were recorded. Further investigations focus to identify floral initiation in relation to time, leaf number and leaf area.

Defoliation trials aimed to determine the juvenile phase in *P. nobilis*. Plants were defoliated above the cotyledons, 1, 2, 3, 4, 5, 6, 8 and 10 leaves. First floral buds were observed 26 days after germination in the 10 and 8 leaf treatments. After a maximum of 34 days all treatments showed visible buds excluding cotyledon and 1 leaf treatments. However 38 and 42 days after germination floral buds were visible in two plants of each treatment.

[S2-O3]

Domestication of Indigenous ornamentals and the crop protection challenges in Morbydick, *Asclepias sp.* in Kenya

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Indigenous ornamental plants are recently gaining acceptance in export markets globally. However, in Kenya, traditional exotic flowers such as Roses form over 70% of the bulk of export volumes, while indigenous ornamentals constitute less than 0.1%. To increase the diversity of ornamental exports and remain competitive in the global export market, collection, domestication and development of production packages for indigenous ornamentals is required. Towards this end, a survey was carried out in central Kenya to identify the major constraints in production of Morbydick, an indigenous *Asclepias sp* ornamental and develop an integrated pest management strategy (IPM) for the crop. In addition, visits were made in collaboration with the wildlife officers, to the Mount Kenya forest and bush lands in central Kenya and Aberdares in search of plants with outstanding ornamental features for possible domestication. The major production constraints for the Morbydick flower crop recorded were nematodes, *Meloidogyne sp.*, aphids, *Aphis gosypiella*, cotton stainers, *Dysdercus sp.* and the red spider mites, *Tetranychus* sp. The most common diseases were stem rot, leaf mosaic symptoms, leaf and boll discoloration disorders whose causes are not yet determined. Solarization using polythene sheet in nursery crop and use of natural pyrethroid, Pesthrin® gave good control of nematodes and the foliar pests respectively. The paper discusses the potential ornamentals collected and their quality attributes for successful commercialization.

[S2-O4]

Demonstrating the potential of South African Restionaceae as new ornamental plants

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Restionaceae, commonly called Restios or Cape Reeds, are a family closely related to grasses and sedges. This is a typical "southern" plant family found on all the southern continents as well as New Zealand. The Restionaceae comprises 55 genera and approximately 490 species, of which 19 genera and some 330 species are found in the Western Cape of South Africa. Restios are one of the defining families of fynbos, the unique and threatened shrubland vegetation occurring in a small belt of the Western Cape. Their natural habitat is coastal and mountainous areas with winter rainfall and a Mediterranean climate. Like a number of other fynbos species, Restios may require or benefit from smoke treatment for seed germination. The Restios are perennial, evergreen plants, ranging from 10 cm to 3 m in height; the plants have erect photosynthetic stems with leaves reduced to leaf sheaths. The family is dioecious and is wind pollinated. Some Restios has economic importance in South Africa as a traditional thatching material, and for decades certain species have been exported as cut-greens. The full potential of Restionaceae as ornamental pants is however only just beginning to be exploited. There is a growing trend towards using grasses and grass-like plants for landscaping as well as in interior decorating, and Restionaceae with its many highly ornamental species will be very suitable for exploiting this opportunity. Restios may be grown as potted plants, as patio plants, as garden plants and for cut foliage. Some species are moderately frost hardy and are becoming increasingly popular in e.g. the southern UK. At New Plant Nursery we have been propagating and growing Restios for more than two decades. We constantly strive to develop new species for the local market and, through our new export venture Fair Plant Nursery, for the export market. Recent developments include special selections for pot and patio plants. Several ornamental species will be presented and policy issues regarding conservation of biodiversity and intellectual property rights will be discussed.

[S2-O5]

A new image from Western Australia for coastal gardens in Mediterranean-like climates

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In summer millions of people flock to the coasts of regions with Mediterranean-like climates in Europe, California, South Africa and Western Australia. Wind, salt-laden air and summer drought are typical of these coastal areas. Water availability for growing populations is increasingly a problem putting substantial pressure on water use in parks and gardens. A range of drought tolerant ornamental plants have been selected primarily from Western Australia for use in coastal areas. These provide a range of forms, foliage colours and flowering displays. Plants include groundcovers (*Hemiandra pungens, Eremophila glabra, Grevillea obtusifolia*), small shrubs (*Grevillea thelemanniana, Ficinia nodosa, Conostylis candicans, Leucophyta brownii*), medium shrubs (*Lepidosperma gladiatum, Olearia axillaris, Pimelea ferruginea*) and shade trees (*Eucalyptus platypus, Eucalyptus lemannii*) suitable for public landscapes. Plants are silver, grey-green, mid-green and deep green with foliage texture varying from very small leaves through to large strap-like leaves. A web-based database has been developed for ready access to information about these plants including suitable soil types, horticultural requirements, management and use in designed landscapes.

[S2-O6]

Biocity Project

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Several of the ornamental plants employed for landscaped purpose in Brazil are introduced exotic plants, while the native ones are not too much cultivated and some of them presenting risk of extinction. In consequence, this fact is causing the loss of the biodiversity of urban environment. The "Biocity Project" aims to rescue the native ornamental plants with ornamental potential from areas where there is no damage caused by anthropical actions and the re-introduce them in public and private gardens with the intention to allow the preservation of the natural patrimony. This project is actually being developed by the City Hall of Curitiba, capital of the Paraná State, Brazil, a much known city in Brazil due to its ecological actions. In the first phase of this project, native plants with ornamental potential will be collected and identified by the Municipal Botanic Museum. In the sequence, tests will be done to evaluate the best propagation technology for each species in a large scale. Plants obtained will be planted in experimental areas located on urban spaces to evaluate their adaptation. The ones that will adapt better to urban ecosystem will be produced in the Municipal Nurseries. For the divulgation of these species will be implanted a Native Plants Garden located inside the Municipal Botanic Garden, and stimulated the plantation of these plants on selected squares and parks. Concomitantly it will be developed educational actions for the community to provoke the sensibility of using native plants at home gardens through the promotion of gardening courses as well course to know native plants. Furthermore, the City Hall will issue two books about native Butterflies and Birds as well will organize an educational film about native plants and animals of the region.

[S2-P1]

Phytogenetic resources of the Macaronesian Region and their economical use

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The Macaronesian Region and especially the Archipelago of Madeira has a rich heritage of plant genetic resources, including several ornamental plant species of economic relevance. Introduction and economical use of cultivated plants commenced in the region in the 15th century along with the islands colonization when a variety of crop and ornamental species were brought from different regions of the world. These plants have been added to a great number of indigenous species with ornamental interest. Both native and introduced species have potential to play an important role in the region's economy. However, they need to be protected using the existing legislation and the National and/or Community (CPVO) protection system. This protection is founded on a deep understanding of plant variety rights and their legal status. To achieve protection of plant varieties, characterization and evaluation of their germplasm has to be performed. The main mandate of the ISOPlexis Germplasm Bank established at the University of Madeira, Funchal, is to monitor, characterize and evaluate the plant genetic resources having potential economic value in the Macaronesian Region. The use of local plant resources in agriculture and sustainable development are major concerns of the ISOPlexis. The ISOPlexis strictly follows the IPGRI/CGIAR and UPOV protocols, including the morphological, biochemical and molecular characterization of the bank accessions. Ultimately, the evaluation of plant resources in field trials is performed to ensure that local crops, as sources of new biomaterials and economic incomes, are properly protected. Several examples of the plant studies conducted at the ISOPlexis that promote the valorization of the local resources as well as their application to floricultural crops will be discussed.

The value of DNA sequence-based molecular markers to "barcode" plant species. Phylogenetic rDNA analysis of five endemic lamiaceae species through its1, 5.8s and its2 nuclear ribosomal region

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Attempts to establish DNA barcodes for plants constitute worldwide attention and significance for species identification and origin. Plethoras of current phylogenetic resources on plant diversity work in the context of identification using molecular techniques and the dynamics of nucleotide DNA sequence information. In this paper we make an assessment of plastid chromosomal regions and different low-copy variable nuclear genes, which currently used in phyllogenetic studies, describing their advantages and limitations at various taxonomic levels. DNA sequence comparison of closely related plant species for ideal barcoding is also discussed. The most widely used molecular markers for plants are presented, such as the intraspecific nuclear ribosomal ITS1, 5.8S and ITS2 regions, the *ncpGS* 3-intron region, the exons *rbcL*, *atpB*, *ndhF*, *matK*, the introns *Adh1*, *Adh2*, *rps16*, the non-coding regions *trnL* and intron/intergenic space *trnL-F*, loci *Adc1* and *Adc2* and the genes *cl*, *waxy*, *pistillata*, *Vicilin*, *Glb1* etc. Phylogenetic analysis of five endemic Lamiaceae species were investigated using sequences of the internal transcribed nuclear ribosomal ITS1, 5.8S and ITS2 regions and results also compared to other related Lamiaceae species described previously.

Survey of the native vegetation with ornamental potential from Campos Gerais, Brazil

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As a consequence of the pressure suffered by the introduction of alien/invasive plants, the Campos Gerais region in the Paraná State, Brazil, has been determined as a strategic area for the study of the local flora. The invasive species have contributed to the extinction process of native plants together with the pressures associated with agriculture, grazing fields, extraction from medicinal plants, extraction for food purposes, timber production and urban expansion. Campos Gerais or Campos Limpos is composed of the oldest vegetation formation of Paraná State. It is a natural phytogeographic zone, with clean fields and gallery woods or isolated formations of mixed ombrofile Forest, where one can find the *Araucaria angustifolia*. The predominant vegetation is of the type grass steppe. It has a high value for landscaping due to its reduced size and tolerance to shallow and sandy soil of low fertility. The objective of this paper was to perform a preliminary survey of the native vegetation with ornamental potential in the Campos Gerais. Initially there was a preliminary collection of the selected families through the evaluation of herbarium specimens from the collection of the Municipal Botanical Museum. From this phase the following families were prominent: Asteraceae, Malpighiaceae, Melastomataceae, Fabaceae, Caesalpiniaceae, Lamiaceae, Myrtaceae, Verbenaceae, Lythraceae, Solanaceae, Portulacaceae and Boraginaceae. The collection sites reported in the register files were used for the planning of the field expeditions. The exploring excursions happened in a randomized manner allowing the definition of the sampling points of the flower survey. Of the twelve expeditions performed, the following families were identified: Bromeliaceae, Portulacaceae, Fabaceae, Sterculiaceae, Mimosaceae, Lythraceae, Gesneriaceae, Apiaceae, Pteridophyta and Boraginaceae. It is important to note the recovery of significant species: *Gonphrena officinalis* var. *macrocephal*, *Callibrachoa caesia*, *Lavoisiera phylocalycina*, *Paepalanthus polyanthus*.

Study of herbaceous annual and perennial species native to Mediterranean area for landscape purposes

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Soils characterized by low fertility, absence of structure, low organic matter content, and high content of alien materials can be a valuable resource for the creation of species-rich vegetation communities. In fact such communities are often associated with low fertility soils, especially regarding to nitrogen levels Very few studies have been carried out in southern Europe on the cultivation techniques of native herbaceous species and on how to create and maintain semi-natural herbaceous communities in relation to soil properties. This study aimed to determine the ecological characteristics and the cultivation needs of 26 herbaceous species native to Italy and southern Europe in order to identify their landscape potential under low-maintenance conditions. Mono-specific plots were set up on three different soils. The criteria to choose the species were based on their capacity to thrive in poor dry soils and to tolerate stress and disturbance, and also on their ornamental value, including the ability to attract insects. Annuals, biennials and perennials were included in the study. Seedling emergence, mortality and plant biomass were determined. The percentage of field establishment and biomass appeared to be affected by physical and chemical characteristics of soil. Species were classified as having low, medium, and high seedling emergence, in the field assessment. The flowering season lasted more than 100 days from April to September. *Calamintha nepeta, Campanula rapunculus, Dianthus carthusianorum, Galium verum, Linaria vulgaris, Salvia verbenaca,* and *Scabiosa columbaria* developed low biomass (0.06 kg/m^3), so they were more suitable for long lasting plantings on unfertile soils (e.g. land restoration). *Centaurea cyanus, Daucus carota, Matricaria chamomilla, Agrostemma githago, Cichorium intybus, Papaver rhoeas, Verbascum sinuatum* produced higher biomass (8.2 kg/m^3) especially on the most fertile soil. They are more likely to survive competition on highly productive soils.

Selecting new plants for roof greening in mediterranean climates – a case study from Melbourne, Australia

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The selection of plants for green roofs in urban landscapes must include consideration of local climatic conditions for any plantings to be successful. Much of the literature pertaining to green roof planting design is based on research and applications in cool temperate climates of northern Europe and North America. There is little available information based on Mediterranean climate zones. This paper describes the plant selection process used in the design of the new CH_2 building in central Melbourne, Australia. This award-winning building is the first in Australia to be awarded six green stars for its environmental design and performance. The paper will discuss design of the elevated plantings (façade or wall climbers) and semi-intensive roof greening installed at the building and includes the development of plant selection criteria, the use of a plant selection matrix and a list of recommended taxa that evolved from the selection process. The paper also includes the results of a pilot study undertaken from March 2005 to January 2006 evaluating the performance of four herbaceous perennial species (*Carpobrotus rossii, Dianella revoluta, Kleinia mandraliscae, Phormium* 'Thumbelina') grown in a specialized roof planting substrate and GreenTech ® roof modules. Results of the study showed that there were problems with substrate performance and plant nutrition over the study period and that only *Kleinia mandraliscae* grew successfully. The study provided the basis for further planting recommendations for semi-intensive roof greening at the building.

Iberis semperflorens l. an attractive Italian endemic shrub with high potential as flowering potted plant

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The genus *Iberis* comprises annual and perennial species occurring in a variety of habitats. *Iberis semperflorens* L. is an evergreen subshrub (30-60 cm) endemic to southern Italy and Sicily. The species naturally grows along the coastal areas of Sicily in partially shaded calcareous rock crevices where it can be easily distinguished for its attracting white fragrant flowers in corymbs and a long flowering period extending from October to April. Seeds and cuttings of naturally growing *I. semperflorens* plants were collected during 2 years of trips in the northern coast of Sicily. Several accessions were propagated, established and evaluated for desirable characteristics. Plant phenology was studied to verify its suitability as flowering potted plant. Plants onginated from cuttings flowered earlier than those originated from seeds. The number of inflorescences per plants, leaf and flower size, dates of anthesis of the first flower and senescence of the last flower were recorded. Substantial genetic variation in the habit, date and duration of flowering were found. The results showed a good adaptation of *I. semperflorens* to pot cultivation and also suggested that the physiology of the plant and its morphological characteristics will establish it as an attractive plant with a place in the ornamental Italian market

Cultivars for floriculture in Lithuania

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Floriculture has an old tradition in Lithuania and due to its geographical position the only species resistant to the local climatic conditions were peony, dahlia, lily, nasturtium and rue. Later tulip, narcissus, gladiolus, dianthus, viola, iris, phlox, crocus and primula became very popular and were grown commercially. Amaryllis, geranium, myrtle, azalea, fig, fern and different cactus were used for interior and exterior decoration of the houses

Recently the plants of Ericaceae *family* have become very popular in Lithuania. Different cultivars of rhododendron, heath and brier were planted in many squares and parks and in private gardens. The different ornamental varieties of tormentil are very popular because of their long period of flowering. Many new varieties of plants have been used for landscaping in Lithuania during the last few years. The berry plants, like different cultivars of lingonberry and high- or low-bush blueberry are successfully in use for landscaping as ornamental plants. Probably because of global climate warming even some species of monkey-puzzle genus grow successfully in climate conditions of mid Lithuania. The selection work of peony and dahlia cultivars was successfully done in Lithuania 35 to 45 years ago and the use of local cultivars is very popular in Lithuania. The most famous and popular Lithuanian peony cultivars are 'Ona", 'Grybauskas', 'Freda', 'Kastytis', 'Maironis, 'Zilvinas', and most famous and popular dahlia cultivars 'Miltinis', 'Skeiviene', 'Panevezys'.

[S2-P8]

Development of web-accesible ornamental collection database at the USAMV Cluj-Napoca Romania

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A research project aimed at collecting and diversification of ornamental plants was initiated this year. It was funded by "Research of Excellence" grant from the Ministry of Agriculture. The purpose of this project is to develop a web site featuring a collection of horticultural important plants.

Web-based information delivers real-time or near real-time data to students and other users.

The collection of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca offers a rich diversity of ornamental plants for students, university personnel and the public. There are many species, collected over the word. The collection is periodically evaluated. The data are transferred to the website and made available to the general public.

The home page explains the site map: links for the 4 databases with the ornamental species (three with annuals, biennales, perennials and one with dendrological species), the involved partners, the CV of project director, the goals and the coordinates. Our databases refer to the ornamental plants in Romania and included specific fields such as plant picture databases forms, scientific and common name, soil and environment conditions, size and usage.

A wide variety of on-line multi media components were incorporated into the website. In addition users page provides relevant data to students or other users.

The web address of this database is www.usamvcluj.ro/2006/SAEMS.

[S2-P9]

Investigation and evaluation of ornamental fern in Beijing area

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Ferns, with their amazing shape of foliage and wide ecological adaptability, are of high value on urban landscaping and revegetation of abandoned land. About 77 species or varieties of ferns inhabit in Beijing area according to Beijing Flora, and most of them still exist in the wild. Since 2003, an extensive investigation of wild fern resources in the Beijing area has been conducted by our team and 20 species with high ornamental value have been collected and their biology, ecological adaptability and ornamental characteristic recorded and evaluated. It is concluded that *Athyrium pachyphlebium*, *A. falleciosum*, *A. multidebtatum*, *Matteuccia struthiopteris*, *Pteridium aquilinum* and *Dryopteris laete* are suitable for garden planting, whereas *Adiantum capillus-junosis*, *Aleuritopteris argentea*, *Gymnocarpium disjunctum*, *Polystichum craspedosorum* can be used for potted plants because of their special characteristics of fronds, and because several species are evergreen when they are grown in glasshouse. Furthermore, the cut foliage of *Polystichum craspedosorum* is good for floristry. The most important is that many species in genera such as *Selaginella*, *Aleuritopteris* and *Asplenium* can be used in rock garden or degraded industrial land because of their high adaptability to drought and low soil fertility.

SESSION 3:
STRATEGIES FOR PLANT INTRODUCTION, MARKET TRENDS AND MARKETING

SESSION 3
ORAL COMMUNICATIONS

POSTER COMMUNICATIONS

[S3-O1]

Introduction of ornamental native plants into commercial production in Croatia

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Abstract. Introduction of new ornamental crops into commercial production and mastering their production technology is an essential requirement for development of commercial horticulture. For Croatian floriculture industry, native ornamental species are especially interesting since they represent the unexploited source of great potential value. At the same time, commercial production of native ornamental plants could represent a way of *ex-situ* conservation of endangered plant species. *Ruscus hypoglossum* L. is a native ornamental plant which is in Croatia under legal protection but is, nevertheless, exploited from the nature by florists. Even though the species is highly ornamental and there is a great demand for this species on the market, its use as a cut plant or for planting in urban green areas is limited by, among other things, the non-existing domestic production. In order to prevent further devastation of natural habitats, the project of species protection through introduction into commercial cultivation was initiated. In this paper, aspects of evaluation and introduction of Croatian native plant species into commercial production will be illustrated on the example of *Ruscus hypoglossum*.

[S3-O2]

Black Iris: a potential new floricultural crop from Jordan

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Iris nigricans Dinsm. (Black iris) is an endemic threatened plant of potential ornamental value. Commercial production of this plant will help restrict interest of people in collecting the plant from natural habitat. Seed germination was studied in vivo and *in vitro*. Seeds were leached, scarified, and then treated with GA_3, KNO_3 or thiourea. Immature seeds and leached-scarified mature seeds were cultured *in vitro* with or without growth regulators. The results indicate that the seeds had two types of dormancy; mechanical (hard endosperm) and physiological (ABA inhibitor). Leaching and scarification reduced dormancy and GA_3 further improved germination (87%). Seeds collected from immature pods are considered a good starting material for *in vitro* seed germination (80%) and establishment of black iris on MS medium containing 1 mg ml^{-1} IAA, 3 mg ml^{-1} kinetin, and 2 mg ml^{-1} BA. The effects of GA_3 on rhizome sprouting and of application method (spray vs. drench) and concentration of GA_3, paclobutrazol, and chlormequat on plant performance were assessed. The results indicate that sprouting was not affected by GA_3. To produce cut flowers with firmer and longer flower stalks, it is recommended to drench plants with 1 mg$\cdot L^{-1}$ GA_3. To produce pot plants, it is recommended to drench plants with 0.25 or 1 mg$\cdot L^{-1}$ paclobutrazol, which would increase flowering by 12%. Somatic embryogenesis was achieved from callus, cell suspension and protoplast cultures. Maximum embryogenesis from callus was obtained using 4.5 µM BA and from cell suspension culture using 4.5 µM 2,4-D and 0.2 M sucrose for four weeks and then culturing cells with 4.5 µM BA. Using 4.5 µM 2,4-D in protoplast culture was necessary for the best protoplast division and colony formation. In all cultures, 90% of the embryos converted to rooted plantlets and the plantlets developed to whole plants and flowered. A reliable cryopreservation protocol by encapsulation-dehydration of somatic embryos was developed. Preculture with 0.75 M sucrose for 3 days at 22°C followed by one day thermal shock at 30°C and 4-h dehydration before rapid freezing ensured maximum survival (60%). The final regrowth percentage of living embryos was 90% after 35 days. Germination of cryopreserved embryos *in vivo* was not successful.

[S3-O3]

Calibrachoa breeding advances in Argentina

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Calibrachoa La Llave & Lexarza (Solanaceae) is an American genus with high ornamental and economic value due to the existence of many successful commercial varieties both for pot plant and landscaping use. Historically, *Calibrachoa* has been included in the *Petunia* Jussieu genus due to morphological similarities. However, now, they are considered two separated genera: *Calibrachoa* species are predominantly perennial shrubs, while *Petunia* species correspond mainly to herbaceous annual plants.

The Institute of Floriculture INTA Castelar (IF) has initiated a *Calibrachoa* breeding programme with the aim to obtain compact plants, with no pruning or growth regulator needs, and which are suitable for Continental and Mediterranean weather conditions.

Crossings between selected clones of five native species, seven intra and interspecific hybrids obtained in IF, and one commercial variety, were performed. It was possible to obtain normal plants in all combinations. The most compact plants of each cross combination were selected and vegetatively cloned. Cuttings were characterised for the number of branches after 40 days of culture. Compact plants were selected and field evaluated in two different locations. Bed cover, plant height and number of flowers were recorded for selected clones. F2 hybrids have also been obtained, and currently a new selection and evaluation is being carried out.

[S3-O4]

Hibridization between pink and yellow *Tabebuia* species native to Argentina (Bignoniaceae)

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Tabebuia A.I. Gomes ex DC. is a neotropical genus of 100 species, ranging from northern Mexico and the Antillas to northern Argentina (Gentry, 1992). *Tabebuia* species are shrubs to large trees and they are important horticulturally because of its very showy flowers.

In Argentina, there are 8 species (Arbo, 1999): *T. alba* (Cham.) Sandwith, *T. aurea* (Silva Manso) Benth. & Hook.f. ex S. Moore , *T. heptaphylla* (Vell.) Toledo, *T. impetiginosa* (Mart. Ex DC.) Standl., *T. lapacho* (K. Schum.) Sandwith, *T. nodosa* (Griseb.) Griseb, *T. ochracea* (Cham.) Standl. and *T. pulcherrima* Sandwith. Some of these species are cultivated in the streets but no breeding work has been reported.

The main aim of breeding has been to obtain juvenile flowering and compact shape *Tabebuia* plants suitable as flowering pot plant varieties. When this objective was accomplished in *T. heptaphylla*, interespecific hybridization was initiated to obtain genetic variation. Selected clones were used for crossings. One pink *Tabebuia* (*T. heptaphylla*), and two yellow species (*T. pulcherrima* and *T. alba*) were crossed reciprocally.

Some crossing combinations were successful. *T. pulcherrima* x *T. heptaphylla* and *T. heptaphylla* x *T. alba* hybrids were obtained. Flowers of hybrid plants were characterized: flower size was measured and color was analysed by colorimetry. Intermediate characteristics were obtained.

Pollen viability of hybrids was determined and some fertile individuals were found, so crossings between related hybrids were possible and segregated progeny could be obtained.

Some hybrids showed high ornamental potential and were cloned for evaluation.

[S3-O5]

Production of tetraploid forms of eight landscape tree species

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The prolific production of messy and sometimes hazardous fruits and seeds make the typical 2n forms of many tropical tree species high maintenance and potentially invasive plants. Tetraploid (4n) plants of monkey pod (*Samanea saman*), Baker's shower tree (*Cassia bakeriana*), golden shower tree (*Cassia fistula*), pink shower tree (*Cassia javanica*), dwarf poinciana (*Caesalpinia pulcherrima*), royal poinciana (*Delonix regia*), Indian coral tree (*Erythrina variegata*), and African tulip tree (*Spathodea campanulata*) were obtained by treating hundreds of meristems of young diploid (2n) seedlings with colchicine solutions in a factorial experiment with three colchicine concentrations (0.05, 0.1 and 0.2%) and two treatment durations (24 and 48 h). Suspected polyploids, based on leaf thickening, distortion or color intensification, were identified. Those suspected polyploids with guard cells measuring 1.3X or larger than those of the diploid controls were further subjected to flow cytometry analysis to measure DNA content as a measure of ploidy, or root tips from airlayers were harvested, fixed and squashed, and chromosome counts were made. The converted tetraploids along with controls for each species will be field-grown to flowering. At flowering, 2n and 4n plants will be crossed to produce 3n (triploid) progeny that are expected to be sterile and non-fruiting for lack of regular meiosis and normal gamete production. Non-fruiting 3n forms of these popular landscape plants (propagated by airlayering or grafting) will be less expensive to maintain, will be non-threatening to native ecosystems, and may have slightly larger flowers and bloom over a longer flowering season.

[S3-O6]

Towards novel autumn crops

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The autumn market is bursting with natural flowers in the gardens, but there is a limited number of species available for indoor or patio plants. Bushes or small trees in containers often cover this niche, while the number of annual and perennial species is limited. Besides the year round crops, there are surprisingly few species available for the autumn market for production in greenhouses

The projects aim was to select and develop this potentially large niche for ornamental potted plants to be sold between end July and Mid September. This market do target both home coming holidaymakers, which might wish to revive their patio plants for the autumn and the many owners of patios and conservatories, which want to see something new with the changing seasons.

The research was focused on selection of plant material, which might have been grown in a limited amount, but not for greenhouse production. The focus was on plant material, which could be initiated around Mothers Day under normal greenhouse climate with as little chemical growth regulation as possible thus making the production as sustainable as possible.

The project was based on a stepwise development work, where a phase one were based on screening of plant material collected from nurseries, private collectors and seed companies mainly from Europe. We collected in total 120 species and cultivars, which was propagated and subjected to an early screening by growers before a systematic propagation and management of growing conditions was made. A production plan was set up for 30-40 species, which was evaluated by growers, wholesale and sales to ensure that the species in question suiting current trends and production systems.

The second screening phase aimed at pinpointing a realistic production niche for especially an array of Agastache, Salvia and other herb like species, where the production methods in greenhouse was developed and compared to partial out door production.

The systematic screening technique can act as en open source method for single growers, groups of growers or companies to target specific production niches.

A new theory – model strategy for new flower crops development

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New Flower Crop Development procedures reflect on innovation as the engine of growth for every organization. In order to approach innovation for the development of new products, a new theory – model for New Flower Crops Development is presented. An inductive driven methodology was used to evaluate the New Product Development methods and practices, which already exist worldwide. The observations made, led to the construction of explanations and theories about what has been observed and what should be applied. Two methods were used for collecting data for this qualitative research; the first was based on primary data collection using a survey addressed to business and the second one was the secondary data collection method, making a comparison of the preceding data with the literature. Application of a questionnaire was subjected to a Greek company that produced floricultural plants and the strategy used to introduce them in the market as New Ornamental Species. This strategy was compared with other ones followed by companies and Research Organizations worldwide and data analyzed based on successful models of theories and practices found in the literature. The research strategy adopted was exploratory in combination with a case study. Balkan Botanic Garden of Kroussia is following the proposed theory – model for New Flower Crop Development and is currently using representative Greek native species of Caryophyllaceae and Lamiaceae, intending to endorse them in the market.

Introduction of ornamental geophytes for production in regions with warm climate

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The production of ornamental geophytes and flowers of high quality in regions with a warm climate has become important during the last decade, and is encouraged by relatively cheap labor cost and the expansion of international trade. In spite of the fact that for commercial bulb production in warm-climate areas, species without cold requirements are more suitable, thermo-periodic geophytes might also be grown successfully. Moreover, the potential for flower production in these regions is obvious: since light intensity is relatively high and winter temperatures are appropriate for flower development, cut flowers and potted plants can be produced in these areas during the off-season, and transported to markets in other countries.

The Israeli experience in bulb and flower production provides a good example of the development of special strategies for warm climates. Bulbs of *Hippeastrum*, *Ornithogalum*, *Crinum*, *Scilla* and other species, adapted to relatively high temperatures, are grown commercially on a large scale. The successful growing of cold-requiring herbaceous peony in Israel, and the development of different growth technologies are based on the precise knowledge of flowering physiology.

Market saturation with traditional plants has forced increasing interest in novelties. Regions where intensive work is being undertaken include Israel, Australia, South Africa, Northeast Asia, and the USA. At the same time, in most countries a lack of knowledge about indigenous geophyte genetic resources still hinders the development of new crops.

The utilization of ornamental geophytes from warm-climate regions could be greatly expanded by increased plant evaluation and effective collaboration among researchers, extension specialists and growers. Obviously, questions of the transfer of knowledge, legal aspects, and the sharing of benefits should be dealt with according to the Convention of Biological Diversity and taken into consideration with each case of new crop development.

Various aspects of the development of bulb and flower production in warm countries, as well as the research needed for this branch of the ornamental industry, will be discussed.

Cacti and succulents: studies on introducing a new group of ornamental plants

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Cacti and succulents represent some of the most diverse and interesting plants in the plant kingdom. Cacti can have ornamental forms, spines, and large ornamental flowers that are occasionally fragrant. Succulents can have ornamental forms and can have ornamental fragrant flowers on inflorescences that often have a long postharvest life. Aside from their ornamental potential, cacti and succulents are often drought, heat and/or cold tolerant, and can have minimal nutritional requirements. Taken together, cacti and succulents represent a group of plants with potential as ornamental potted, bedding and/or landscape plants. We initiated a project 3 years ago to evaluate the potential of unstudied species in these two plant groups as new ornamental crops. Early studies focused on determining what factors induce flowering and assessing the potential of each species as a new ornamental potted, bedding and/or landscape plant. Thus far, we have determined the flowering requirements for over 75 cactus species across six genera. Among succulents, we have focused on identifying how to induce flowering on already identified ornamental crops (often due to plant/leaf form). Other than flower induction work, we developed criteria for assessing the ornamental potential within each plant group. Follow-up experimentation to develop production protocols were also conducted and will be outlined. This study is an example of case study of what experiments may be considered when initiating work on a new group of species with potential for ornamental commercialization. Which species show the greatest potential, future experiments planned, breeding needs, and future collections planned will be discussed.

The study of four native wild groundcovers

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Four native wild groundcovers, including *Duchesnea indica, Ranunculus repens, Solanum septemlobum* and *Dendranthema lavandulifolium var.seticuspe*.were studied in the present research. Following the introduction, the morphological properties and the characteristics of their growth and development have been observed and recorded, and in order to estimate the potential value of application in Beijing landscape, the ecological adaptation including shade-tolerance, drought-resistance and hot-resistance were studied. The results show that although all the four species could live in the situation of 1/6 to full light, the optimal light density for their decorative appearance is respectively 1/3 of full light for *Duchesnea indica and Ranunculus repens* and full light for *Solanum septemlobum* and *Dendranthema lavandulifolium var.seticuspe*. The drought-resistance sequence of the 4 plants was shown as Solanum *septemlobum, Dendranthema lavandulifolium var.seticuspe, Duchesnea indica* and finally *Ranunculus repens*. As to the heat-resistance, the LT_{50} of the four species was respectively 59.20°C for *Dendranthema lavandulifolium var.seticusp*, 53.62°C for *Duchesnea indica*, 52.60°C for *Solanum septemlobum* and 45.73 for *Ranunculus repens* °C.

[S3-P4]

Tropical fruit trees with potential as containerized ornamentals in Brazil

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Brazilian flora is very rich in woody plants with great potential for ornamental use, including species of trees with edible fruits. Several species of native fruit crops are found growing in the wild with scarce scientific studies and rare commercial use. The genetic variability of these species has an important and strategic value for the development of new plant products nationwide. Growing fruit crops in containers is not yet a common practice in Brazil. Few examples are found in urban areas and most of the used species are exotic. Introducing new species to this cultivation technique demands selection criteria for certain plant attributes such as dwarfism, precocity, beauty, and rusticity. In Pernambuco State, Northeast Region of Brazil, traditional nurseries have been growing some fruit bearing trees in containers, mainly species like *Anacardium occidentale* (Cashew), *Averrhoe carambola* (Star fruit), *Citrus sinensis* (Orange), *Eugenia uniflora* (Pitanga), *Ficus carica* (Common fig), *Hancornia speciosa* (Mangaba), *Hyophorbe lagenicaulis* (Bottle palm), *Mangifera indica* (Mango), *Manilkara zapota* (Sapoti), *Myrciaria jaboticaba* (Jaboticaba), *Punica granatum* (Pomegranate), *Theobroma cacao* (Cocoa), among others. When plants are 2 years old or more, growers obtain higher profits because of higher prices, especially if some fruits are already present. This paper brings information on some of the most common fruit trees, native or exotic, grown in containers for ornamental purposes in Brazilian Northeast Region. Families such as Anacardiaceae, Apocynaceae, Arecaceae, Malpighiaceae, Myrtaceae, and Rutaceae present great potential for commercialization, selection and breeding for the agribusiness of containerized ornamentals in Brazil.

[S3-P5]

Perennial moonflower as ornamental plant for walls and fences in tropical areas

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Landscaping techniques are known to improve the urban and rural environments at least for more pleasant appearance. Selected plants can bring better comfort in both visual and microclimate aspects. Walls and fences are present in many residential areas and can be used as supporting structures for vine plants. In tropical areas, many plants grow very fast permitting to cover large areas and to show great ornamental results in short time. Moonflower (*Ipomoea alba*) is an evergreen climber plant, from Convolvulaceae family, that can be used to cover walls and fences, along boundary edges. It produces a nice green background with beautiful white flowers, which can reach up to 15 cm in diameter. In tropical areas, the plants are perennial and blossom the whole year. As a vigorous climbing plant, it supports itself by twining around provided strings and wires or around branches of other plants. It grows better in full sun and well-drained soil with daily irrigation. Covering walls, the plant contributes to reduce the temperature due to protection from direct sun. In rural areas, the vivid green foliage can hide fences of barbed wire, softening its general aspect. In Brazilian Northeast Region, the flowers start to open around 4 pm and close in early morning. Seeds can germinate in less than one week, seedlings can be ready for transplanting in less than three weeks, and plants can start to flower in less than six months. The characteristics of this plant combined with tropical weather conditions make one more option for landscaping business and nursery industry in Brazil.

[S3-P6]

Seven new Daylily cultivars from Instituto Agronômico (IAC), Campinas, Brazil

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The program of improvement of *Hemerocallis* in development at the IAC, since 1990, firstly introduced new American varieties for the evaluation of their behavior in the country and then started to produce new hybrids and select them for the landscape use in the São Paulo State and surrounding areas. Plants must be well adapted to soil and climate conditions, and also tolerant to rust (*Puccinia hemerocallidis*). This program is developed in collaboration to the enterprise Agrícola da Ilha Ltda., which trades the plants after multiplication by division in field conditions. Seven of these are now released as new cultivars:

IAC Campinas (IAC 13) - golden yellow with red eye

IAC Bárbara (IAC 06A) – red greenish with yellow throat

IAC Olga Ullmann (IAC Olga) – pink with yellow throat

IAC Canário (IAC L) – light yellow

IAC Castanho (IAC A civ) – maroon with golden throat

IAC Guaratiba (IAC E. 16182) – salmon with yellow throat

IAC Jundiaí (IAC 08) – red with yellow throat

The adaptation of these selections is very good and the flowering season goes for at least six months (from October until March) in the Southeast part of Brazil. In the Northern region of Brazil there is a lack of cool season, necessary for flower induction. These seven new hybrids are on the way to be registered at the SNPC – National Service of Cultivar Protection, an office of the Brazilian Ministry of Agriculture.

[S3-P7]

Cross-ability in the genus *Lachenalia*

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Lachenalia is a bulbous genus endemic to Southern Africa. The genus has been utilized in a breeding program with the aim to develop a new pot plant product for the international floriculture market. The genus has approximately 120 described species and is unusually variable. The variation in terms of flower-form, -color, -length and -posture opens up a range of possibilities in terms of pot plant types as well as cut flower potential. The extent of the variation, however, also causes several natural crossing barriers influencing the cross-ability among species. The genus is just as varied in chromosome number as in phenotype. Various basic chromosome numbers are present in the genus *Lachenalia*, i.e. x=5, 6, 7, 8, 9, 10, 11 and 13. Ploidy levels range from diploid to octoploid and polyploidy is present in several species. A large number of interspecies crosses have been made. The results of these and the implication on the cross-ability of different species are discussed. The crossing data are compared to results from studies on the phylogeny of the genus as determined using trnL-F sequencing and chromosome numbers. Cross-ability between species with the same basic chromosome number of x=7 or x=8 is fairly good. Cross-ability between species with other basic chromosome numbers is, however low. The cross-ability of species with different basic chromosome numbers is mostly very low. The only exception being some successes between species of x=7 and x=8.

New forms of *Gloxinia gymnostoma* (Gesneriaceae) produced by poliploidization

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G. gymnostoma is an herbaceous plant growing in the shadowy and humid places of the Yungas (subtropical forest extending from Bolivia to northwest of Argentina). Its colorful and showy fuchsia flowers make this specie a potentially ornamental pot plant to be used indoors or in protected areas. The flowering period extends from late spring to the end of the summer. Later, the aerial organs die and underground rhizomes stay dormant until the next spring.

As *G. gymnostoma* height does not completely reach the market requirements of compactness, we started a breeding program with the objective of obtaining plants with a more compact shape than the wild types. Induction of poliploidy was used as a tool to reach this goal.

Selected seeds recently harvested were treated with different concentrations of colchicine solutions: 0, 0.2, 0.4, and 0.6, % during 24 or 48 hours at 25°C. Two replicates of 25 seeds were used per treatment. The assessment of ploidy levels of surviving seedlings was done by flowcytometry.

Tetraploid forms of G. *gymnostoma* were obtained by applying 0.2-0.6 % colchicine aqueous solution during 24 and 48 hs at 25°C. Flowers of tetraploid plants were significantly bigger than diploids and the colour of the leaves was more intense. Plant height of tetraploid forms was shorter than diploid and pollen grains were larger. Tetraploid plants had a slower growing rate and the flower initiation was delayed.

These new forms obtained have more desirable ornamental characteristics and also constitute a good base material for future breeding activities.

Constitutive expression of a cell division inhibitor reduces growth in transgenic pot Azalea *Rhododendron simsii* 'Hellmut Vogel'

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The cyclin-dependent kinase inhibitor KRP2 is an element of the plant cell cycle machinery. It inhibits the progression of mitosis in function of environmental signals. When constitutively expressed in transgenic *Rhododendron simsii* 'Hellmut Vogel', *KRP2* from *Arabidopsis thaliana* partially inhibited cell cycle progression which results in a reduced shoot growth, increased branching and early flower induction. Flower and leaf size were reduced, but the length/width ratio of the leaves was not affected. Larger dimensions of particular cell types compensate the reduction in cell number. This is the first transgenic azalea with a potential horticultural value. Pinching and chemical growth reduction, which are necessary during classical commercial culture, are not required anymore.

Screening of genetic resource of *Camellia lutchuensis* for fragrant Camellia breeding; analysis of floral scent compounds

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Camellia lutchuensis T. Ito ex Matsum., which is a wild camellia species belongs to subgenus *Matacamellia* section *Theopsis*, is distributed around south-west island chain from Amami-oshima to Iriomote Is. in Japan. *C. lutchuensis* emits the strongest fragrance in the genus *Camellia* and is used as a plant material for breeding of ornamental fragrant *Camellia* plants.

We compared floral scents of 13 wild lines of *C. lutchuensis* collected in Okinawa Is. with those of *C. lutchuensis* line 1118, which is one of the pollen parents of fragrant camellia cultivar, in order to find better genetic resources for the breeding. Limonene and 6 aromatic compounds, o-anisic acid methyl ester, benzaldehyde, benzyl benzoate, eugenol, methyl salicylate and phenylacetaldehyde were newly identified as well as methyl benzoate, 2-phenylethanol and benzyl alcohol, whose occurrence in *C. lutchuensis* has been reported. The total amounts of scent compounds in most of 13 wild lines, especially lines 3 and 36, were more than those of the line 1118. Floral scent of the line 36 possessing a high composition ratio of 2-phenylethanol and phenylacetaldehyde with floral note was felt stronger than that of the line 3. Some progenies between the line 1118 and *C. japonica*, e.g. 'Himenoka' bred by NIFS, had similar scent components to the line 1118 and its total amount of scent compounds was more than the line 1118. These results show that scent compound of *C. lutchuensis* is inherited at the hybrid progeny. The line 36 is a promising genetic resource for breeding of ornamental fragrant *Camellia* plants.

Genetic studies of *Arbutus* sp. by morphological characteristics and random amplified polymorphic DNA markers

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Arbutus unedo (Strawberry tree) is a species widely used in Landscape Architecture, while *A. andrachne* (Greek or Cyprus or Eastern strawberry tree) and their natural hybrid *Arbutus x andrachnoides* could easily introduced for use in the urban and suburban Landscape or reforestation.

Morphological characteristics and the method of Random Amplified Polymorphic DNA Polymerase Chain Reaction (PCR-RAPD) was used to study the diversity of *Arbutus andrachne* and *A. unedo* individuals from two different regions of collection, Kalamos and Varympompi, prefecture of Attici, and individuals of *Arbutus* sp. with intermediate morphological characteristics found in Kalamos.

The bark of *A. andrachne* plants and of those with intermediate characteristics was smooth and cinnamon-red in colour, peeling in long stripes revealing a grey-green internal. Oblong areas of dark red colour were found on the bark of plants with intermediate morphological characteristics. *A. unedo* bark was rough and dull brown or ash-grey and occasionally peeling in small flakes revealing a chestnut-coloured internal.

The leaves of *A. andrachne* were untoothed, elliptic to obovate, and of *A. unedo* elliptic or oblong lanceolate, serrate, while of the intermediate plants were oval, oblong, elliptic or lanceolate, pointed or sub-acute. The plants with intermediate characteristics fructified seldom contrary to the rich fructification of *A. andrachne* and *A. unedo*.

Four decamer primers of arbitrary nucleotide sequence were used to amplify genomic DNA and over 36 reproducible polymorphic fragments were generated. Degree of genetic similarity was calculated and the dendrogram of seven individuals was established. A genetic variation among individuals with intermediate morphological characteristics and those of *A. unedo* and *A. andrachne* was indicated, confirming morphological variations observed. This allows the statement that it is another species, at least for the starters used, possibly the one referred in the bibliography as a natural hybrid between *A. unedo* and *A. andrachne*, named *Arbutus x andrachnoides*.

Interspecific hybridization in *Nierembergia*: a source of variation

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The genus *Nierembergia*, a member of *Solanaceae*, comprises about 20 species. The center of diversification is in Argentina, where 15 species are distributed in 20 provinces. This genus includes creeping perennial herbaceous species such as *N. calycina*, *N. aristata*, *N. veitchii and N. micrantha*, erect herbaceous species such as *N. browalloides*, *N. linariaefolia*, and also shrub species such as *N. scoparia* and *N. tandilensis*. Many species of this genus are being used as ornamental plants in gardens in the Northern Hemisphere. A breeding program was initiated in this genus in the Floriculture Institute (of Argentina) in 1999. Since then, two commercial varieties for ornamental pot plants have been registered in Argentina. The objective of this work was to increase the variation to produce novel ornamental cultivars by using interspecific hybridization. Two species were used in reciprocal interspecific crossing, *N. scoparia* which has white and violet flowers and good adaptability under greenhouse conditions, and *N. ericoides*, which has white flowers and is floriferous with a long flowering period. Successful hybrids were obtained and fertility was maintained in successive generations. Height, branching and flower color were evaluated in the segregating progenies derived from the crosses between related hybrids and from the backcrosses of the hybrids with their parental species. From a total of 20 combinations, 57 plants were evaluated, propagated from cuttings, and evaluated both at the plug stage (that is at 40 days after rooting) and in full flowering.

Genetic variability in *Cattleya violaceae* (Orchidaceae) in the Amazonian region

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The variability within Orchidaceae family is perceived in a large number of genus and species, as well as for the diversity within the same specie, like found in *Cattleya violaceae*. Few plants surpass the orchids in distribution throughout the world, variability of growth habits, and the magnificent spectrum of colors produced by their flowers and leaves. Not surprisingly, flowers color variation indicates how to assemble together a number of species and varieties. The aim of this work was to analyze the genetic variability among eleven *C. violaceae* varieties from Amazonian Region (three Brazil Amazonian States and one Venezuela Amazonian region) with different flower coloration: *Cattleya violaceae caerulense, Cattleya violaceae maravilha, Cattleya violaceae semi-alba, Cattleya violaceae semi-alba estriata, Cattleya violaceaesemi-alba flamea, Cattleya violaceae rubra, Cattleya violaceae caerulea, Cattleya violaceae semi-alba fantasia, Cattleya violaceae amesiana, Cattleya violaceae bicolor* and *Cattleya violaceae alba*. The DNA extraction was made by CTAB protocol and then submitted to amplification by RAPD analysis and separation of amplification products by agarose electrophoresis. The grouping was made by neighbor-joining method based on similarity matrix from Jaccard index. The varieties were grouped in ten different groups. The most similar varieties were *Cattleya violaceae caerulense* and *Cattleya violaceae caerulea* that had blue flowers and collected in Mato Grosso state and Roraima state. The most dissimilar were *Cattleya violaceae rubra* and *Csattleya violaceae semi-alba estriata* belonging to the same region of Roraima state and are similar with white and purple flower coloration. The genetic diversity analysis showed the necessity for conservation *in situ* and *ex situ* of the biologic diversity of the genus *Cattleya* and orchidaceae family in Amazon Region.

Obtaining an annual varietal conveyer of ornamental shrubs for the parks of the Research Institute for Fruit Growing

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To extend the ornamental value of the arboretum at Research Institute for Fruit Growing Pitesti-Maracineni, Arges, a wider range of species and varieties adapted to soil and climate conditions of the area was investigated. The studies were carried out at the RIFG from 1977 to 2006. Individual ornamental plants of the park-collection were assessed including 132 species and ornamental varieties. Studies were focused on enhancing the aesthetic value of the arboretum with valuable ornamental plants. The aesthetic value is given by the shape of shrub and leaves, as well as by the colour of branches, leaves, flowers and fruits and how these characters change over time and especially by the leaves persistence during winter time in the evergreen species. The purpose of this paper was to: 1) describe the plants and emphasize the strong scenery elements, 2) obtain a collection of ornamental species and varieties in the green areas for a period as long as possible, 3) present the behaviour of the ornamental species and varieties under the specific soil and climate conditions of the region as well as under the pollutant factors of the environment. The studies and investigations were carried out during a long period in a park-collection organized in year 1977 around the Institute. The 132 species comprises 258 taxons, ornamental species, both deciduous and coniferous. Analyzing the behaviour of the ornamental species and varieties we noticed that these plants offer a complete and nice décor during the whole year, both though the flowers and fruits, or through leaves and canopy. Most of the species and varieties of the genera studied are well adapted to the soil and climate conditions of the region, except for the species *Lagestroemia indica* which does not survive temperatures lower than – 18° C. At temperatures above – 18° C temperatures, the annual shoots die back but regenerate again in spring.

Study to expand the range of wild plants for extensive roof greening systems using super absorbent polymers (SAP)

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Members of Sedum family and mosses are heavily used for existing extensive greening systems providing a thin vegetation layer with low water capacity. This leads to a monotonous visual appearance of the vegetation.

The aim of the present study was to evaluate a range of wild plants for extensive roof greening systems under the environmental conditions of Berlin by using super absorbent polymers in different concentrations.

The substrates used were expanded slate, crushed 1/11 mm + 1g SAP/l substrate, expanded slate, crushed 1/11 mm + 3g SAP/l substrate, expanded slate, crushed 1/11 mm + 10% organic matter, and expanded slate, crushed 1/11 mm as a control.

The species tested were, *Anthemis carpatica, Armeria maritima, Cerastium tomentosum, Dianthus carthusianorum, Dianthus deltoides, Euphorbia myrsinites, Gypsophila repens, Leucanthemum vulgare, Linum perenne, Saponaria oxymoides, Scabiosa lucida, Veronica spicata, Nana' and the experiment commenced in May 2004.*

The substrates with 3g L^{-1} SAP gave the best results in view of the degree of coverage and regeneration under the climatic conditions of the years 2005 and 2006 which had long dry periods. The plants growing in substrates with SAP were healthy and vigorous and showed fewer negative effects from the dry periods. Water supply was enhanced with SAP so that a wider range of species can be used in this system under the environmental conditions of Berlin, including *Cerastium tomentosum, Dianthus deltoides, Gypsophila repens, Saponaria oxymoides, Dianthus carthusianorum, and Euphorbia myrsinites.*

[S3-P16]

The contribution of ornamental crops to the German import-export-balance of N and P regarding horticultural products

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According to increasing globalization, the consumers can select amongst a great diversity of worldwide fabricated horticultural products all-the-year. Significant nutrient loads are coupled with this commodity flow. Our interest was focussed on nitrogen and phosphorus loads.

These nutrient loads were analysed based on the German import-export-balance of horticultural products between 1999 and 2004. In the balance were included: vegetables, herbage, fruits and ornamental crops. The nutrient balance was calculated considering the nutrient concentrations in the dry matter of the horticultural products (N: 1 - 6%, P: 0.1 – 0.5%).

Between 1999 and 2004, Germany imported annually about 12 Mio. tons horticultural products (including ca. 1 Mio. t ornamental crops) and exported 2 Mio. tons (including ca. 0.15 Mio. t ornamental crops). The calculated import surplus of about 10 Mio.t per year corresponded to an annual import of 35.000 t nitrogen and of 4.000 t phosphorus. The proportion of ornamental crops these nutrient imports wars 6 – 7 % for nitrogen and 4 – 6 % for phosphorus.

Beside all positive effects of the globalization of the trade with horticultural products, the related nutrient flow may have consequences to the waste industries and the environment. The corresponding details should be part of future investigations.

SESSION 4:
PROPAGATION AND PRODUCTION

SESSION 4
ORAL COMMUNICATIONS

POSTER COMMUNICATIONS

[S4-O1]

Heliconia genotypes under partial shade: II. Evaluation of flowering stems

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Heliconia beautiful tropical flowers are helping to increase profits of cut flower industry worldwide. The inflorescence durability and vivid colors are supporting the commercialization on the international market. In Brazil, Pernambuco State is leading the research, production, and commercialization of heliconia inflorescences. The Federal Rural University of Pernambuco State (UFRPE) maintains its own Heliconia Germplasm Collection, which supplied the 10 genotypes evaluated in this study. The experimental design was randomized complete block design, with four replications. Cultivated in partial shade, the genotypes evaluated during 18 months were: *Heliconia bihai*; *H. bihai* 'Nappi Yellow'; *H. caribaea* x *H. bihai* 'Carib Flame'; *H. collinsiana*; *H. episcopalis*; *H. pendula*; *H. psittacorum* x *H. spathocircinata* 'Golden Torch'; *H. rostrata*; *H. stricta* I; *and H. stricta* II. The flowering stems were collected at harvesting point, according to the genotype features. The evaluated variables were: fresh weight of stem (FWS); stem diameter (SD); stem length (SL); inflorescence length (IL); number of open bracts (NOB); bracts arrangement (BA) and wax on inflorescences (WAX). *H. collinsiana* e *H. rostrata*, which have pendant inflorescences, presented higher values of IL and NOB. The heaviest FWS was obtained with *H. bihai* (470 g) and *H. collinsiana* (410 g), which would have higher influence on transportation costs. SL varied from 71.60 cm (*H. stricta* II) to 121.51 cm (*H. collinsiana*). These results supply information for further studies on plant breeding programs and also show the potential of heliconia genotypes for tropical cut flower industry.

Growth rhythms of South African Iridaceae forced as pot plants

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South African Iridaceae contain many genera with a high potential for new floricultural crops. From the beginning of 2005 until 2007, investigations on five geophytic species native to the Cape Floral Region have been conducted. Belonging to the genera *Babiana*, *Freesia*, *Sparaxis* and *Tritonia*, the species are winter-growing and spring-flowering in the Southern Hemis-phere. If they are forced as pot plants for the European autumn and winter months, their low temperature requirements during cultivation could represent substantial energy savings for the future grower.

The investigations focused on the following aspects: commercial availability in South Africa, export during the corm dormancy, storage conditions after export, forcing experiments at different times of the year in Berlin and general cultivation requirements of the different species. The cooperation with New Plant Nursery in George, South Africa, which sells only species indigenous to South Africa, was essential in acquiring sufficient quantities of plant material to conduct adequate trials. Results were obtained by regularly monitoring the corms and the plant development. Flower initiation was determined by microscopic examination of the apical meristem during the growing season.

The export of dormant corms proved to be uncomplicated and their dormancy could be further maintained in subsequent storage in Berlin at temperatures above 20°C. Temperature was found to be the main criterion to successfully induce flowering after planting: The species varied in their sensitivity, but generally cultivation at 13°C at night was essential, with temperatures of 17°C and above possible during the day. The minimum time from planting until flowering was eight weeks. During the Central European summer months flower induction failed to happen completely or flower primordia were aborted within the corm due to the high temperatures present. A reduction in plant height and enhanced flowering could be achieved for some species by specific storage regimes and the application of a growth regulator.

Plumeria rubra: an old ornamental, a new crop

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Known from early Spanish records of Aztec plants, *Plumeria rubra* L. has been spread across the tropical and subtropical worlds as a landscape tree. Early use in cemeteries led to its being called a graveyard flower, and the fragrant, colorful, waxy blooms were offered to the gods and the departed. In Hawaii, the flowers are strung to make a floral necklace or lei, and the tree has become an important crop with over 14 million blooms sold for lei in 2005. Collectors have descended upon Hawaii to find different color forms, fragrances, and flower shapes, and the fever to own a new plant has brought prices as high as $75 per cutting for rare and unusual forms. Although records are unavailable for the value of exported cuttings, tens of thousands are exported each year from Hawaii to support this demand, but Thailand has become a recent source for new varieties from their thriving nursery industry. From Sicily to Australia, plumeria collectors have become a market for enterprising nurseries as new varieties are developed each year. This paper presents information about propagation, culture, research into response to growth regulators, manipulation of flowering, and flower keeping quality as well as some of the problems of this special crop.

[S4-O4]

New method for propagation of mistletoes enables production as potted plants

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Mistletoe is the common name for various parasitic plants belonging to the families Santalaceae, Loranthaceae and Misodendraceae. Due to their fascinating biology, curious appearance and to the lore and legend that surrounds them the mistletoes has a great potential as new ornamental plants. Until recently propagation of mistletoes or rather production of pants with mistletoes, as the mistletoe is an obligate parasite, has been either too slow or too costly to make it economically feasible to produce them as potted plants on a large scale. At the Botanic Garden, University of Copenhagen we have however developed and patented a method for mass production of plants with mistletoe. This method includes a dual propagation system of seeding the mistletoe while propagating the host vegetatively. The work presented has mainly concern the genus *Viscum* and in particular the South African mistletoe *Viscum crassulae*. *Viscum* belonging to Santalaceae, is a genus of about 70-100 species, native to temperate and tropical regions of Europe, Africa, Asia and Australasia. They are woody hemi-parasitic shrubs. The foliage usualy perform some photosynthesis, but the plant is drawing its mineral and water needs from the host. Different species of *Viscum* tend to use different host species though most species are able to utilise several different host species. The aspects of the convention on biological diversity (CBD) and intellectual property rights will be discussed. And a model equitable utilization of species new to cultivation, with respect to the CBD, will be presented.

[S4-O5]

Enhanced bud regeneration and bulb formation of spring snowflake *Leucojum vernum* in liquid cultures

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Most geophytes are propagated vegetatively utilizing their potential to develop storage organs. The propagation rate of three selected cultivars of snowflake was very low and tissue culture was used in attempt to increase bulb production. Three selected cultivars, an early, medium and late flowering ones, were cultured in semi-solid cultures with NAA and BA, however their propagation rate was low (4-5 bulbs/explant) and slow. Liquid cultures and growth retardants, inhibitors of GA biosynthesis, were found to augment bulb production, utilizing bud clusters development in geophytes. In vitro bulblets were used as explant source for enhanced regeneration. Scales, twin-scales and basal plate sections were cultured in liquid MS with 5 µM NAA and BA each and in the presence or absence of Majic. The presence of 0.5-2.5 ppm Majic yielded clusters consisting of 35-40 bud meristemoid, while in its absence only 8-10 buds were observed. Bud clusters were separated by a grid cutter, for further biomass increase, testing effects of inoculum size and number of cycles in the same medium on growth. Clusters were also subcultured to a bulb inducing 1/2 MS minerals medium with 10µM IBA, 6% sucrose and 1.0 ppm Majic in liquid shake cultures or bioreactors. Bulblets produced were separated, subcultured to hardening 1/2 minerals semi-solid medium with 10 µM IBA and 0.5 ppm activated charcoal. Bulblets 4-6 mm in diameter were transplanted to the greenhouse with 95% survival rate. Plants were left to grow for a second year, bulbs reached a diameter of 10-12 mm and will be tested for their fidelity. Liquid cultures and growth retardants can greatly enhance bud regeneration and bulb production in snowflake.

In vitro callus induction and plantlet regeneration protocol developed for the oryzalin treatment of *Zamioculcas zamiifolia*

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A novel tissue culture protocol was developed for the oryzalin treatment of *Zamioculcas zamiifolia* (ZZ) callus tissue. Leaflet and petiole explants were harvested from juvenile-like stock plants and disinfested with 95% ethanol, 0.65, 0.33 and 0.13% sodium hypochlorite. Leaflet explants were trimmed to 1 x 1cm square and petioles trimmed to 2.5cm length. Explants were cultured onto callus inducing medium composed of half strength MS macro- and micronutrients, half strength MS vitamins, 100mg l^{-1} myo-inositol, 0.2mg l^{-1} BA, 4mg l^{-1} 2,4-D, 20g l^{-1} sucrose, and 3g l^{-1} gellan gum. Cultures were transferred to fresh medium every 2 weeks, and stored in the dark at 25-27°C. Callus was observed on the explants about 4.5 weeks after cultures were initiated, and once a sufficient amount of callus had been produced, cultures were transferred to shoot induction medium composed of half strength MS macro- and micronutrients, half strength MS vitamins, 100mg l^{-1} myo-inositol, 1mg l^{-1} BA, 40g l^{-1} sucrose, and 3g l^{-1} gellan gum. Cultures on shoot induction medium were kept in the light, and adventitious bud development was observed after 11 weeks on the medium. Once the adventitious buds had elongated and the leaf sheath was about 2.5cm, cultures were transferred to shoot elongation medium with no plant growth regulators for further development. Rooted plantlets, about 5cm in height, where then transferred to community pots in the greenhouse under 70% shade. All plantlets transferred to the greenhouse developed normally. The protocol developed was used for the oryzalin treatment of ZZ callus in an experiment aimed at producing a tetraploid ZZ plant *in vitro*.

Propagation techniques for *Iberis semperflorens* L.

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In the last years many plants native to the Mediterranean region are sought and selected for their ornamental value. *Iberis semperflorens* L. is an evergreen subshrub (30-60 cm) endemic to southern Italy and Sicily with attracting white fragrant flowers in corymbs which bloom from October to April. Although *I. semperflorens* has good potentiality for pot cultivation and outdoor ornamental use there is a lack of detailed and published research results on the propagation of this winter flowering species. The aim of this research was to define potential commercially suitable propagation methods (seed, cuttings, tissue culture) for *I. semperflorens*. To study the influence of temperature on germination, seeds were germinated at various constant temperatures (14, 20, 24 and 28°C) and in continuous light or darkness. Highest germination occurred at 20°C in the light. To study the influence of temperature and auxin treatment on vegetative propagation, cuttings were inserted in a mixture of torba and perlite with or without bottom heat and either dipped in a 500 ppm 1H-indole-3-butyric acid (IBA) solution or not treated (control). Rooting was markedly improved by bottom heat and IBA treatment. In vitro axillary shoot proliferation was induced on Murashige and Skoog (MS) agar medium supplemented with benzyladenine (BA). Microshoots rooted after four weeks on MS agar medium.

Effect of applying commercial gibberellins on seed germination of *Chrysanthemum coronarium* L.

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Chrysanthemum coronarium L. is a very common species native to the province of Murcia, SE Spain, which flowers towards the end of winter. Although the plant produces a large number of seeds, the germination percentage tends to be very low. Since several studies have found that the application of gibberellic acid improves this percentage; the object of this work was to ascertain the effectiveness of commercial gibberellins on the germination percentage in *C. coronarium*. In a first experiment, the seeds were treated with novagib ($GA_{4/7}$ 1%), clemencuaje (GA_3 1.6%), vip (6-benzyladenine 1.9%+$GA_{4/7}$ 1.9%) or gibberellic acid (GA_3 90%), at concentrations of 250, 500, 1000, 1500, 2000, 2500, 3000 and 3500 mg L^{-1}. The results showed that novagib produced the highest germination percentage (24%). In a second experiment, binary combinations of these products were assayed but no synergistic effect was observed. A third experiment studied the effect of the gibberellins on intact and on naked seeds. The germination percentage in the naked seeds, whether or not treated with gibberellins, reached 90%. We conclude that the dormancy of *C. coronarium* seeds is regulated by coat imposed dormancy and not to the physiological processes regulated by gibberellins.

Effects of pretreatment with gibberellic acid and promalin (GA_4 +GA_7 +BA) on germination of *Protea aristata* and *P. repens*

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Dormancy in *Protea* spp. seeds (botanically achenes) seems to be mainly imposed by a low temperature requirement. In order to study the effects of gibberellic acid (GA_3) and promalin (GA_4 +GA_7 +BA) on germination of *Protea aristata* and *P.repens*, seeds of those species were sown in a mixture of peat moss and lapilli (1:1 in volume), in plastic propagating trays which were placed in a well ventilated greenhouse. Before sowing, seeds were imbibed for 24 h in GA_3 (100 ppm), or promalin (100, 200, 400 ppm) or distilled water (control). A randomized block design with five treatments and four replications was employed. Twenty and thirteen seeds per treatment were used in *P.aristata* and *P.repens*, respectively. The total number of seeds was 400 for *P.aristata* and 260 for *P.repens*. Germination was recorded weekly, for 15 weeks. Percentages and rates of germination were calculated.

In *P. aristata*, pretreatment with 100 ppm of GA_3 gave the highest percentage of germination (62.5%) followed by pretreatment with 100 ppm of promalin (47.5%) and pretreatment control (47.5%). There were no significant differences among those pretreatments. Increasing promalin concentration decreased germination percentages, but not significantly. As for germination rates, there were no significant differences among pretreatments. In *P. repens*, although a tetrazolium test showed that 58% of seeds were viable, germination percentages were abnormally low, perhaps due to incubation of the seeds under a no-optimal temperature regime.

[S4-P4]

Effect of gibberellic acid, temperature and cold-moist stratification on seed germination of *Danae racemosa*

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Danae racemosa (Hamishak in Iran) naturally grows mainly in the north parts of Iran. This plant is native of Iran and also an evergreen shrub growing under a shade of forest trees and use as cut foliage. This species harvests from natural habitat and has been sold for arrangement of flower in different cities of Iran.

These experiments carry out in dark condition and growth chamber. Best germination occurred when seeds treated with GA_3 and germinated at 20˚C. Germination decreased when seeds were in a growth chamber at 25 or 15˚C. Seeds treatment with cold-moist stratification for 4 weeks followed germination at 20˚C evaluated higher germination than other treatments. Post germination of seeds (when radicle and leaf bud emerge), leaf emergence inhibited and observed dormancy. GA_3 treatment was not able break of this dormancy. Cold moist stratification for 10-12 weeks followed in growth chamber at 20 or 15˚C was best condition for emerging of one leaf and sometimes two leaves. Leaf emergence inhibited at 25˚C.

[S4-P5]

Growth regulators and KNO_3 on seed germination of *Angelonia salicariifolia* Bonpl. (Scrophulariaceae)

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Angelonia salicariifolia is an herbaceous perennial native to Brazil with great ornamental potential as garden plant, cut-flower and potted plant. It shows blue flowers with 1.0 to 1.4 cm of length, in terminal racemes with 10 to 30 cm of length. In previous studies about the seed germination requirements of *A. salicariifolia* was observed a positively photoblastic behavior under constant temperatures of 10, 15, 20, 25, 30 and 35°C. Gibberellins and cytokinins are known to stimulate the germination of positively photoblastic seeds. The present study was carried out to evaluate the effects of growth regulators (100, 200, 300, 400, 500 mg L^{-1} of gibberellic acid and 2.25, 11.3, 22.5 mg L^{-1} of 6-benzylamino purine) and potassium nitrate (0.2 and 1.0 %) on *A. salicariifolia* seed germination. The experiments were conducted in complete randomized design with six replications of 25 seeds for each treatment. Seeds collected from dehiscent capsules were sown in plastic boxes on one layer of filter paper and moistened with growth regulators or KNO_3 solutions. The seeds for control trial were moistened in distilled water only. Germination was carried out at 25°C ± 1°C, under continuous light or darkness. Germination (protusion of the radicle) was observed daily for 20 days. In the dark, only gibberellic acid promoted seed germination. The percentage of germination, the speed of germination index and the mean germination time at 300 mg L^{-1} (45.38%; 0.79; 10.84 days), 400 mg L^{-1} (47.30%; 0.86; 10.19 days) and 500 mg L^{-1} (51.96%; 0.95; 10.03 days) were significant better compared to 100 mg L^{-1} (27.83%; 0.38; 11.93 days) and 200 mg L^{-1} (32.31%; 0.49; 11.47 days). Under light conditions treatments did not differed among each others and from control, except for 22.5 mg L^{-1} of 6-benzylamino purine and potassium nitrate (1.0 %), which decreased the percentage of germination and the speed of germination index. It is not necessary the application of growth regulators or potassium nitrate under light condition. Gibberellic acid at 300, 400 and 500 mg L^{-1} stimulates the germination of seeds in the dark.

Application of plant growth promoting bacteria *Enterobacter radicincitans* to improve germination and seedling development

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Many different bacteria are known to produce plant growth-promoting effects in a wide range of plant species. So also the endophytic bacterial strain *Enterobacter radicincitans*, isolated from the phyllosphere of winter wheat, has been proven and tested to promote seed germination, seedling development and plant yield in various plant species. The plant growth-promoting bacterial strain produces phytohormones (two auxine compounds: 3-indole-acetic acid and 3-indole-lactic acid and the cytokinins: N^6-isopentyladenosine and N^6-isopentyladenine) in pure culture, fixes biologically atmospheric nitrogen and solubilizes hardly available P-compounds. Due to its high chemotactic affinity to young plant roots, the bacterial strain is able to colonize the root tissue and successfully compete with the native bacterial community. Using an *E. radicincitans* specific TaqMan™ probe and the quantitative real-time PCR approach the high competition and colonization ability of introduced bacterial cells was shown in greenhouse experiments. Plant roots were colonized with a density of 10^7 cells g^{-1} fresh root weight up to at least 14 days after inoculation. That is equivalent to a proportion of *E. radicincitans* 16S rDNA-gene copy numbers compared to the total bacterial communities of about 10-16%. Online emission fingerprinting using the CLSM 510 META and fluorescent Cy5- and FAM-labelled probes specific for bacteria and *E. radicincitans*, respectively, established that the introduced bacteria proliferated on and inside the root and that they colonized the intercellular spaces of the root cortex layer.

Such highly competitive, good colonizing and plant growth-promoting bacterial strains offer the opportunity to successfully apply these strains as biofertilizers in horticultural and ornamental plant production systems. Such biofertilizers can partly replace the amount of mineral fertilizer and pestizides application by containing the same or even improved plant growth.

Micropropagation of an Amazonian terrestrial orchid (*Brassia biddens*) from Roraima State, Brazil

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There are about 2,500 of native orchids in Brazilian States, especially in Roraima and Amazonas. The burning and logging has caused devastation of the Amazon rainforest and loss of species, including orchids. Tissue culture has proven to be a valuable tool to increase production and preserve orchid species. Orchids have been multiplied routinely by seeds using a non-symbiotic culture as a propagation method. The objective of this paper was to promote the seed germination for plantlets production of *Brassia biddens*, an Amazonian terrestrial orchid by using tissue-culture methods. In order to evaluate this approach, we performed an factorial experiment with the media containing one of four sucrose concentrations (0 $g.L^{-1}$, 10 $g.L^{-1}$, 20 $g.L^{-1}$ and 30 $g.L^{-1}$) and one of five concentration of the Knudson and Morel's basal medium (control, or with full strength; 1/2 ; 1/4 and 1/8 stength). These experiments were performed following a randomized complete block design with ten replicates. The results were submitted to statistical ANOVA analysis and the differences were tested with Duncan's multiple-range test at $p \leq 0.05$. The analysis of variance revealed: (1) significant differences between treatments; and (2) that the interaction sucrose *versus* strength was not significant ($p \leq 0,05$). The results revealed that sucrose at 20 $g.L^{-1}$ and 1/4 strength Knudson and Morel's basal medium as the best treatment. The protocol was efficient in promoting the seed germination and has allowed the establishment of *in vitro* production of orchid plantlets on large scale. In addition, the survival of acclimatized plantlets was successful in greenhouse conditions.

Studies on *in vitro* propagation of *Lithodora zahnii*

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Lithodora zahnii (Heldr. ex Halacsy) I.M. Johnston (*Lithospermum zahnii*) is a dense and much-branched dwarf subshrub, with silvery-hairy young shoots, greenish or grayish linear leaves and blue or white flowers. It is an endemic species of Greece, characterized as vulnerable, found only in certain rocky places, hence the name *Lithodora* –from Greek *lithos*, stone, and *doron*, gift, of south Peloponnese peninsula. It grows on exposed, almost vertical limestone rocks in narrow rocky ravines, at low to moderate elevations. It flowers from late March, peak period April to May, and continuing to June. In the present study the *in vitro* propagation of *L. zahnii* was studied as a first step to introduce the species as a bedding plant, a plant for rock gardens, roof gardens, restoration of downgraded landscapes and slop stability.

Seeds collected in April were initially left at room temperature for three months and then put at 4°C for two months. They were surface sterilized with 20% commercial bleach for 10 min and put for germination on solid half strength MS medium with 2% sucrose, at 10°C, under 16h photoperiod of 37.5 μmol m^{-2} sec^{-1} fluorescent light.

Nodal explants from *in vitro* grown seedlings were cultured on solid MS with 2% sucrose supplemented with 0.2 or 0.5 mg l^{-1} BA or zeatine in order to induce shoot production. In all media the percentage of explants responded giving shoots was high (73-92%). The highest number of shoots (average 6.7 shoots per explant) was taken on the medium with 0.2 mg l^{-1} zeatine. BA media gave less but longer shoots. On the medium with 0.2 mg l^{-1} BA an average of 3.7 shoots per explant of 1.6 cm long was taken after two months in culture. A very low percentage of the explants rooted simultaneously with shoot production.

Seed germination and *in vitro* propagation of *Sideritis athoa*

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Sideritis athoa is an alpine, aromatic herb, native of Greece that could be introduced as a bedding plant, as a plant for rock gardens, roof gardens, restoration of downgraded landscapes and slop stability.

S. athoa seeds collected in August were germinated in November. Seeds were germinated on a peat: perlite (1:1 per volume) medium or on 100% perlite. Seed *in vitro* were placed onto a solid half strength MS medium with 2% sucrose. Both *ex vitro* and *in vitro* cultures were held at 10, 15, 20 or 25°C, under continuous darkness or 16 h photoperiod of 37.5 μmol m^{-2} sec^{-1} fluorescent light.

Germination percentages at temperatures of 20 or 25°C were higher compared to that under lower temperatures independently of substrate and photoperiod. The highest germination (80-88%) was obtained for seeds planted *ex vitro* at 20°C. *In vitro* the germination was slightly lower (71 and 76% at 20 and 25°C, respectively, under 16 h photoperiod).

Nodal explants from *in vitro* grown seedlings were cultured on solid MS with 2% sucrose supplemented with various plant growth regulators (IBA, NAA, 2,4D, BA, 2iP, TDZ) in order to induce shoot regeneration. The highest shoot numbers were obtained in media with 0.2 or 0.5 mg l^{-1} BA (1.8 or 2.3 shoots per explant, respectively). The medium with 1 mg l^{-1} IBA produced fewer but longer shoots (1.5 shoots per explant, 2 cm long). The addition of NAA in the BA-media, as well as media with TDZ induced calus and deformed shoots.

Nodal explants of *in vitro* produced shoots were initially successfully subcultured for multiplication on a medium with 0.2 mg l^{-1} BA (6 shoots per explant). However, in following subcultures, half of the produced shoots on this medium were vitrified. Media with IBA or IAA at 2 mg l^{-1} were more appropriate for shoot multiplication (2-5 shoots per explant, 2-3 cm long), as these media did not induce hyperhydration Simultaneously, IBA or IAA media induced rooting at 35% of the explants.

In vitro propagation of *Arbutus andrachne* L.

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Arbutus andrachne (Eastern, Greek or Cyprus strawberry tree) grows naturally in thickets, woods and dry rocky places of SE Europe and Asia Minor. It is an evergreen shrub or small tree, with smooth cinnamon-red bark, peeling in long stripes and glossy dark green foliage. It is very attractive during fructification (October-February) having small, strawberry-like orange-red fruits. After fruit ripening, clusters of small, white flowers (January-April) bloom. It has the potential to be introduced for use in the urban and suburban Landscape and for reforestation, as it sprouts again after fire. *In vitro* propagation of the species will facilitate its use.

Nodal stem segments from adult plants cultured on Woody Plant Medium (WPM) supplemented with various concentrations of BA and NAA produced not elongated shoots. Shoot elongation occurred when the explants were transferred on WPM with 2.5 mg l^{-1} zeatin.

In subcultures, WPM was supplemented with various cytokinins (BA, kinetin, 2iP, zeatin) at four concentrations (0.5, 1.0, 2.5 or 5.0 mg l^{-1}) in order to test their effect on shoot multiplication. In most media 100 % of the explants produced shoots except in the one with 0.5 mg l^{-1} zeatin (88 %) and those with kinetin (75-88 %). Zeatin was the most effective cytokinin for shoot multiplication (3.8-4.8 mean shoot number per explant with 1.3-1.9 cm mean shoot length). 2iP was also quit effective (1-2.9 mean shoot number per explant, 1.5-2.5 cm mean shoot length), while BA and kinetin were the least effective as they couldn't induce elongation of the shoots produced.

Microshoots were rooted *in vitro* with 94 % success on WPM with 1 mg l^{-1} IBA and 80 % of the produced plantlets were established successfully *ex vitro*.

Seed germination and *in vitro* propagation of *Dianthus fruticosus* L.

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Dianthus fruticosus is an endemic plant of Greece found in rocky places of the Cyclades islands Serifos, Sikinos and Folegandros. It can be used a bedding plant ideal for rocky gardens and Mediterranean roof gardens, as well, as a grown cover plant for slop stabilization and restoration of downgraded landscapes in the Mediterranean region. In this work seed germination conditions were studied and a micropropagation method was developed.

Seeds surface sterilized in 15% commercial bleach water solution for 20 min, were put for germination on solid half strength MS with 2% sucrose at 15, 20 and 25°C under 16 h photoperiod of 37.5 $\mu mol.m^{-2}.s^{-1}$ fluorescent light. Germination was 97% at 15°C and was reduced to 47% and 13% at 20 and 25°C, respectively.

Nodal explants from the *in vitro* germinated seedlings were cultured on solid MS with 2% sucrose and various combinations of plant growth regulators (NAA, IBA, 2iP, TDZ) at various concentrations. The best response in terms of shoot production was taken on a medium with 0.1 mg l^{-1} NAA and 0.5 mg l^{-1} 2iP (100 % shoot production, 2 shoots per explant, 0.6 cm mean shoot length). Very good response (89% shoot production, 1.6-2.1 shoots per explant, 0.4-0.8 cm mean shoot length) was also obtained on media with 0.1 mg l^{-1} NAA and 0.5 mg l^{-1} BA, 0.1 mg l^{-1} IBA and 0.5 mg l^{-1} BA or 0.5 mg l^{-1} 2iP, 0.1 mg l^{-1} TDZ, 2 mg l^{-1} IBA. In the later the explants except of shoots were giving roots as well (100% root production).

In subcultures, media with 0.1/0.5 (mg l^{-1}) NAA/2iP or 2 mg l^{-1} IBA gave the highest shoot multiplication rate (100 % shoot formation, 2-3 shoots per explant, 0.5-1.5 cm shoot length). Shoots from 0.1 mg.l^{-1} TDZ transplanted on 0.1/0.5 (mg l^{-1}) NAA/2iP gave the highest shoot production.

All shoots produced in various media transplanted on a medium with 2 mg l^{-1} IBA rooted very well (7 roots per explant) and plantlets were successfully established *ex vitro*.

Micropropagation of *Quercus euboica* Pap., a rare, endemic, oak species of Greece

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Quercus euboica Pap., is a rare, endangered oak species, endemic in northeastern Euboia (Aegean island). It is a small tree or big shrub, with many erect branches sprouting from the plant base. The new vegetation is red-green, while the leaves during winter turn brown and remain on the plant until next spring. The species can be used as an ornamental plant in urban and suburban landscape. Its drought tolerance and capability to sprout again after fire and grazing makes it suggested species for reforestation in Mediterranean climates.

A micropropagation method for the species was developed. Woody Plant Medium salts, with 100 mg l^{-1} myoinositol, 1 mg l^{-1} thiamine, 0.5 mg l^{-1} pyridoxine, 0.5 mg l^{-1} nicotinic acid and 3% sucrose was used as basal medium. Several cytokinins at various ratios were evaluated for their effect on shoot multiplication from nodal segments of one or two year old seedlings and adult plants. The highest shoot multiplication rate was taken from one year old seedlings on medium supplemented with 1 mg l^{-1} BA.

Seasonable influence of explants collection on establishment was observed; explants collected beginning of May gave the highest multiplication rate compared to explants collected in July and September.

A number of experiments were conducted to develop suitable methods for rooting of *in vitro* produced shoots. The presence of auxin was essential for rooting. IBA at 2 mg l^{-1} applied in the culture medium during the first week of culture followed by culture in hormone-free medium gave the best rooting results. Basal immersion of microshoots in IBA concentrated solutions, for various periods of time, followed by culture *in vitro* on WPM or *ex vitro* in soil, did not improve rooting in comparison to IBA added in the medium.

Plantlets acclimatized *ex vitro* in soil from the natural environment of the species survived at a higher percentage and had more vigorous growth than in a compost–perlite (2:1 v/v) medium.

In vitro rooting of X *Malosorbus florentina* Zucc. microshoots

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X *Malosorbus florentina* Zucc. is a rare native species of Greece that could be introduced as an ornamental and reforestation plant. In micropropagation studies of the species a difficulty in rooting was observed. The usual practice of culturing the microshoots on a solid half strength MS medium with IBA (0.5, 1, 2 or 3 mg l^{-1}) did not induce rooting, while initial culture (one week) on an IBA medium followed by transfer on an IBA-free medium gave very low rooting percentages (7-18%). Similarly, low rooting percentages were taken by dipping the base of the microshoots in concentrated IBA solutions (500 or 1000 mg l^{-1}) for 10 sec followed by culture on a hormone-free solid MS medium. In all the above methods leaf and shoot tip drying of 50-80% of the microshoots was observed.

Rooting percentages were increased (25-67%) by the use of IBA (0.5 or 1 mg l^{-1}) in combination with IAA (8 mg l^{-1}) in the medium. Darkness during the first week of culture (root induction period) seemed to improve rooting percentage but gave more callus at the base of the microshoots. Activated charcoal (AC) inhibited rooting completely, when it was added into the medium during the root induction period, and had no effect when added after the first week of culture.

Dipping the base of the microshoots in combined IBA-IAA concentrated solutions (500 or 1000 mg l^{-1} IBA and 250, 500 or 1000 mg l^{-1} IAA in all possible combinations) followed by culture on hormone-free half strength MS gave low rooting percentages (0-20%), while in the same experiment an 1000 mg l^{-1} IBA solution, used as control, induced rooting at 40% of the microshoots. In this technique the addition of AC in the culture medium reduced shoot drying.

Effect of growth medium on *in vitro* shoot regeneration of X *Malosorbus florentina* Zucc.

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X *Malosorbus florentina* Zucc. is a rare and endangered native species of Greece, natural hybrid of *Malus sylvestris* and *Sorbus torminalis*, suitable for use as an ornamental plant in mountainous landscapes or in reforestations.

Apical buds collected in March (before sprouting), were surface sterilized in 10 or 15% commercial bleach water solution and cultured initially on solid MS with 0.7 or 1 mg l^{-1} BA with or without 0.1 mg l^{-1} IBA. The infection percentage was very high (97%) and the percentage of buds responded giving shoots very low (13%).

Nodal explants of the *in vitro* produced shoots were subcultured four times on MS with 1 mg l^{-1} BA and 0.1 mg l^{-1} IBA (six weeks culture period for each subculture) with high shoot multiplication rate in all subcultures (4.5-8.4 shoots per explant, 4.0-5.4 mm mean shoot length).

The use of Woody Plant Medium instead of MS for nodal explant culture increased the mean number of shoots per explant, but induced morphological alterations in the shoots (reduced leaf size, red colouration, drying of the apical bud).

Culture of nodal explants for three weeks on a medium with 1 mg l^{-1} BA and 0.1 mg l^{-1} IBA followed by three weeks culture on a medium with half the concentration of BA led to increased shoot length.

Nodal explants were also cultured on media with 0.2 or 2 mg l^{-1} TDZ and 0 or 0.1 mg l^{-1} IBA in all possible combinations giving high number of shoots (7-9 shoots per explant) with small length (2-3 mm); the lowest TDZ concentration giving the highest shoot number. Subculture of shoot clusters (2-3 shoots) from TDZ media on a medium without plant growth regulators or with 0.5 mg l^{-1} BA and 0.05 mg l^{-1} IBA or 1 mg l^{-1} BA and 0.1 mg l^{-1} IBA induced multiplication of the shoots (5.3-8.7 shoots per explant), but only shoot-explants coming from the low TDZ concentration produced elongated shoots (6 mm) suitable for subculture.

Influence of season and sterilization method on response of X *Malosorbus florentina* buds to *in vitro* culture

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X *Malosorbus florentina* Zucc., a rare native species of Greece, is suggested as an ornamental and as a suitable plant for reforestation.

Apical buds collected in March, before the sprout of new vegetation, were surface sterilized after the removal of external scales only or along with bark using 7%, 10% or 15% commercial bleach water solution for 10 min, and cultured on solid MS containing 0.7 or 1 mg l^{-1} BA with or without 0.1 mg l^{-1} IBA. Only 20% of the buds sterilized after the removal of bark too were not infected. Browning and necrosis of the explants occurred and only 33% of buds in media with IBA sprouted. Four subcultures of the produced shoots on MS with 1 mg l^{-1} BA and 0.1 mg l^{-1} IBA followed giving high shoot multiplication rate (4.5-8.4 shoots per explant).

Apical buds collected in March, 20 days after new vegetation sprouting, were disinfected by 20% commercial bleach solution for 15 min or 80% ethanol for 5 sec followed by 15% or 20% commercial bleach solution for 10 min, and cultured on MS with 1 mg l^{-1} BA with or without 0.1 mg l^{-1} IBA or NAA. 20% commercial bleach solution gave the lowest infections (40%). Callus only was formed, which was subcultured on various media in order to regenerate shoots, without success.

Apical buds collected in June, 50 days after sprouting, were cultured on MS with 1 mg l^{-1} BA with or without 0.1 mg l^{-1} IBA or with 1 mg l^{-1} kinetin with or without 0.1 mg l^{-1} IAA or with 0.05 or 0.2 mg l^{-1} TDZ. The infections' percentage reached at 40% after disinfection by 25% commercial bleach solution for 15 min. Many explants turned brown, and others did not respond concluding to extremely low installation percentage (2%). Bud sprouting was favoured on media with BA, while in the presence of IBA the produced shoots were longer. Two subcultures on MS with 1 mg l^{-1} BA and 0.1 mg l^{-1} IBA followed, with low shoot multiplication rate (1-3.7 shoots per explant) compared to those of the cultures started in March.

[S4-P16]

In vitro and *in vivo* polyploidization of *Dracaena* with oryzalin

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Polyploid forms of plants often have horticulturally desirable characteristics such as more compact growth habit, thicker and more robust leaves, and a deeper green color. Dracaenas are an important foliage plant not only in the United States, but also worldwide, and a polyploid form with new desirable characteristics would be helpful in maintaining consumer demand. In addition, a polyploid form could be useful for creating variety in hybridizing efforts. Two methods of polyploidization on *Dracaena* were attempted. The first method treated developing axillary buds of *D. deremensis* 'Santa Rosa' *in vivo* by placing oryzalin soaked cotton on the meristem and wrapping in plastic. The second method treated callus tissue of *D. deremensis* 'Lisa' *in vitro* by soaking the calli in oryzalin solution. Both methods employed six treatments consisting of 3 concentrations of oryzalin and 2 durations of treatment: 0% for 24 hours, 0% for 48 hours, 0.005% for 24 hours, 0.005% for 48 hours, 0.01% for 24 hours, and 0.01% for 48 hours. The developed shoots from the axillary buds and the regenerated shoots from the callus tissue were tested for conversion to polyploidy using flow cytometry with leaf tissue nuclei. *In vivo* treatments resulted in only one mixoploid. *In vitro* treatments resulted in one mixoploid and one tetraploid plant. The tetraploid has shorter internodes and shorter leaves than its diploid counterpart and is being further evaluated for suitability as a new variety or for use in hybridizing efforts.

SESSION 4 - POSTER

[S4-P17]

Optimum irradiation dosage of unrooted *Dracaena* cuttings for mutation induction

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Mutation induction using irradiation is a useful method for creating new varieties of ornamental plants that are vegetatively propagated. Dracaenas are an important foliage plant not only in the United States, but also worldwide, and new varieties are needed to maintain consumer demand. The LD_{50} dosage at which 50% of the plant material survives is generally accepted as the optimum irradiation dosage for the purpose of creating new varieties because an acceptable number of cuttings survive while a high number of mutations are obtained. Unrooted cuttings of four *Dracaena* varieties were irradiated using Cesium-137 gamma rays at seven different dosages to determine the LD_{50} dosage. *D. deremensis* 'Santa Rosa', *D. fragrans* 'Massangeana', *D. fragrans* 'Victoriae', and *D. ×masseffiana* were irradiated at 0, 5, 10, 20, 30, 40, or 50 Gy. Data were collected on root and shoot formation and observations on changes in morphology and variegation were recorded. The LD_{50} dosages for rooting were estimated as 14.6, 13.8, 5.7, and 17.7 Gy for *D. deremensis* 'Santa Rosa', *D. fragrans* 'Massangeana', *D. fragrans* 'Victoriae', and *D. ×masseffiana*, respectively. The LD_{50} dosages for shoot formation were estimated as 19.4, 16.6, 22.1, and 10.9 Gy for *D. deremensis* 'Santa Rosa', *D. fragrans* 'Massangeana', *D. fragrans* 'Victoriae', and *D. ×masseffiana*, respectively. Visually detectable mutations for each treatment were observed at rates of 0% to 93.3% with chlorophyll mutations being the most common. It is concluded that irradiation of *Dracaena* cuttings is a useful and practical breeding method and large numbers of cuttings can now be irradiated at the LD_{50} levels determined in this experiment to attempt to create new varieties of *Dracaena* for the industry.

Polyploidization of *Marsdenia floribunda*

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In Hawaii, flowers of *Marsdenia floribunda* (Brongn.) are either strung as lei lengthwise, requiring about 25 flowers, or they are pierced through the side of the corolla, utilizing about 700 flowers. The production of a tetraploid cultivar possessing larger flowers with thicker, sturdier petals would benefit the lei industry, since fewer flowers would be required to produce the lei. The objective of this experiment was to create a tetraploid *M. floribunda* plant. Seeds of a diploid (2n = 22) *M. floribunda* plant were treated with 0.05, 0.1, 0.2, and 0.4% colchicine (distilled water used as controls) for 24 or 36 hours. After colchicine treatment, the seeds were sown in moist Pro-Mix 'BX' media under 50% shade. In total, 40 plants were tested for changes in ploidy level via flow cytometry. All the controls tested maintained the diploid status while five mixoploids and one tetraploid plant were identified. The identified tetraploid was produced by treating seeds at 0.4% colchicine for 24 hours.

In vivo polyploidzation of *Zamioculcas zamiifolia*

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The ability of *Zamioculcas zamiifolia* (Lodd.) to grow under low light conditions; its tolerance to drought stress, unique appearance, low maintenance requirements and limited pest problems are characteristics that contribute significantly to its ornamental and interior plantscaping value. With only one species in the genus of this foliage ornamental, the creation of new clones may allow breeding and variety development to advance more quickly. The objective of this experiment was to produce a tetraploid *Zamioculcas zamiifolia* (ZZ) plant. Leaflets (before and after rhizome development) of a diploid ZZ plant (2n = 34) were treated with 0.05%, 0.2 %, and 0.4% colchicine for 24 hours with distilled water used as the control. Ploidy level changes were confirmed via flow cytometry. Eight mixoploid (2x + 4x) and 5 tetraploid (4x) plants were identified. Tetraploid plants were produced at the following concentrations: 0.4% colchicine (leaflets treated before rhizome development); 0.05% and 0.2% colchicine (leaflets treated after rhizome development). The identified mixoploids represent plants with leaflets composed of diploid and tetraploid tissue or plants in which the ploidy level varies from leaf to leaf. Tetraploid plants showed a slower growth rate (dwarfed appearance) and thicker, greener leaves as compared to the control. The induction of tetraploids using this method has proven to be simple and cheap.

[S4-P20]

Field establishment of seed, cutting and tissue culture propagated Flannel flower (*Actinotus helianthi*, Apiaceae)

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The Flannel flower is an Australian native plant species that is being developed as a crop for cut flower production. Field establishment was achieved using plants propagated by seed, cutting and tissue culture. Only minor yield increases of saleable stems (flowering stems longer than 40 cm) were achieved using tissue culture-derived plants. Cutting-grown plants were the lowest yielding. It is suggested that seed may be the best form of propagation until high yielding varieties are available by vegetative propagation or, preferably through the development of uniform seed lines. Yield of seedling grown plants per unit area was maximised by a planting density of 25-49/m^2 conferred by row spacing of 15-22.5 cm and between plant spacing of 15-30 cm. Further optimisation of planting density is required as this trial was conducted for one season at one site.

[S4-P21]

Diseases affecting Flannel flower (*Actinotus helianthi*) cultivars

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Three cultivars of Flannel flower (*Actinotus helianthi*, family Apiaceae) were inoculated with isolates of *Rhizoctonia* sp., *Phytophthora cinnamomi*, *Cylindrocladium pauciromosum*, *Fusarium oxysporum* and *F. solani*. After four months, cultivar 'Starbright' was unaffected by all but *C. pauciromosum*, and had high survival rates. 'Lucky Star' had lower survival rates and was severely affected by *C. pauciromosum*. 'Parke's Star' was severely affected by all pathogens tested, especially by *C. pauciromosum* and *F. oxysporum*. These results indicate that cultivars of this species may be screened for disease susceptibility/resistance and that this information may be useful for selecting parent lines for future breeding programs.

Propagation of *Helichrysum obconicum* DC. and *Helichrysum devium* Johns. from cuttings

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Helichrysum obconicum and *Helichrysum devium* are endemic plants of Madeira Island that already showed their potential as ornamental plants.

Several experiments were conducted with mature apical cuttings from both species, in order to determine the best commercial propagation procedures.

In the first experiments with *H. obconicum* and *H. devium* was studied the combined effect of removal or not of 1cm of the epidermal layer from the lower part of the cutting, and the application of Seradix nº 1, IBA and KIBA (1000ppm; 5 seconds dipping) on rooting. In *H. obconicum*, epidermis removal increased significantly the rooting percentage, and a faster rooting was obtained when combined with KIBA (90 and 93.3% of rooting after 2 and 3 months, respectively). In *H. devium*, the epidermis removal increased, in most cases, the rooting percentage, and there was a faster rooting when combined IBA (87.5 and 90% of rooting after 2 and 3 months, respectively).

In a second experiment with *H. obconicum*, different concentrations of KIBA (0, 500, 1000, 2000, 4000 and 8000ppm) were applied to cuttings with epidermis removed. Results showed that KIBA increased significantly the rooting percentage, but there were no significant differences between the concentrations used. The third experiment tested the effect of different dipping times of the cuttings with epidermis removed on rooting (5, 10, 20 and 40 seconds). The highest dipping time gave the worst result and was significantly different from 5 and 10 seconds.

In the second experiment with *H. devium* was evaluated the effect on rooting of different concentrations of IBA applied to cuttings with epidermis removed on rooting. There was no significant difference between 0, 500, 1000 and 2000ppm, but only between any of those concentrations and 4000ppm. 500ppm IBA gave a slightly better answer in hastening rooting of the cuttings.

The best procedure to propagate *H. obconicum* and *H. devium*, is to remove 1cm of the epidermal layer from the lower part of mature apical cuttings, followed by a 5 seconds dipping in a KIBA 500ppm solution or a 5 seconds dipping in a IBA 500ppm solution for *H. obconicum* and *H. devium*, respectively.

A new - old plant in the assortment - *Duranta erecta* L.

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Duranta erecta – first described in 1753 –grows into a 6 m tall shrub in its native habitat. Not only has it a high ornamental value due to its blue flowers which stand together in long racemes, but the species is also interesting for the ornamental plant assortment because of its orange coloured fruits. Unfortunately, precise indications concerning the cultivation of *Duranta erecta* and its scheduling for the production as flowering pot plants are lacking.

A main research aim was to find a method of effectively propagating this species. The rooting success of four types of cuttings as well as of different locations on the plant from which the cuttings originated (topophysis) was analysed. Essential to these investigations was whether generative tip cuttings have an advantage over vegetative stem cuttings with regard to the longitudinal growth, branching and flowering of the therefrom developing plants. Furthermore, the influence of the growth factor light was examined in order to improve the regulation of the cultivation. Variants with differing day lengths as well as photosynthetic lighting were realized.

The different types of all cuttings showed high rooting percentages. The generative tip cuttings produced noticeable smaller plants with improved branching. Moreover, the results show that the highest longitudinal growth is achieved under short-day growing conditions and that during long days the plants were the most floriferous. Since a few plants also flowered under short-day conditions, a quantitative long-day or day-neutral flower induction can be assumed. Furthermore, branching could be significantly enhanced with increasing the day length and the light intensity. Especially one type of stem cutting resulted in plants which flowered earlier and more intensively.

Generally, it can be recommended to grow *Duranta erecta* first under short-day growing conditions to promote vegetative growth. Following long days will achieve an intensive flowering. In conclusion, it can be stated that *Duranta erecta* is very well suited for the flowering pot plant assortment.

Control of growth and flowering of *Passiflora reflexiflora* Cav.

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In the present *Passiflora* assortment the colours white, blue, lilac as well as yellow and orange are offered to the consumer. The few known red flowering types tend to be difficult to grow, especially to propagate, and their cultivation and consumer value is low. Consequently, there is a demand for such a variety in the range of flowering pot plants. This could be achieved with the investigated *Passiflora reflexiflora*. Belonging to the subgenus *Tasconioides*, the species has crimson flowers and a decorative habit. It has been known since 1799, but has not been commercially available yet.

The investigations focused on the following research aims: vegetative propagation dependent on the season and on the application of auxins (rooting hormones IBA and NAA) at different concentrations. Also, the influence of day length and varying temperature regimes on the vegetative and generative growth were examined in order to schedule the cultivation. Moreover, the effects of pruning to encourage branching were determined. Rooting percentage, floriferousness, leaf development as well as fresh and dry mass were analysed.

The investigations showed that an application of IBA at 1% significantly increased the rooting rates during spring, but that during the following light intensive months an IBA concentration of 2% was required to improve the rooting success. Long days advanced flowering and the intensity thereof. Overall, flowering was best at a growing temperature of 25°C. Dry mass proved to be highest from plants grown at 20°C. Pruning of plants down to only four to five leaves slowed the start of flowering down by three weeks, decreased the flowering intensity and did not succeed in improving the branching of the plants.

Propagation and production of *Zamioculcas zamiifolia*

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Zamioculcas zamiifolia (Lodd.) Engl. is a tropical ornamental perennial native to Eastern Africa that produces succulent rhizomes at the base of its attractive dark green and glossy foliage. Propagation and production of *Zamioculcas* can be challenging due to its slow growth habit and warm temperatures required to produce a marketable crop. We performed experiments to determine if plants could be asexually propagated by single leaflet, apical leaflet sections, basal leaflet sections, or rachis cuttings. The effects of photoperiod and daily light integral (DLI) on rhizome development were also quantified. Cuttings were rooted in a greenhouse with overhead mist and maintained at 24 to 25 °C and a vapor-pressure deficit of 0.3 kPa. A 9- or 16-h photoperiod was delivered using a 9-h natural day extended with light from soft-white fluorescent lamp. DLI environments were created using 0, 30, 50 and 70% woven shade cloth. Apical and single leaflet cuttings developed 130% and 200% more rhizomes, respectively, than basal leaflet cuttings propagated under a 16-h photoperiod. Both apical and basal leaflet cuttings produced fewer rhizomes under a 9-h photoperiod. After 6 weeks, apical leaflet cuttings propagated under an average DLI of 0.7 to 2.2 $mol \cdot m^{-2} \cdot d^{-1}$ produced a mean of 4.7 rhizomes compared to 3.2 when cuttings were rooted under an average DLI of 0.5 $mol \cdot m^{-2} \cdot d^{-1}$. Rooted cuttings were then transplanted into 10-cm pots and grown at a constant 20, 23, 26, 29 and 32°C to determine the effects of temperature on plant development. Marketable plants were achieved after 6 to 8 months at forcing temperatures of 29 to 32°C; temperatures below 26°C delayed shoot emergence. Propagation and production time of *Zamioculcas* can be reduced by propagating apical leaflet cuttings under a 16-h photoperiod and a minimum DLI of 2 $mol \cdot m^{-2} \cdot d^{-1}$.

[S4-P26]

Propagation, flowering and cut flower performance of three *Renealmia* species from Venezuela

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Only a few species of the tropical genus *Renealmia* L. f., Zingiberaceae family, are in cultivation, and recently very attractive ones are being tested for cut flowers. Propagation, flowering, and postharvest performance as cut flower of three native Venezuelan species (*Renealmia cernua* (Sw.) J. F. Macbr, *R. aromatica* (Aubl.) Griseb. and *R. alpinia* (Rottboel) Maas) were studied. Like other members of its family, these species can be propagated by seeds or rhizomes. Seed germination differs with the species, seed maturity and freshness. Germination tests using fresh seeds of mature fruits shown that the seedling emergency of *R. cernua* can reach 70 %, with germination commencing after 35 days and continuing for more than 50 days, while in *R. aromatica* and *R. alpinia* emergence was lower and slower (15 % in 40 days and 80 days, respectively). The plants propagated by seed required 18 to 24 months to commence flowering, while that it was 9 to 12 months for plants propagated by rhizome. *R. aromatica* bloomed from April to September. *R. cernua* is the most unique of the 12 Venezuelan native species with terminal flowering, whose inflorescences are similar to *Alpinia* which are sold as cut flowers. The basal inflorescences of *R. aromatica* have a nice form of 50 to 80 cm in length with showy red and yellow colors (flowers and fruits simultaneously), and vase life up to 7 days. Floral designers have shown interest in their shining red to dark fruits, hence these basal flowering species could acquire an important place in the cut-flower specialties market.

[S4-P27]

Growth and flower development of *Epidendrum ibaguense* orchid

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Epidendrum ibaguense is an orchid naturally found in Brazil, which can be commercially growth under fully light conditions in open fields, and due to its long flowering stem, it could be used as cut flower. The full development of the inflorescence last at about 32 days, when the terminal inflorescence presents at least 50% of completely opened flowers. The postharvest opening of bud flowers was small, close to 7%, for the commercially harvested inflorescences. The longevity of the inflorescence in vase containing only distilled water ranged from six to seven days, when at least 50% of the flowers had already abscised. This orchid had a better vegetative and flowering growth during the cooler months of the year, with maximum production of stems during the month of July, when the average temperature was 17.3 °C. Longer flowering stems were obtained during the months of July and August, reaching lengths above 40 cm. The inflorescence largest diameter was coincident with the highest number of flowers/inflorescence, which occurred throughout the month of May. Production of commercial flowering stems from the months of October to March was negligible, since the inflorescence diameter and stem length were much smaller compared to those obtained from April to September growing season.

Growth and nutrient status of *Dipladenia sanderi* L. crop in the Mediterranean climate

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Dipladenia sanderi L. var. "Scarlet Pimpernel" is an ornamental evergreen vine with dark glossy oval leaves and trumpet-shaped flowers that appear from mid-spring to late-summer. It is native to Brazil, but it can be grown in the Mediterranean area, obtaining high quality plants that can be used in sustainable gardens with high biodiversity, together with autochthonous species. Nevertheless, there is little information about its technical cultivation. In this work, *Dipladenia* growth was studied during the crop cycle, considering height, number of leaves number of buds, as well as, root and shoot fresh and dry weight (FW and DW). The density was 8 pots per m^2 (0.25 x 0.5 m^2), with two cuttings per pot (14-cm diameter) and the substrate was a mixture 3:1 peat:expanded clay. Plants were ready for sale when they reached a height of 15 cm, with 32 leaves and 8 buds. The nutrient solution, applied via fertigation, was: pH 7.2, E.C. 1.2 dS m^{-1}, NO_3^- 6 mmol L^{-1}, NH_4^+ mmol L^{-1}, $H_2PO_4^-$ 0.8 mmol L^{-1},K^+ 3.0 mmol L^{-1}. The shoot:root ratio was 3.3. The water consumption of each pot plant was 2 L and the daily water consumption range was from 5 to 35 cm^3 $plant^{-1}day^{-1}$. The foliar nutrient levels during the cultivation were 16.4-25.5 mg g^{-1} DW of N, 1.5-3.8 mg g^{-1} DW of P, 11-23 mg g^{-1} DW of K, 1.1-6.2 mg g^{-1} DW of Ca, 1.3-3 mg g^{-1} DW of Mg, 5.3-13.5 mg g^{-1} DW of S and 2.0-6.0 mg g^{-1} DW of Na. These data can contribute to a better understanding of the behaviour of this crop in the Mediterranean area, being the basis of its adequate commercial production and its use in more sustainable gardens. *Dipladenia sanderi* is a suitable crop to be produced in a low cost greenhouse in the Mediterranean area. In these conditions, the maximum growth rate takes place in January.

Growing medium and fertilisation affects visual quality characteristics of potted *Eremophila* plants

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Eremophila (Family: *Myoporaceae*) is a large genus of 214 species, all endemic to Australia. *E. glabra*, an interesting species for pot plant, is a very complex species with many different forms that ranges from completely prostrate forms to shrubs up to 1.5 meters high. Leaves may be glabrous or greyish and conspicuously hairy. The flowers also vary considerably and may be green, yellow, orange or red. Flowering occurs from late winter to summer.

Rooted apical cuttings of *Eremophila glabra*, in the first week of February 2006, were transplanted to 22 cm plastic pots on a peat: perlite 1:1 or 2:1 (by volume) medium, placed in a greenhouse in Southern Italy. The plants were fertilised with a complete fertilizer (containing macro and microelements 20N-20P-20K (1,5 g/l) every week or every two weeks. Forty plants were used per four treatments (resulting from all combinations of two media and two frequencies of fertilisation). Environmental data were recorded for the air temperature and humidity. Measurement of visual quality included the following characteristics: plant height, average diameter, shoot length, number of nodes, leaves and lateral shoot. The treatment with fertilisation every week combined with the 2 peat: 1 perlite medium provides plants with better commercial quality: long and more lateral shoots and highest number of flowers too.

[S4-P30]

Effect of planting time and short-day treatment on growth and flowering of *Dahlia imperialis*

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Dahlia imperialis was once solely cultivated in botanical gardens in Japan, but recently it is also being cultivated in home gardens. It can be problematic that the plant flowers late and grows more than 3m. The cuttings of *Dahlia imperialis* were planted at 1 m intervals in a field or in a plastic container of measuring width 35 × length 50 × height 30 cm (capacity of 17.5 liter). Those placed in a glasshouse on May 11, June 11, July 10 and August 7, 2001, were analyzed. The stem elongation showed a sigmoid curve. Stem grew slowly during the high temperatures recorded in June and August, and the stems elongated rapidly from September when night temperatures dropped and the elongation stopped with the flowering beginning. It was generally surmised that stem length, the number of flowers produced, and the duration of flowering was better if the planting occurred early. Plants cultivated in the glasshouse produced very few flowers. Sunlight quality through the glass and limited root zone are two probably factors.

The short-day of 10 hours treating *Dahlia imperialis* planted in Wagner pot (1/2,000 are) and planted 1 m interval in a field were assessed for stem length, number of flowers and duration of flowering. When the treatment began earlier and lasted longer, it was confirmed that flowering occurred more rapidly and that flowers were more abundant.

[S4-P31]

Effect of temperature on the adventitious bud formation by leaf cutting of *Heloniopsis leucantha* (Koidz.) Honda

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Heloniopsis leucantha (Liliaceae) is an evergreen perennial plant that inhabits parts of Okinawa and Kagoshima, Japan. It is an endangered species and sometimes admired as a potted plant. The effect of temperature on adventitious bud formation in leaf cutting propagation was investigated to meet the supply of seedlings. Leaf cutting was performed on May 15, 2006, and maintained for four and a half months at natural temperature, and at 15°C, 20°C, 25°C, and 30°C. The adventitious bud formation rate was highest at 20°C with a 100% success rate, followed by 95% at 25°C, 85% at natural temperature, 70% at 30°C, and 20% at 15°C. 20-25°C was equivalent to the temperature of spring and autumn in the habitat. Spring is the most suitable time for the leaf cutting because the adventitious bud formation rate was low at 15°C and leaves were damaged at 30°C. This was also affirmed in additional experiments performed in March, June and August, where leaf cutting was done under natural temperature conditions. As for the adventitious bud, it originated from a cell under the cuticle layer of the basal part of the leaf after having growing roots from the cut end of the leaf. The number of adventitious buds per leaf was high at the natural temperature, 20, 25°C where rooting was superior to, and was 2.6-1.9.

[S4-P32]

Flowering of Sturt's desert pea (*Swainsona formosa*) is affected by changes in glucose concentration in shoot apices

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Sturt's desert pea (*Swainsona formosa*) is an Australia native legume which has potential as an ornamental pot plant and is also suitable for hanging baskets and as a cut flower. One of the impediments to the commercialisation of *S. formosa* as a pot plant is its inability to produce flower under low light conditions. The work reported here investigated the effect of high light intensity (800 ± 50 µmol $m^{-2}s^{-1}$) and low light intensity (150 ± 10 µmol $m^{-2}s^{-1}$) on the flowering of *S. formosa* with particular emphasis on the changes of glucose concentration in shoot apices from the vegetative to floral stages. Plants grown under high light initiated flowers within 45 days from seed germination, while plants grown under low light intensity remained vegetative and produced no flowers during the 60 days of experimental period. Using HPLC, trace amounts (0.26 mg mL^{-1}) of glucose were detected under high light intensity at the beginning of transition from vegetative to floral stage (40 days after germination) which increased to 1.35 mg mL^{-1} with progressive floral development. No glucose was detected in shoot apices of plants grown under low light during the experimental period. Results indicate that adequate glucose production may be required for floral initiation and development in *S. formosa*.

[S4-P33]

The effect of bulb size and bulb temperature treatments on flowering of *Iris xiphium*

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Iris xiphium is a plant native to the Western Mediterranean, among which some selection from wild forms and hybrids are used for year-round cut flower production. The influence of bulb size and some bulb temperature treatments on sprouting, earliness, yield and quality parameters of *I. xiphium* was studied. Four bulb size (<6g (6), 6-4g (4), 4-2g (2) y >2g (0)) and two temperature treatment (20° and 9°C for 9 weeks) were tested. Bulbs were planted in an unheated greenhouse in the Campo de Cartagena (Mediterranean coast of SE Spain). Sprouting was not affected by bulb size and temperature. Bulbs stored at 9°C flowered 18 days before bulbs stored at 20°C. The length of the flowering period was shown to be increased by 15 days after higher temperature storage. The number of flowering stems was higher in the largest bulb size and in bulbs stored at 9°C. In general, it was shown that the quality and vegetative parameters were affected by bulb size but not by temperature treatments.

Adaptation and productive behaviour of *Callistemon citrinus* to European Mediterranean areas

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Callistemon has inflorescences composed of clusters of tiny flowers arranged along and around the branches (bottlebrush shape). The blooms are remarkable for their long, showy stamens, from which the genus name is derived (Greek *kallos* - beauty, and *stemon* – stamen). It is a perennial shrub with a maximum high of 4 metres that belongs to the Myrtaceae family. The flowering period lasts from spring to summer. Because of its exuberant and colourful flowers, this shrub is the epitome of the endemic Australian flora which due to its climatic requirements, and it is suitable for the Mediterranean area. The use of *Callistemon* and autochthonous species permits the design of high biodiversity and sustainable gardens. In this work, productive behaviour adaptations of *Callistemon citrinus* have been studied during a crop cycle. Therefore, growth, water consumption and nutrition requirements have been studied by collection of data on growth parameters, substrate solution composition and leaf nutrient levels. The trials were conducted in a polyethylene-covered greenhouse located in the Mediterranean area (Spain). During the cultivation period, the nutrient solution (applied via drip irrigation) was collected in a small closed container and the soil solution was extracted with suction cups. The average EC and pH of the nutrient solution applied were 1.70 dS m^{-1} and 7.10, respectively, and the values of the substrate solution extracted were 1.68 dS m^{-1} and 7.07, respectively. *Callistemon* shows normal nutritional requirements, as shoot and substrate solution nutrient concentrations were inside the recommended range and the nutrient application was mild. This crop displays a moderate rate growth (0.29 g fresh weight per day and 0.09 g dry weight per day), showing an average dry weigh shoot:root ratio equals to 2.7 g g^{-1}. The average water consumption was 63 mL day^{-1} $plant^{-1}$.

Heliconia genotypes under partial shade: I. Shooting and blooming

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In the Northeast Regions of Brazil, the weather conditions are very suitable for growing heliconia plants, which assures a great potential for the cut flower industry. There is a vigorous vegetative growth, with strong and fast emission of lateral shoots, forming large clumps. The Federal Rural University of Pernambuco State (UFRPE) maintains its own Heliconia Germplasm Collection, which was the source of the 10 genotypes evaluated in this study. The experimental design was the randomized complete block design, with four replications. Cultivated at partial shade, the genotypes evaluated during 18 months were: *H. bihai*; *H. bihai* 'Nappi Yellow'; *H. caribaea* x *H. bihai* 'Carib Flame'; *H. collinsiana*; *H. episcopalis*; *H. pendula*; *H. psittacorum* x *H. spathocircinata* 'Golden Torch'; *H. rostrata*; *H. stricta* I; and *H. stricta* II. The evaluated agronomic parameters were: number of shoots per clump (NSC); area per clump (APC); number of flowers stems per clump (NIC); beginning of flowering stage (BFS); days for inflorescence emission (DIE); number of days from inflorescence emission to harvesting (DIH); length of flowering cycle (LFC). The NSC varied from 31.7 (*H. bihai* 'Nappi Yellow') to 143.7 (*H. psittacorum* x *H. spathocircinata* 'Golden Torch'). The APC varied from 0.39 m^2 (*H. bihai* 'Nappi Yellow') to 2.53 m^2 (*H. stricta* II). These genotypes yielded 31.7 and 105.8 shoots per clump, respectively. The NIC varied from 12 (*H. stricta* II) to 55.6 (*H. psittacorum* x *H. spathocircinata* 'Golden Torch'). The LFC varied from 131 days in *H. psittacorum* x *H. spathocircinata* 'Golden Torch' (short cycle) to 238 days *H. stricta* II (medium cycle). These results answer some of the initial questions from growers currently working at the Atlantic Forest Zone on plant selection and crop management. The information obtained with this study also serves as first guidelines for further studies on heliconia plant breeding programs in this environment.

Influence of triazoles on leaf's mineral content of *Lantana camara* subsp. *camara* in relation to light regime

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It has been already reported that the triazoles paclobutrazol (50 and 100 mg·L^{-1}) and triapenthenol (175 and 350 mg·L^{-1}) contribute to the production of compact *Lantana camara* subsp. *camara* (lantana) plants with noticeably ornamental value due to increased flowering. The present work examined the effects of the previous concentrations of paclobutrazol and triapenthenol (plus 0 mg·L^{-1}, control) on leaf's mineral content (K, Ca, P, Fe, Cu, Zn) of lantana under the shading levels 0% and 66% with the aim of drawing useful conclusions on the mineral nutrition of this plant.

Results showed that triazole concentration and shading level had significant effect on K, Ca, P, and Fe content, on a dry weight basis, while in most cases there were not any significant interactions. K and Ca content increased significantly in plants treated with triapenthenol at 350 mg·L^{-1} (vs. other triazole concentrations) and with paclobutrazol at 50 mg·L^{-1} (vs. control), respectively. In most cases, P increased significantly in plants treated with the examined triazole concentrations as did Fe with paclobutrazol, compared to control. K, P and Fe increased while Ca decreased significantly as shading increased from 0% to 66%. Cu and Zn on a dry weight basis remained fairly stable in relation to triazole concentration and shading level.

Global assimilation of mineral elements (GAE) decreased on a leaf area basis up to 31% compared to control. Leaf's dry weight decreased up to 22%. In most cases, % leaf's dry weight decrease was lower than the respective % GAE decrease on a leaf area basis. Based on these results, it could be inferred that the mineral fertilization of paclobutrazol and triapenthenol treated lantana plants could possibly be reduced to the same extent of the GAE reduction on a leaf area basis in order to reduce production costs and environmental contamination.

Effects of a new cyclical lighting system on flower induction in long-day plants

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Photoperiod is commonly manipulated during commercial production of many floriculture crops to induce or prevent flowering in photoperiodic species. To promote flowering in long-day plants, continuous 4-h night-interruption (NI) lighting at a low-intensity or cyclic lighting (e.g., 6 minutes on and 24 minutes off) for 4 hours during the middle of the dark period is generally effective. A new technology for greenhouse long-day lighting was commercially developed using a stationary high-pressure sodium (HPS) lamp with an oscillating parabolic reflector (cyclic HPS lamp). The reflector provides an intermittent beam of light over a relatively large growing area. We performed an experiment to compare the efficacy of a cyclic HPS lamp on flower induction in long-day floriculture crops with traditional NI lighting strategies. Six long-day species of annuals and herbaceous perennials were grown in a glass-glazed greenhouse at a constant temperature of 20°C with natural short-day photoperiods and three NI treatments. NI lighting was delivered during the middle of the dark period (2200 to 0200 HR) from a 400-watt HPS cyclic lamp mounted at one gable end of the greenhouse or from incandescent lamps that were illuminated for the entire 4 h or for 6 min every 30 min for 4 h. Control plants were grown under a constant 9-h photoperiod. Plants under the cyclic HPS lamp received varying light intensities, depending on the distance from the lamp. Time to visible flower bud and flowering, flowering percentage, and the number of flowers per plant were recorded. Results and implications will be presented.

[S4-P38]

Hymenocallis Salisb. - bulbs reactions to applied temperatures

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Bulbs of *Hymenocallis harrisiana* Herbert (H-3) and *H. jaliscensis* M. E. Jones (H-4) were harvested 1.09.05 after leaves were lost, and stored dry at 18 to 22°C until use. The test temperatures were 10, 15, 20, 25, 30°C (H-3) and 10, 15, 20, 25, 30, and 35°C (H-4). Bulbs were taken out of storage 9.2; 3.4. and 15.4.06 for planting at indicated temperatures. The main objective of this test was to define the approximate time of bulbs dormancy and temperature, which perhaps could be used to break it. Both species belong to xerphyte obligate group of *Hymenocallis*. As storage time progressed, the time - response shortened and the temperature to initiate the emission of leaves and scapes lowered. The temperature required to initiate the emission of leaves and scapes differed for each of the species. The field soil temperature (maximum °C - minimum °C) was almost equal to the successful laboratory temperature for H-4 foliation and flowering of bulbs stored from September to April. Thus, bulbs growing under the open field and stored under laboratory conditions terminated dormancy almost at the same time. Data suggest that the types of both species are not suited for forced flowering. The thermic requirements were higher for H-3 bulbs. These bulbs gave a higher mass of leaves and bulbs at 30°C than at lower temperatures. In contrast, H-4 bulbs reacted with equal mass at 20, 25 and 30°C. Quantitative responses are illustrated with respective regressions.

[S4-P39]

Two substrate trial to cut flower *Heliconia* in soilless culture

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Cut flower production of two cultivars of *Heliconia psittacorum*, 'Teide' and 'Guajara', was evaluated using two substrates, inorganic volcanic basalt tuff (picón or lapilli) and coconut fiber, in soilless culture in a climate-controlled greenhouse.

Earlier studies using tuff alone were satisfactory, but the present trials showed that coconut fiber increased flower production by 40 to 45%. The fiber substrate also improved quality in terms of individual stem length and overall weight, and the weight: length ratio was also improved, particularly in 'Teide', which has a tendency to produce overlong, thus weaker, stems. However new shoot production in the plants grown in the fiber substrate was so great that competition for light eventually caused a significant decrease in flower bud production, resulting in the need to renew the crop yearly instead of every two years as when tuff is used. Trials are underway to clarify the extent to which the coconut fiber itself is responsible for this excessive vegetative growth.

Temperature requirements for good quality *Lachenalia* pot plants

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Temperature is the main factor influencing flower formation and emergence in many flower bulb genera. *Lachenalia* is a winter flowering bulb crop with a warm – cold – warm growth temperature cycle. Flower initiation and development takes place during the storage period of the bulb. The natural flowering time of cultivars (produced in the Southern Hemisphere) is June – August. During this period there is a very low demand for flowering pot plants in Europe (the main export market), because of the summer holidays. The flowering time thus have to be retarded for flowering during October to April when the market demand is higher. Research on the treatment of bulbs with different storage temperatures to ensure good quality pot plants have been done over the last 15 years. It was found that flowering can be retarded by storing bulbs at 9°C directly after harvest. Storage at 20-25°C for a minimum of 18 weeks (early flowering cultivars) and 20 weeks (late flowering cultivars) are needed for optimal flower initiation and development. Cold pre-plant temperature treatments can be used to shorten the glasshouse period. A treatment of 9°C for three weeks just before planting significantly reduced the glasshouse period, but also reduced the quality of flowers. Growth temperatures also influenced the quality of pot plants. The prevailing temperatures in the preparation phase as well as the actual growth temperatures will additionally play a role in the quality of the plant. Cool growing temperatures for both phases are required for best quality.

Behaviour of Anthurium cultivars as pot plant in Northern Paraná State, Brazil

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The genus *Anthurium* Schott. (Araceae) inserts more than 600 ornamental, distinguished by their foliage beauty. The *Anthurium andraeanum* Linden has the preference of the costumers as an ornamental plant because its spathes size and color. 'Parakanã', 'Terena', 'Apalai', 'Ianomami' and 'Rubi', are cut flower cultivars of *Anthurium andraeanum* produced by Instituto Agronômico (IAC), which were evaluated as pot plant, in Londrina(PR). The *in vitro* propagated seedlings were obtained from the Laboratory ClonAgri. The experiment was lead in an arc type greenhouse, with 80% of shadow (black colored polypropylene screen). The micropropagated plants were cultivated on vases (diameter = 23 cm and height = 17 cm) containing substrate of coconut fiber Golden Mix type 80 of Amafibra®. The evaluation of the comparative performance was initiated since the seedlings were planted, in February of 2003. The parameters evaluated monthly were: height of the plants, number of leaves and spathes. Evaluations showed an increase on the height of plants and in the number of leaves during the three years of cultivation. The cultivars Parakanã, Rubi, Terena and Apalai had reached the standard for commercialization as pot plant after three years, while cv. Ianomami presented less vegetative development and did not flower during this period.

Comparation of different fertilization methods in pot native plants production I: *Iberis carnosa*

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The use of native plants, more adapted to the environment, in gardens can contribute to a water and nutrient saving and to generate a more sustainable way of live. The commercial production is necessary to satisfy the demand for this kind of plants. The goal of this work was to evaluate the effects of different fertilization methods on biomass production, uptake and N, P and K leaching amounts of *Iberis carnosa*, which belongs to the *Brasicaceae* family. This species presents a low size (15 mm) and lives in sandy and rocky areas between 800-2000 m above sea level.The experiment was conducted in a polyethylene greenhouse located in Almería (Spain). Plants of *I. carnosa* obtained from seeds were transplanted to containers filled with a mixture of perlite, blond peat and coir (3:1:1 v/v/v) on the 25th of March, 2004. The trial was concluded at the full flowering stage. Two fertilization methods were applied: controlled release fertilizer (CRF) mixed with the substrate (O), with Osmocote plus 16:8:12 (8-9 month release at 20°C) at pre-planting, and fertigation (F). Two nutrient levels per fertilization method were studied. The treatments were: O_1 (5 g L^{-1}), O_2 (7 g L^{-1}), F_1 (3 mM of N, 0.4 mM of P and 2.5 mM of K) and F_2 (5 mM N, 0.7 mM of P and 4 mM of K). The crop cycle, from transplanting to flowering, lasted 123 days. The highest CRF level gave the significantly highest dry matter production (3.876 g per plant). The plant uptake was 104 mg N, 9 mg P and 123 mg K per plant and the integral losses by leaching was higher for N (168 mg per pot) than for P and K (19 mg and 81 mg per plant, respectively). The average dry matter NPK concentration has been 26.9, 2.3 and 31.7 mg g^{-1} DW, respectively. The NPK balance recommended for fertilization was 1: 0.1:1.2. These data set the basis to establish the technical criterion for native plants production.

Comparation of different fertilization methods in pot native plants production II: *Teucrium capitatum*

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Native plants are well adapted to the environment and the design of gardens containing these plants can contribute to reduce the use of fertiliser and water and hence are more sustainable. Calcicole and gypsum tolerant plants, like *Teucrium capitatum* which belongs to the *Lemiaceae* family, are especially interesting in the Mediterranean area. The objective of this work was to evaluate the influence of different fertilization methods on biomass production, as well as on N, P and K uptake and leaching of *Teucrium capitatum*. The experiment was conducted in a polyethylene greenhouse located in Almería (Spain). Plants of *Teucrium* obtained from seeds were transplanted to containers with a mixture of perlite, blond peat and coir (3:1:1 v/v/v) on 25th March, 2004. Two fertilization methods were applied: controlled release fertilizer (CRF) mixed with the substrate, with Osmocote plus 16:8:12 (8-9 month release at 20°C) at pre-planting (O), and fertigation (F). The treatments were: O_1 (5 g L^{-1} Osmocote), O_2 (7 g L^{-1} Osmocote), F_1 (3 mM of N, 0.4 mM of P and 2 mM of K) and F_2 (5.5 mM N, 0.6 mM of P and 3 mM of K). The cultivation cycle, from transplanting to the full flowering phase, lasted 123 days. The highest level of CRF gave the significantly higher dry matter (DW) production (3.11 g per plant). The average NPK concentration in dry matter was 26.5, 3.4 and 24.4 mg g^{-1} DW, respectively. The plant uptake when supplied with the higher rate of Osmocote was 82 mg of N, 11 mg of P and 76 mg of K per plant. The recommended fertilization equilibrium was 1:0.1:0.9 (N.P.K). The average NPK leaching percentage with Osmocote (12% of N, 5% of P and 21% of K) was lower than with soluble fertilizers. The results show that the addition of Osmocote plus 16:8:12 to the growing media is more efficient way of producing good quality *Teucrium* pot plants.

Comparation of different fertilization methods in pot native plants production III: *Thymus longiflorus*

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Thymus is a woody aromatic perennial plant often found in chalk and limestone grasslands in Europe which belongs to the *Lamiaceae* family. It is a mat-forming plant that has lance-shaped, dark green leaves with yellow variegation and lavender-pink flowers that provide additional interest in summer. Data about its production techniques are essential to enable a production for the demand for more sustainable Mediterranean gardens, with native plants. The aim of this work was to evaluate the effect of different fertilization methods on biomass production, as well as on N, P and K uptake and leaching from the pots of *Thymus longiflorus*.. The experiment was conducted in a polyethylene greenhouse located in Almería (Spain). Plants of *Thymus* obtained from seeds were transplanted to containers with a mixture of perlite, blond peat and coir (3:1:1 v/v/v) on 25th March, 2004. The trial was concluded at the full flowering phase. The experimental design consisted in two fertilization methods: controlled release fertilizer (CRF) mixed with the substrate before planting, with Osmocote plus 16:8:12 (8-9 month release at 20ºC) (O) and fertigation (F). Two nutrient levels were used within each method. The treatments were: O_1 (5 g L^{-1} Osmocote), O_2 (7 g L^{-1} Osmocote), F_1 (3 mM N, 0.4 mM of P and 2 mM of K) and F_2 (5 mM N, 0.6 mM of P and 3 mM of K). The cultivation cycle, from transplanting to full flowering, lasted 88 days. CRF gave a significantly higher dry mater production, with 4.40 g per plant (O_2), versus the 2.5 g per plant in F_2. The average NPK concentration in dry matter was 20.4, 2.0 and 25.6 mg g^{-1} DW, respectively. The average plant uptake of CRF was 90 mg of N, 9 mg of P and 113 mg of K per plant. The recommended fertilization equilibrium was 1:0.1:1.2 (N.P.K). The losses by leaching during the cultivation were lower in the CRF treatments. The results show that the addition of Osmocote plus 16:8:12 to the substrate, although it is more expensive than soluble fertilizers, contributes to a more efficient production of good quality thyme pot plants.

Production trials of *Odontonema strictum* (Nees) O. Kuntze for flower-pots production

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Odontonema strictum (Nees) O. Kuntze, native of Central America, is an herbaceous perennial plant belonging to Acantaceae family. In 2005, after consideration of its ornamental value, including its persistent leaves and beautiful flowers, *O. strictum* was introduced into C.R.A. - Istituto Sperimentale per la Floricoltura – Sezione di Palermo in order to evaluate flower-pot production during the autumn-winter season.

The aim of this trial was to verify the best aesthetic effects of the pot-plant. Rooted cuttings from the nursery, in the middle of August, were used for the trial. Two different diameters of the pots (18 and 22 cm), filled in with an organic substrate and four treatments (1 to 4 plants/pot) were tested. The experiment was conduced with a density of 15 pots.m^{-2} under 30% shade cloth in order to reduce the light intensity. A split-splot experimental design with 3 replicates, consisted of 5 pots each thesis was used for the statistical analysis.

During the experiment the following parameters were evaluated: number of shoots/pot, plant height; number of buds/pot, besides, the production mean time of the marketable pots was calculated. Data were analysed by variance analysis.

The results of the trial showed that under the temperature and light environment occurred during the experiment, it was possible to obtain flowering potted plants during autumn-winter season with different aesthetic effects in relation to the number of plants/pot and the pots diameter. The combination (4 plants/pot in to 22 cm diameter) provided, in about 80 days, healthy and good quality compacted plants with the highest number of shoots/pot (10), the best height rate (51 cm) and the highest number of flowering shoots/pot (5,6).

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SESSION 5:
POSTHARVEST BIOLOGY, TECHNOLOGY AND QUALITY

SESSION 5
ORAL COMMUNICATIONS

POSTER COMMUNICATIONS

[S5-O1]

Abaxial and adaxial surfaces of spathe tissue of *Zantedeschia*, differ in their pattern of re-greening

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Re-greening of spathe tissue is a primary determinant limiting the post harvest quality of *Zantedeschia* as both a cut flower and pot plant. In the absence of any detailed description of the pattern of re-greening in *Zantedeschia* hybrids, the change of spectrophotometric a/b ratio in both intact spathes and excised discs were investigated. From harvest maturity, changes in value of the a/b ratio over time was consistent between excised discs, detached spathes, and those spathes remaining attached to plants. For the cultivar 'Best Gold', the a/b ratios of discs excised from the bottom, central, and upper regions of the adaxial surface remained constant at a value of 0.1 for the first 2 days, and subsequently decreased rapidly at different rates until they reached a plateau of approx -0.3 by 19 days. The rate of decline of a/b ratio increased from bottom to upper positions, ranging from 0.055/day at the bottom to 0.018/day at the upper region. The a/b ratio of the abaxial surface decreased at a slower rate of 0.025/day than the 0.055/day of the adaxial surface. Correlations between changes in spectrophotometic values, pigment concentration, and cellular ultrastructure of abaxial and adaxial surfaces from bottom, central, and upper regions will be presented.

[S5-O2]

Improving water balance and vase life of new cut foliage branches of *Dodonea* by postharvest treatments

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Decorative foliage branches provide an important filler crop in floral decorations for world floriculture industry, and their marketing is significantly expanding. One of the new foliage branches cultivated and developed in Israel is *Dodonea* hybrid 'Dana', which has a high export potential as decorative foliage, but has limited vase life due to leaf wilting and abscission. *Dodonea* hybrid 'Dana' is a new successful clone with purple tinted leaves, derived from *Dodonea viscosa* L. (*Sapindaceae*) originated from Australia, which is grown as a foliage small-medium shrub. The wilting problem of cut *Dodonea* hybrid 'Dana' branches results from improper water conductance, which may be caused by vessel occlusions due to tylose or gum deposition in the xylem, air embolism or lack of transpiration. Therefore, our research was focused on studying the anatomical properties of various *Dodonea* clones that differ in their longevity, as well as examining the effect of various postharvest treatments on water balance parameters. Anatomical analysis of *Dodonea* hybrid 'Dana' revealed that the stems have relatively few water vessels and they are enriched with fibers. In the xylem of the leaf petioles some unidentified depositions were observed, which increased during vase life. The longevity of the various *Dodonea* clones was negatively correlated with their weight loss during vase life. Storage of *Dodonea* hybrid 'Dana' branches at 6°C for 24 h as transport simulation, which enhanced their leaf wilting and abscission, resulted in a significant reduction of their water uptake, but did not affect their water evaporation. Pulsing *Dodonea* branches for 24 h with a solution composed of aluminum sulfate (TOG-10), organic chlorine (TOG-6) and the ethylene action inhibitor silver thiosulfate (STS), significantly prevented leaf abscission and improved longevity, due to the positive effect of this treatment on water uptake, water potential and the relative water content (RWC) of the leaves. Pulsing the branches with 50 mM KCl, known to decrease hydraulic resistance, significantly improved water uptake. Our results suggest that treatments which affect the water balance status of *Dodonea* cut branches, can significantly improve their quality and enable the export of this new decorative branch from Israel.

Postharvest treatments to improve quality of new cut flowers following air or sea transport from Israel

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The broad and successful Israeli flower export is based on introduction of new floricultural crops, according to the market trends and requirements. This strategy depends mainly on the appropriate acclimatization of the new crops in Israel, as well as on their adequate postharvest manipulation that will guarantee the highest quality. Accordingly, several new treatments were developed for improving the postharvest quality during storage and transport of various new crops exported as cut flowers. A brief screening of various chemical treatments developed to solve common postharvest problems in several exported new cut flowers, will be presented. 1) Sucrose pulsing (for 24 h) combined with ethylene action inhibitors such as silver thiosulfate (STS) or 1-methylcyclopropene (1-MCP) and addition of 1% glucose (commercial 'cut flower food') to the vase solution, improved flower opening, color and vase life duration of *Leonotis leonurus*, *Delphinium elatum* and *Salvia azurea* Lam cut flowers. 2) Dipping cut branches of *Viburnum tinus* in STS and subsequent pulsing with 2,4-dichlorophenoxyacetic acid (2,4-D) and STS for 24 h, prevented floret abscission and improved their opening after prolonged sea transport of 8 days at 2°C. 3) Dipping the inflorescence of several new *Grevillea* cultivars ('Spiderman', 'Misty Red' and 'Little Pink Willie') in cytokinin solutions of benzyl adenine (BA) or thidiazuron (TDZ), combined with addition of 1% sucrose and a preservative to the vase solution, improved significantly the vase life and inhibited flower senescence. All these postharvest treatments enabled successful handling and transport of various new cut flowers, and significantly improved their quality and vase-life following air or sea export from Israel.

Pulse treatments on postharvest of *Ctenanthe setosa* (Rosc.) Eichler cut foliage

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Cut foliage is an important part of the florist industry, being an obligatory component in floral arrangements and ready bouquets. Marantaceae leaves have a contrasting color pattern and a decorative design which are interesting traits for its use as cut foliage. No postharvest research has been carried out on the potential as cut foliage for species of the genus *Ctenanthe*, Marantaceae. Grey-maranta (*Ctenathe setosa*) is an herbaceous ornamental plant native of Brazil whose cut foliage has potential to be used as new crop product for local ornamental market as well as for international ones as a source of novelty due to its decorative leaves with dark and metallic green bands and reverse purple. The objective of this study was to report observations upon grey-maranthe foliage postharvest characteristics and evaluate pulse treatments to maintain quality and extend keepability. The experiment was conducted in a complete randomized design with three replications (three stems in each vase) and eight treatments: distilled water; pulsing cut petioles-ends in citric acid (pH = 2.8/1h); 2% sucrose (4h); 1% sucrose plus 200 mg L^{-1} citric acid (4h); 0.01% Tween® 20 (4h); 100 mg L^{-1} benzyladenine plus 0.01% Tween® 20 (4h); 100 mg L^{-1} gibberellic acid plus 0.01 % Tween® 20 (4h); and maintenance of cut petiole in holding solution containing 0.5 mL L^{-1} of commercial sodium hypochlorite. The senescence symptoms were mainly characterized by leaf rolling and for a decrease on the angle formed between leaf and petiole as a response to water deficit stress. Twenty days after harvest, foliage pulsed with gibberellic acid plus Tween® 20 showed a significant smaller leaf rolling (33.08%) compared to control (59.01%) and higher leaf relative water content compared to foliage in holding solution of sodium hypochlorite. Gibberellic acid or benzyladenine pulse treatments significantly extended longevity (7 days compared to control) and maintained leaves green coloration and brightness for a longer time compared to control. Foliage pulsed with benzyladenine plus Tween® 20 showed a significant smallest loss of accumulated fresh mass percentage compared to control by the t test as to parallelism of treatments lines.

Postharvest characteristics and treatments to overcome latex exuded from cut flowers of Lotus

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Lotus (*Nelumbo nucifera* Gaertn.) is a perennial herbaceous aquatic ornamental plant with potential to be used as a new cut flower for the Brazilian ornamental market. It shows exotic and attractive flowers and has a strong market appeal, once it is known as a symbol of purity, holiness and immortality. However, blooms have a short-vase life. Lotus flower stem exudes a large quantity of sticky milky sap from the cut surface, which is produced in laticifers, spatially associated with both xylem and phloem. It has been reported that, latex coagulates on the cut surface preventing or reducing water absorption and reducing flowers keepability, requiring treatments to stop the flow of latex. The objective of this study was to report observations upon lotus postharvest characteristics and evaluate treatments to overcome latex flow. The experiment was conducted in a complete randomized design with three replications (four stems in each vase) and eight treatments: control (distilled water), pretreatment of cut stem-ends with hot water (40°C/1 minute), boiling water (3 seconds), isopropyl alcohol 90% (10 minutes) or citric acid (pH = 2.8/1h) and, maintenance of stems in holding solution of Tween® 20 (0.01 %), citric acid (200 mg L^{-1}) or Tween® 20 (0.01 %) plus citric acid (200 mg L^{-1}). Treatments had no significant effect on flowers keepability (three days in average), although isopropyl alcohol, hot and boiling water completely stopped latex flow. Also, treatments did not differ significantly as to the accumulated variation of fresh mass percentage. Cut stem-ends pretreated with citric acid (pH = 2.8/1 h) showed a significantly higher relative water content of petals compared to others treatments. The senescence symptom of lotus cut flowers was mainly characterized by abscission of turgidy petals and stamens shattering without any visual change on petal color and brightness.

Effects of silver thiosulfate complex (STS), sucrose, surfactant and their combination on the vase life of cut flower of *Lathyrus latifolius* L.

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Perenial pea (*Lathyrus latifolius* L.) is a perenial new florist crop introduced to Japan in the 1990s. Flowering behavior and pretreatment method to extend the vase life of this plant has been unknown. This study was carried out to develop a useful and practical pretreatment method using STS solution to extend the vase life of cut perennial pea flowers. Cut flowers were treated with 1) 100g·liter^{-1} sucrose for 2 hr, 2) 0.05% surfactant for 2 hr, 3) 0.2 mM silver thiosulfate complex (STS) for 2 hr, 4) 0.2mM STS + 10% sucrose + 0.05% surfactant for 2 hr, and 5) water (control). To evaluate effects of the treatments on vase life were transferred to vessels containing distilled water and kept at 22° C, 70% relative humidity, under 10 μ mol·m^{-2}·s^{-1} light intensity and a 12-h photoperiod. Compared to the control, all treatments extended longevity. Vase life of cut flowers treated with 0.2mM STS + 10% sucrose + 0.05% surfactant for 2 hr was extended by 3 times compared with that of control. This pretreated is recommended to extend the vase life of cut perennial pea flowers.

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SESSION 6: STRESS PHYSIOLOGY

SESSION 6
ORAL COMMUNICATIONS

POSTER COMMUNICATIONS

Phosphorus nutrition of the australian plant *Caustis blakei*

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Most Australian plants (80%) are not sensitive to phosphorus (P) and concern over real or assumed P sensitivity has limited the commercial use and popularity of some species. The unique adaptations of some native plants such as the Australian sedge *Caustis blakei* Kük (Cyperaceae) enable these plants to access P from improvished soils. *Caustis* is highly efficient in its acquisition and uptake of P (Gikaara et al., 2004). We sought to identify some of the physiological adaptations contributing to the high P use efficiency of *Caustis* and also to characterise its extreme sensitivity to P when grown under a range of solution P concentrations. Observed low-P adaptations include an increased root to shoot ratio and the formation of specialised dauciform roots at very low solution P concentrations ($\leq$1µM). It is proposed that dauciform roots play an analogous role to cluster roots as an adaptation to low soil fertility (Davies et al., 1973; Shane et al., 2005). After 20 weeks of growth at 0.01, 0.1, 1.0 and 10 µM solution P, the percentage of dauciform roots to the entire root mass was greatest in the low P solution of 0.01 µM (37%) and declined with increasing P supply. Citrate was the major carboxylate present in root exudates of mature dauciform roots reaching a peak rate of 0.3 µmole h^{-1} g^{-1} FW. Malonate was the dominant internal carboxylate present with the highest concentration in young dauciform roots, (17 µmole g^{-1} fresh FW). At solution P concentrations of $\geq$ 10 µM, dauciform roots were absent, and the plants showed typical P toxicity symptoms. We hypothesized that the down regulation of root high affinity P transporters may be impaired in *Caustis blakei* leading to the accumulation of P in the shoot to toxic levels. Molecular experimental work led to the isolation of two putative high affinity transporter genes, CbPT1 and CbPT2 from P starved roots. Research to increase our understanding of root function and P acquisition mechanisms in Australian native plants may lead to novel ways to improve P utilisation efficiency in all species.

Ornamental geophyte *Renunculus asiaticus*: annual changes in root cell structure during plant desiccation and rehydration

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Renunculus asiaticus L. (Turban Buttercup), originated in southwestern Asia and the Mediterranean region, is a perennial geophyte with bright flowers varying in color from white and yellow to pink and red. Underground storage organs of *R. asiaticus* are annual crowns with several renewal buds and tuberous roots. *R .asiaticus* represents a special type of resurrection geophyte, which survives unfavorable environmental conditions in the form of underground storage organs. This species is ecologically adapted to an annual cycle of desiccation and resurrection, and can serve as a model for investigations of mechanisms of plant adaptations to long periods of heat and drought, as well as desiccation tolerance of underground organs, especially roots. The annual developmental cycle of tuberous roots was studied with respect to structure and content of their cells, to understand how they are adapted to desiccation, high temperature and rehydration. The roots o f *R. asiaticus* undergo profound changes in cellular structure and contents during their annual life cycle, incorporating phases of growth, cell wall and protein deposition, desiccation, and degradation of the wall and cellular contents. The accumulation of proteins presumably serves as a store for nitrogen to support early re-establishment of the shoots, and some proteins may have a protective function under high-temperature and/or desiccation conditions. In addition, binding of water by pectin in the cell walls may serve as a protection mechanism during desiccation and rehydration to limit stress-induced damage to the cells, as well as serving as a potential source of carbon for the growing plant when mobilized. Longitudinal Magnetic Resonance Imaging examinations during the drying of *Renunculus* roots showed a decrease in external size initially as result of water loss, while their internal relative water content remained rather constant. The MR relaxation times T_1 and T_2 values exhibited a gradual decrease, commensurate with the decrease in size and overall water loss. The decrease in relaxation times was most likely caused by internal changes in the structure and composition of cells, reflecting protective, desiccation-adaptive measures.

[S6-O3]

Echeveria spp. - rosettes tolerance to long-lasting water constraint

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The genus *Echeveria* offers interesting ornamentals. Its plants are characterized by excellent use of water. For this reason more attention should be paid to CAM plants. It was found, studying *Echeveria* cut flowers, kept without water, that their lateral inflorescences were growing, buds were opening for weeks. This suggested that perhaps rosettes and the whole plants could be extracted from the soil and stored without water for some weeks. If such material could restore their original size and preserve flowering capacity then this will save a lot of water and maintenance expenses. Moreover, production of rosettes ready for flowering could be started away from their final destination. The objective of this study was to test this assumption. The rosettes (roots free) and whole plants (rooted rosettes) extracted from the soil of *E. gibbiflora*, *E. pallida* and a mutant # 126 at the start of March were exposed for 2.5 and 3.5 month to the open sky (sunny exposition) and the shade (without direct sun). During that time the loss in fresh mass was recorded. At the end of the exposition time the loss in fresh mass reached 40%. After that time the rosettes were planted in soil. Replanting resulted in stems rooting and the restoration of rosettes' growth. Every 2 weeks measurements were taken of rosettes and flowering stem growth (vegetative and generative parts). At the end the flowering quality was recorded. From 1 to 3 flowering stems per rosette were obtained at the end of the experimental time. The rosettes restored normal size. The conclusion is that rosettes cut from the trunk or the whole plant, rooted or rootless, extracted from the soil and stored under the open sky or shade, can be stored for at least three month without impairment to their capacity of rooting, growth of rosettes or flowering. This procedure allows saving of water. The results indicated also that rosettes of *Echeveria* can be produced as half-finished product away from its final destination.

[S6-O4]

Wildflowers plantings to reduce the burden of urban gardens and roadsides management

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Public green areas are a heavy charge for local councils and they are often neglected due to the limited resources. Infact traditional horticulture requires high agronomical and economical inputs to succeed. Since the '70 in North Europe and USA it has been a common practice to manage roadsides, roundabouts and some urban areas with mixed plantings of annual and perennial native species with a great reduction of inputs (water, chemicals). In the Mediterranean regions very few studies have been carried out on this subject, in spite of water shortage and difficulties to manage successfully the green areas. The Agency for Development and Innovation in Agriculture and Forestry of Tuscany (Italy) financed the project "Production and strategic employment of wildflowers for the beautification and environmental regeneration of derelict, urban and peri-urban areas" aimed to study the ecology of herbaceous native species and their suitability for naturalistic plantings and to promote a more sustainable urban horticulture. Twelve plantings were set up in different areas in cooperation with town councils, schools and motorway companies. Soils were sampled to determine their physical and chemical characteristics, the plantings were monitored up to the flowering period and the best low input techniques was assessed. Wildflower meadows performed very well in soil resulted unsuitable for traditional ornamental planting and most of the species flowered in the first and second years. The employ of local wildflower in naturalistic plantings resulted a low-cost technique to manage green areas, to contribute to the biodiversity maintenance, and a useful tool for the conservation of species.

[S6-O5]

Original vegetation recovery of two degraded areas in the Mediterranean island of Marettimo

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The Egadi archipelago consists of three islands (Favignana, Levanzo and Marettimo) located west of Sicily in the Mediterranean Sea. Of the three islands, Marettimo with a surface area of 12 km^2, is the furthest from Sicily about 38 km. Marettimo is the most mountainous island and richest in endemic species. Soils are mostly thin and low in fertility and organic matter. Scrub (*maquis*) is the natural vegetation. Since ancient times, islanders developed a productive agricultural system based on a series of finely constructed terraces which supplied food for the populations' needs. However, unemployment and poverty, after World War II, forced many growers, to abandon entire fields. Since then human activity and soil erosion have largely depleted the original vegetation in some parts of the island. The aim of this study was the vegetation recovery of two degraded areas of Marettimo, where endemic and naturally growing plant species have largely disappeared. After a detailed analysis of the remaining original ground cover vegetation, several species adapted to survive in the hot arid summers of the South Mediterranean were identified. Seeds and/or cuttings were collected from *Coronilla valentina* L., *Erica multiflora* L., *Euphorbia dendroides* L., *Helichyrisum rupestre* (Raf) DC. var. *messerii, Inula crithmoides* L., *Rosemarinus officinalis* L., *Senecio bicolor* (Willd.) Tod. and used to propagate new plants. Propagated plants were reintroduced to their native habitat.

[S6-P1]

Water consumption modelling in *Dieffenbachia amoena* 'tropic snow'

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In soil-less culture, the small water retention capacity of the root medium implies a high watering frequency with a discontinuous rhythm along the day. For this reason, the study of models about the water consumption is necessary. These models can be employed in the water management of gardens, what permits a sustainable maintenance, using climate sensors to register the climatic parameters. Considering water consumption equivalent to transpiration (E), the modified equation proposed by Penman-Monteith [E = A f_1(LAI) G + B f_2 (LAI) VPD] can be used for its estimation. This equation is composed by a radiation component (G) and an advective component (VPD), related to the leaf area index (LAI). The trial was carried out for two years in a buried greenhouse where external radiation, temperature and humidity were measured continuously using a Q20-B sensor and a RTV-5B sensor. In order to estimate the leaf area, the length (m) and the maximum width of each leaf of all the plants used in the trial were measured twice a month. Besides, the regression equation previously established was applied, introducing the experimental estimation coefficient in a random sample of 50 leaves; length, width and area were measured using a leaf area meter Delta-T. As parameters A and B are related to LAI, they depend on the species and show the following values for *Dieffenbachia amoena* 'Tropic Snow': A = 0.25 (adimensional) and B = 0.016 kg h^{-1} m^{-2} kPa^{-1} (values obtained through multivariante regression with a determination coefficient of 0.92). These results allow using the water consumption model for irrigation management in commercial crops.

Eucalypts as ornamental shrub mass and hedges in Mediterranean climate landscapes

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As sustainability issues become more important in the selection of ornamental plants, there must be greater emphasis placed on species that are both attractive and functional but that do not require significant resource inputs, particularly water, for success. Plants must also tolerate specific environmental stresses, the local climate and ideally have biodiversity values. Finding suitable species that can meet these requirements is a challenge. Many eucalypts are used in floriculture to produce colourful stems of juvenile foliage. In these systems many species are extremely drought tolerant, easily cultivated and trees are managed by pollarding and/or coppicing to control height and stimulate stem production. Some of these floriculture species may suit use as hedges and shrub mass in urban landscapes, managed by annual or biannual pruning. An experiment was conducted to investigate the responses of twenty eucalypts to heavy, sequential coppicing. The plants were grown in a field plot using a randomized block design and subjected to four coppice treatments. Plant growth data was recorded prior to each coppice treatment in February, 2003, September, 2003, April, 2004 and April, 2005. There were significant differences between species in survival, plant height and shoot number. These differences could be used to sort species into three response groups: Group 1 contained plants with low rates of survival and/or vigour and a small growth habit/form; Group 2 had plants with high rates of survival, but excessive vigour and growth habit/form; and Group 3 had plants with high rates of survival, a moderate growth rate and moderate growth habit/form. Plants in Group 3, including *E. pulverulenta* and *E. perinniana*, showed the greatest potential for use as shrub mass and hedges in metropolitan Melbourne and similar Mediterranean climate urban landscapes.

Growth of Magnolia under three irrigation systems in a woody ornamental nursery

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Supplying ornamental plants for landscaping is a challenge and an opportunity for a large number of nurseries, mainly those ones capable to be more competitive. Offering better products with lower prices demand application of better technologies and more efficient management of agricultural practices, including irrigation systems and water saving strategies. This paper reports the effects of three different irrigation systems on plant growth parameters of one-year old magnolia plants (*Magnolia grandiflora* 'D.D. Blanchard'), in 56.8-liter (15-gallon) plastic containers. The study was carried out in a commercial nursery in Florida, USA, where there are more than 7,000 registered nursery growers producing woody and many other ornamental plants. In this industry, overhead sprinkler system is the most common among growers, microirrigation system is not yet very common, and the outdoor ebb and flow irrigation system is an innovative system. The ebb and flow system is a recirculatory system and has components for rainwater harvesting and reuse, such as plastic lining throughout the cultivated area and a reservoir. Irrigation variables and plant growth parameters of magnolia were monitored during a period of 12 months. There was significant effect of irrigation systems on plant height and growth index during the period of study. In both cases, the overhead sprinkler irrigation system produced smaller values than ebb and flow and microirrigation systems. These results show that irrigation system selection and management practices have important impact on plant growth and also on water savings. The potential of these irrigation systems, or a combination of their structures, according to the local conditions, should be taken in consideration when planning nurseries to grow magnolias or any other container-grown woody ornamental plant.

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ANEXO 3

Presentaciones en posters

Zamioculcas

Introduction

Zamioculcas zamiifolia, which will be referred to hereafter as ZZ, is a member of the Araceae family and is commonly known as African coontie, aroid palm, arum fern, and emerald frond. The ability of ZZ to grow under low light conditions, its tolerance to drought stress, its unique appearance, its low maintenance requirements and limited pest problems are characteristics that contribute significantly to its ornamental and interior plantscaping value.

With only one species in the genus of this ornamental, the creation of new clones may allow breeding and variety development to advance more quickly. The objective of this experiment was to create tetraploid ZZ plants using various concentrations of colchicine.

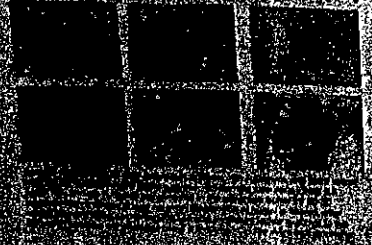
Materials and Methods

Treatments

Colchicine was dissolved in distilled water to make 0.05, 0.2, and 0.4% solutions and ZZ leaflets were treated with colchicine in two ways: immediately after harvest (before rhizome development) and after a small rhizome had been produced. For those leaflets treated immediately after harvest, the cut portions of the leaflets (the exposed surface of the petiole) were soaked for 24 hours in 50ml of the treatment solution. After treatment, the leaflets were rinsed with distilled water and transplanted to a metal flat containing moist 1:1 v:v peat vermiculite. Leaflets with a small rhizome were graded according to rhizome size and treated at the aforementioned concentrations and durations. After treatment, the leaflets were rinsed and returned to the mist bench. All treated leaflets were transplanted to individual 2" pots once roots began to appear on the rhizome.

Screening for Ploidy Level Changes

Suspected tetraploids were initially screened using guard cell measurements, followed by chromosome counts. Ploidy level status was confirmed using flow cytometry.



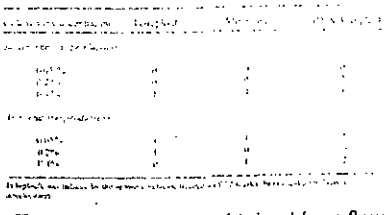
Results and Discussion

Visual inspection of the regenerated plants resulted in the identification of several potential polyploids. Leaflets were rounder, thicker, overall plant height was smaller than that of the controls.

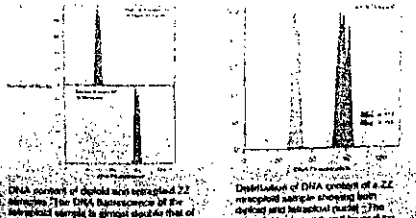
Diploid | Suspected Polyploid | Suspected Polyploid

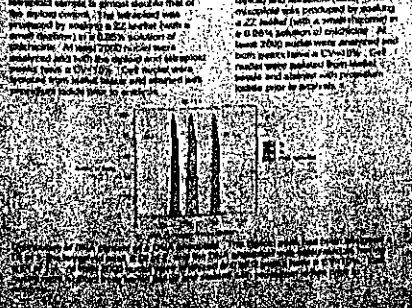
After screening with guard cell measurements, root tip chromosome counts were attempted on the suspected polyploids. Ploidy status verification, however, was not possible. ZZ chromosomes are large and long, so that chromosome overlapping was common. The only chromosome counts obtained were those of the controls, with 2n = 34 as shown above.

The table below shows the number of ZZ diploids, tetraploids, and DNA aneuploids that were identified via flow cytometry.



The graphical results obtained from flow cytometric measurement of the leaflet samples are shown below.





How did we get mixoploids?

Before rhizome development

Not all cells were converted to tetraploids so that a mixture of diploid and tetraploid cells gave rise to the new rhizome.

After rhizome development

Only some of the treated rhizome cells were converted to tetraploid cells.

Mixoploidy within a leaflet

The leaflet was derived from a meristematic region that consisted of diploid and tetraploid cells, eventually leading to the production of a leaflet with both cell types.

What are DNA aneuploids and how did they arise?

The term DNA aneuploid was used in this project to describe a sample with an abnormal DNA content. DNA aneuploids produce a 8-90% shift in the mean channel number as compared to the control. It should not be confused with the cytological term for "true" aneuploidy derived from karyotypic evaluation.

Photographs (a) and (b) were taken using an Olympus BX51 Epifluorescence Microscope with 400nm excitation frequency in order to view propidium iodide stained nuclei (red dots) and debris/cellular debris. Yellow arrows point to the debris.

A review of literature did not provided a concrete explanation or mechanism for the production of DNA aneuploids via colchicine treatment. We believe there are two contributing factors: (i) cellular debris and (ii) sample browning, both of which may reflect light scatter after sample illumination and also affect the fluorescence intensity of that sample.

Further analysis of the DNA aneuploids is required. A number of troubleshooting solutions have been reported, including the use of a surfactant (Triton X-100) to reduce adhesion of cellular debris, the addition of citrate to condense sample DNA, the addition of β-mercaptoethanol to minimize sample browning, and the use of citric acid and Tween 20 to decrease sample CV to 1-1.5%.

The 6 tetraploids produced will be monitored for further changes in leaf shape, overall growth morphology, and confirmation of the ploidy status of the germinal cell line. A complete characterization of our regenerated tetraploids will contribute significantly to future breeding studies utilizing these plants.

ANEXO 4

Material preparado para charla de difusión

GOBIERNO DE CHILE
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INNOVACION AGRARIA

UNIVERSIDAD DE
TALCA

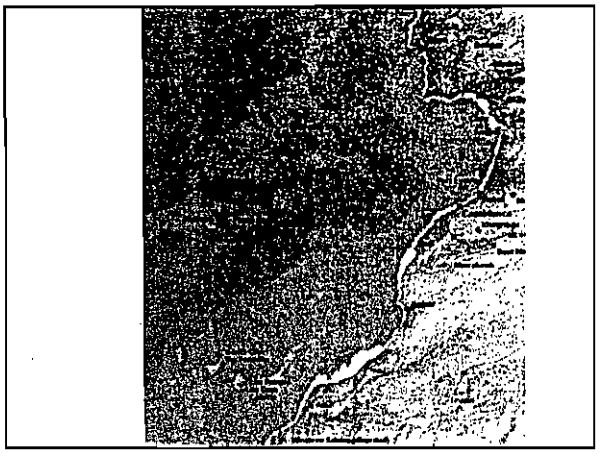
La UNIVERSIDAD DE TALCA y la FUNDACION PARA LA INNOVACION AGRARIA (FIA), tienen el agrado de invitarle a participar en la charla de difusión que se realizará el dia **miércoles 25 de Julio a las 11:00 horas en el Campus Lircay de la Universidad en Talca (Av. Lircay s/n) auditórium Facultad de Ciencias Agrarias.** En esta actividad se presentarán los aspectos más relevantes del "VI Simposio Internacional de Nuevos Cultivos Ornamentales", realizado el pasado Junio en la Isla de Madeira, Portugal; y al cual asistió una delegación de tres profesionales chilenos, en el marco del Programa Participación en Eventos Técnicos 2007 de la Fundación de Innovación Agraria (FIA). Agradecemos su asistencia, y la difusión de esta actividad a los posibles interesados.

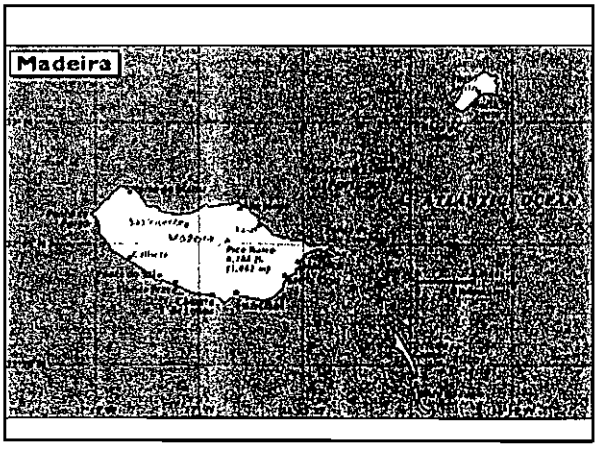
S.RC. 71-200214
09-9140386

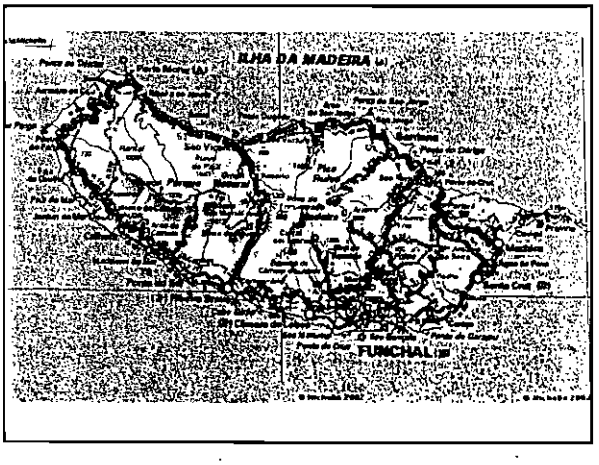
Participación en
VI Symposium on New Floricultural Crops

Funchal, Madeira (Portugal)
11 a 15 de junio de 2007

Paola Yáñez
Pedro Sánchez
Alejandra Basoalto







En los últimos años se ha incrementado el interés por la introducción de nuevos cultivos ornamentales, debido a su amplia aplicación en la industria de la floricultura.

La utilización de plantas nativas, con mejor adaptación a las condiciones locales, permitiría su uso no sólo para recuperar hábitats en áreas degradadas y paisajismo urbano, sino que también, como planta de jardín, flor cortada o de maceta.

VI Symposium on New Floricultural Crops

Organización

The International Society for Horticultural Science (ISHS)

SRA - Secretaria Regional do Ambiente e dos Recursos Naturais

Centre for Macaronesian Studies (CEM)/ University of Madeira (UMa)

Temas principales

- Plantas nativas y recursos genéticos
- Uso sustentable de la biodiversidad para floricultura y paisajismo
- Estrategias para introducción de plantas, tendencias del mercado y comercialización
- Propagación y producción
- Fisiología del estres
- Biología, tecnología y calidad de poscosecha

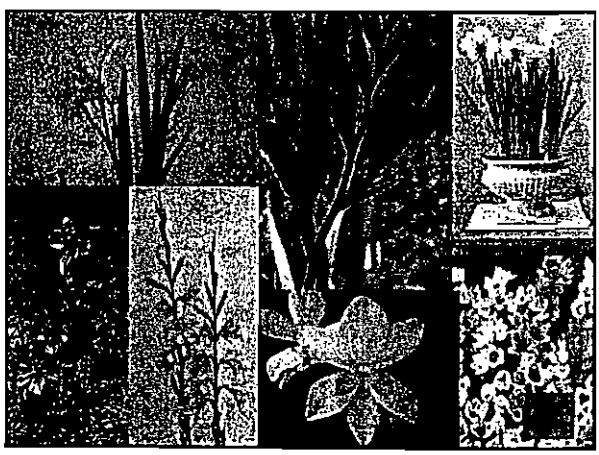
Plantas nativas y recursos genéticos

- Vegetación nativa de madeira.
- Evaluación de geófitas sudafricanas como plantas de jardín para floración invernal en el hemisferio norte
- Investigaciones de retamos Sicilianos y su potencial en el sector de la floricultura.
- Desarrollo de nuevas variedades de plantas nativas australianas para el mercado de flor de corte y planta en maceta.

Plantas nativas y recursos genéticos

- Preocupación mundial por la conservación de la biodiversidad
- Lugares con alta diversidad y endemismo
- Parque Natural de Madeira (77% superficie de la isla):

"Proteger la naturaleza, salvaguardar la biodiversidad, defender los paisajes naturales, luchar contra las plantas invasoras"

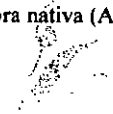


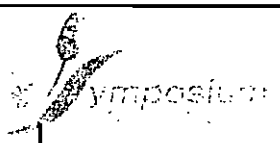
Plantas nativas y recursos genéticos

- Desarrollo de un Centro de floricultura nativa en Australia el 2003, para el desarrollo especies nativas australianas para el mercado mundial. Su objetivo es identificar y desarrollar nuevas especies.
- Impacto de plantas ornamentales nativas en el sector de la floricultura Argentina. Un estudio de caso.

Uso sustentable de la biodiversidad para floricultura y paisajismo

- Buscando nuevos cultivos ornamentales (estudios de floración)
- Desarrollo de nuevos cultivos florícolas en sudáfrica
- Desarrollo de *Ptilotus nobilis* una flor nativa australiana
- Domesticación de flora nativa (Asclepias sp.) en Kenya





- Periodo juvenil
- Fotoperiodismo
- Vernalización y/o dormancia
- Radiación

Condiciones que favorecen el desarrollo vegetativo/reproductivo

La importancia de entregar al mercado un producto terminado
Establecimiento de relaciones cooperativas con entidades comerciales
La importancia de marketing para alcanzar el éxito final
Exp. Sudafricana

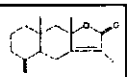
- Demostrando el potencial de las Restionáceas sudáfricanas como nuevas plantas ornamentales.
- Una nueva imagen para los jardines costeros desde el oeste de Australia
- Proyecto Biociudad

Estrategias para la introducción de nuevas plantas, tendencias de mercado y márketing.

- Estrategias para introducción de plantas y tendencias de mercado en los EEUU.
- Introducción de plantas nativas ornamentales en Croacia.
- Iris Negro, Un nuevo cultivo florícola en Jordania.
- Avances en mejoramiento de Calibrachoa en Argentina.
- Hibridación entre especies rosadas y amarillas de tabebuia nativas de Argentina.
- Producción de formas tetraploides de ocho especies arbóreas.
- Avances en nuevos cultivos de otoño.
- Una teoria nueva; Modelo estratégico para para el desarrollo de nuevos cultivos de flores.

- El mercado mundial de las plantas ornamentales se ha incrementado en los últimos 100 años.
- El mercado ha experimentado subidas y bajadas y ha habido un aumento en la liberación de nuevas variedades.
- La introducción de nuevas especies presenta numerosas limitantes como el aumento de costos (patentamiento, royalty, mantenimiento del stock etc).
- En los años '50 un cultivar nuevo dominaba el mercado por más de 10 años, sin embargo en la actualidad la vida del producto puede ser de 2 a 5 años.
- La investigación de nuevas variedades de plantas empuja a utilizar genética molecular e ingeniería genética para encontrar plantas que puedan sostenerse en el mercado por más tiempo.

Estrategias para la introducción de nuevas plantas, tendencias de mercado y márketing



Propagación y producción

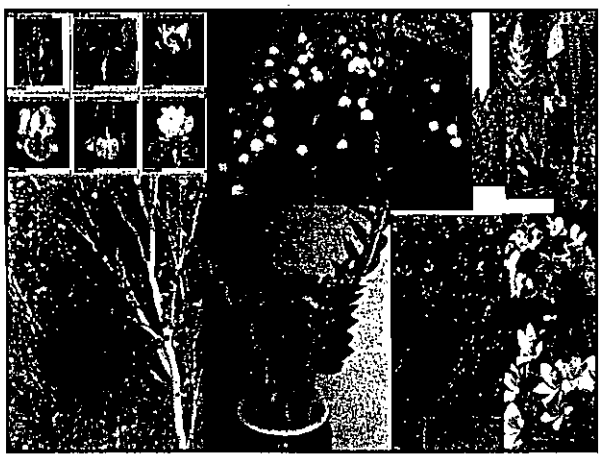
- Butenolido; un potente químico que ayuda a la germinación encontrado en el humo.
- Genotipos de heliconia bajo sombra parcial. Evaluación de tallos florales.
- Ritmos de crecimiento de Iridacea sudafricana forzada para planta en maceta.
- *Plumeria rubra*; una vieja planta ornamental, un nuevo cultivo.
- Nuevo método de propagación de muerdagos permite la producción como planta en maceta (Dinamarca).
- Mejoramiento de regeneración de brotes y formación de bulbos de "copo de nieve" *Leucojum vernum* en medios de cultivos líquidos.
- Inducción de callos *in vitro* y protocolo de regeneración de plántulas desarrollado por el tratamiento de oryzalina de *Zamioculcas zamifolia*.

- El humo derivado de la quema de material de planta promueve la germinación de semillas de especies de plantas de Australia, Norte América, Sudáfrica y Europa.
- El componente que produce este aumento es el butenolido proveniente de la combustión de la celulosa.
- Este proceso abre las posibilidades a un gran número de especies de plantas con dificultades para germinar.

Propagación y producción

- Se destaca el hecho que algunas malezas como gramíneas también responden al fuego.
- Este descubrimiento representa un avance significativo para las ciencias de la agricultura, conservación natural y reestablecimiento y apunta a que la comunidad científica trabaje en la optimización de los protocolos de germinación de semillas.

Propagación y producción

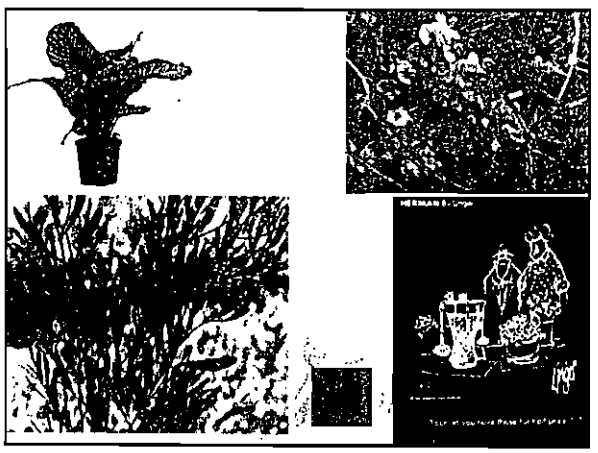


Biología y tecnología de poscosecha

- Sensibilidad a temperatura, comportamiento con bajos niveles de luminosidad, sensibilidad al etileno
- Especies buenas pero con corta vida de florero
- La tecnología podría permitir su introducción, mejorando algunos aspectos como:
- Inhibir los efectos de etileno
- Retrasar amarillamiento de hojas
- Herramientas moleculares

- Mejoramiento del balance de agua y la vida de florero para nuevas ramas de follaje de Dodonea por tratamientos de poscosecha.
- Tratamientos de pulso en poscosecha de *Ctenathe setosa* (Rosc.)Eichler para follaje.
- Efectos del tiosulfato de plata (STS), azucar, surfactante y su combinación en la vida de poscosecha de *Lathyrus latifolius* L.

Biología y tecnología de poscosecha



Fisiología del Estrés

- Estres biótico

Competencia

patógenos

- Estrés abiotico

Relaciones hídricas

Niveles de luminosidad

Fertilización

Contaminación

- Geófita ornamental; *Ranunculus asiaticus*: cambios anuales en la estructura de las células de la raíz durante la desecación y rehidratación.
- *Echeveria* spp. Rosetas tolerantes al largo periodo de falta de agua.
- Modelo del consumo de agua en *Diffenbachia amoena* "tropic snow"
- Crecimiento de magnolio bajo 3 sistemas de riego en un vivero ornamental.

Fisiología del Estrés

MUCHAS GRACIAS!!!!