IMPRESIONES DE GIRA AL 5º SIMPOSIO INTERNACIONAL DE KIWI EN CHINA

16 al 19 de Septiembre de 2002

OBJETIVOS

1. Actualizar conocimientos del kiwi.

2. Conocer la zona de origen del kiwi.

3. Conocer China: su geografía, cultura y estado económico, junto a su potencial.

REALIDAD POR PAÍSES

I. CHINA

1.- Cultivo comercial desarrollado desde 1957.

2.- Enorme investigación en recursos genéticos desde 1977: 57 variedades comerciales y continúa desarrollo.

3.- Bastante producción silvestre: sólo en Hunan 23.000 tons.

4.- En 1999 produce 165.000 tons, 4º productor (después de Chile), con 3 – 4 ton/ha.-

5.- Sobre 45.000 has. Será el principal productor mundial en próxima década.

6.- En 2005 esperan 650 – 800.000 tons, lejos el principal productor mundial.

7.- Superficie plantada frenada. Shanxi principal provincia con 167.00 has.

8.-Gran concurrencia al Simposio: cerca de 70 personas.

9.- Muy interesante efectuar visita de reconocimiento de variedades y técnicas en Est. Experimentales y plantaciones.

DESAFÍOS DE CHINA

1.- Aumentar consumo interno: valoración nutritiva del kiwi.

2.- Mejorar desarrollo tecnológico del cultivo.

3.- Producir buena calidad, por sobre cantidad. Tienen plena conciencia de sobre oferta mundial.

4.- Conservar Recursos Genéticos: protegerlos del “desarrollo”.

5.- Concientes de su buen nivel científico y pésima aplicación en su industria.

6.- Existen inversiones extranjeras: ej. Plantación de 1.000 has en Hubei.

II. ITALIA

1.- 1er productor con 19.000 has en producción y 5.000 nuevas.

2.- Crecimiento en plantaciones por sustitución de otros frutales (ej. Manzanos y carozos en Verona)-

3.- Gran concurrencia al Simposio: 27 representantes.

4.- Investigación activa: desde genética (pocos aportes) hasta post-cosecha, con integración de varias Universidades (ej. Universidad della Basilicata con Bologna).

III. NUEVA ZELANDIA

1.- 2º productor mundial.

2.- 11.000 has actuales y proyección de 12.500 ha en 2005, con 9500 Hayward, 2.500 Zespri Gold y unas 500 *A. arguta.*

3.- Extraordinaria Integración Vertical y Horizontal de su industria, que es muy relevante en la economía nacional.

4.- Concientes de sus ventajas comparativas: Clima, Suelo, Especialización, Experiencia e Innovación.

5.- Convencidos de que la INNOVACIÓN es la clave del futuro.

6.- Desarrollo activo de variedades: ya hablan de 3 variedades comerciales de *A. arguta* y otras de *A. chinensis* (Zespri Gold) en desarrollo.

III. NUEVA ZELANDIA

7.- El kiwi en NZ no es más sólo Hayward: es *A. deliciosa* (Hayward), *A. chinensis* (Gold) y *A. arguta* (Baby Kiwi). Además su oferta está diversificada en "Greens" (Hayward comunes), "Organic" (Hayward orgánicos), "Gold" (Zespri Gold), "Kiwistart" (programa de Hayward tempraneros) y pronto "Argutas" (Baby Kiwi).

8.- Empeño por certificación total EUREP.

9.- Actualmente todos sus packing y frigoríficos con norma ISO 9001 y ya han exportado 3.000.000 de cajas con código de barras para máxima trazabilidad.

10.- Plena conciencia de meta: Aceptabilidad del consumidor.

IV. FRANCIA

1.- 5º productor después de China 4.000 has, estable.

2.- Producciones más estables, por control de heladas con Riego por Aspersión en la mayoría de las plantaciones.

3.- Valoración relativa de Indice de Materia Seca como índice de calidad, pero cosecha definitiva forzada por riesgo alto de heladas en muchos casos.

4.- Enemigos de Normas de Calidad y muy proclives a Certificaciones de Calidad.

V. GRECIA

1.- 6º productor, a veces mayor que Francia pero producción más inestable por clima.

2.- Plantaciones aún aumentan por buen negocio con mejores precios (primeros en Europa).

VI. OTROS PAÍSES

1.- JAPÓN:

- 1.500 hás que producen 23.000 tons.
- Importa 34.000 tons.
- Activa investigación en variedades: Est. Exp. Kagawa ha desarrollado vars Koryoku, Sanryoku y nuevos híbridos en desarrollo.
- Calidad excelente en mini propiedades con polinización manual tecnificada y uso de CPPU.

2.- PORTUGAL y ESPAÑA:

- Superficie menor, limitada por clima y suelos.
- Adaptación de tecnología externa a realidades propias, pero productivdades menores.
- Potencial de crecimiento como mercados para Chile?.

3.- IRÁN:

- Superficie menor, pero crecimiento por sustitución de Cítricos poco competitivos.
- Producción consumida en M. Interno y países vecinos.

VII. CHILE

1.- 3er productor mundial.

2.- Superficie y producción estable. Sólo leve crecimiento.

3.- Industria estática en tecnología de producción (principalmente dedicado a copiar tecnología externa).

4.- Bien avanzado en equipamiento de post-cosecha.

5.- Ausente en reunión del la IKO y en el 5º Simposio de China.

6.- Sin renovación ni esfuerzos de mejoramiento genético.

7.- Diversidad frutícola con poca especialización: ¿Ventaja o Desventaja?.

ACTUALIZACIÓN DE CONOCIMIENTOS DEL KIWI

VARIEDADES

VARIEDADES DE CHINA

- **Marcada competencia entre Regiones y Est. Exp. por obtener mejores variedades, pero algunos convencidos de que Hayward es la mejor. Hay variedades seleccionadas de plantas silvestres y otras obtenidas por hibridación, tendencia hacia *A. chinensis* por facilidad de cultivar, mayor gusto de consumidores locales y mayor valor nutritivo. Pulpa roja atrae más a los consumidores.**

VARIEDADES

- **FENGYUE (Hunan): *A. chinensis* dorado, cosecha 15 – 20 días antes que Hayward,. Muy poductiva.**
- **CUIYU (Hunan): *A. chinensis* pulpa verde intensa, 23 – 25ºBrix, buena conservación (Hayward), madura 15 días después y calibre poco mayor.**
- **MILIANG Nº1 (Hunan): *A. deliciosa*, conservación ídem Hayward. Tardía, cargadora y buena adaptación.**
- **Otras Hunan: QUINXIANG (muy buen sabor y conservación), KUIMI y JUIMI.**

MÁS VARIEDADES DE CHINA

- **JINTAO (IBW): *A. chinensis* dorado de selección natural con derechos entregados al "Consorcio Kiwi Gold" (Italia). Buena presencia, buen valor nutritivo, alta productividad (doble de Hayward) y 4 – 5 meses de almacenaje. Interesante.**
- **Otras del IBW: WUZHI 2, 3 y 5, TONG SHAN Nº5.**
- **HONGYANG (Sichuan): A. Lindl con corazón rojo y pulpa amarilla. "Sol Rojo" es productiva, con buen calibre, buen sabor y valor nutritivo, cosecha 15 – 25 días antes que Hayward, coloración roja tiende a perderse en 3 meses de almacenaje.**
- **SHIMEI y G3 (Guangxi): *A. deliciosa* tipo Hayward mejoradas por forma bien cilíndrica, maduración más temprana, buen calibre y valor nutritivo.**
- **Variedades más tradicionales: QUINMEI, CHUANMI, ZAOXIAN, etc.**

VARIEDADES DE JAPÓN

De Estación Experimental Kagawa:

- **KORYOKU: ya "tradicional", híbrido libre de Hayward con mayor calibre.**

- **SANRYOKU: *A. deliciosa* x *A. chinensis,* digna de mayor estudio.**

- **KOUSUI: híbrido recién lanzado, peso 54 grs y muy buen sabor, calvo. Poco requerimiento de frío, brota temprano y madura 2 semanas antes que Hayward.**

VARIEDADES DE NUEVA ZELANDIA

HortResearch

HortResearch Kiwifruit Cultivars

HortResearch has a large, established kiwifruit breeding programme producing a range of new kiwifruit cultivars to excite consumers and reward producers.

Actinidia species collection

'Hort16A' fruit on display.

'Hort16A' fruit on the vine.

The foundation of the programme is a collection of *Actinidia* germplasm consisting of about 400 accessions of seed and budwood representing a total of 23 species. Parental material selected from this collection has been used in a conventional breeding and selection programme to produce a series of commercial cultivars.

HortResearch has recently developed three new cultivars of *Actinidia arguta* in New Zealand. Fruit of the three cultivars mature at different times to give an extended marketing season. The flavour is very sweet and the fruit of two cultivars stores exceptionally well for fruit of this type.

Actinidia arguta - Weka

Actinidia arguta - Tahi

Actinidia arguta - Toru

The most successful cultivar released so far is 'Hort16A'. This produces delicious yellow-fleshed fruit marketed as ZESPRI ™ GOLD Kiwifruit. 'Hort16A' was selected in 1991 and about 20,000 tonnes of ZESPRI ™ GOLD Kiwifruit were marketed in 2001-02.

HortResearch selected the kiwifruit rootstock cultivar 'Kaimai'. 'Kaimai' has been shown to increase the productivity of grafted 'Hayward' vines in New Zealand by enhancing budbreak and increasing flower numbers. It is now being tested as a rootstock for 'Hort16A'.

Flowers of an ungrafted vine of 'Kaimai'.

A range of male cultivars has been selected by HortResearch as pollinizers for 'Hayward', 'Hort16A' and the *A. arguta* female cultivars.

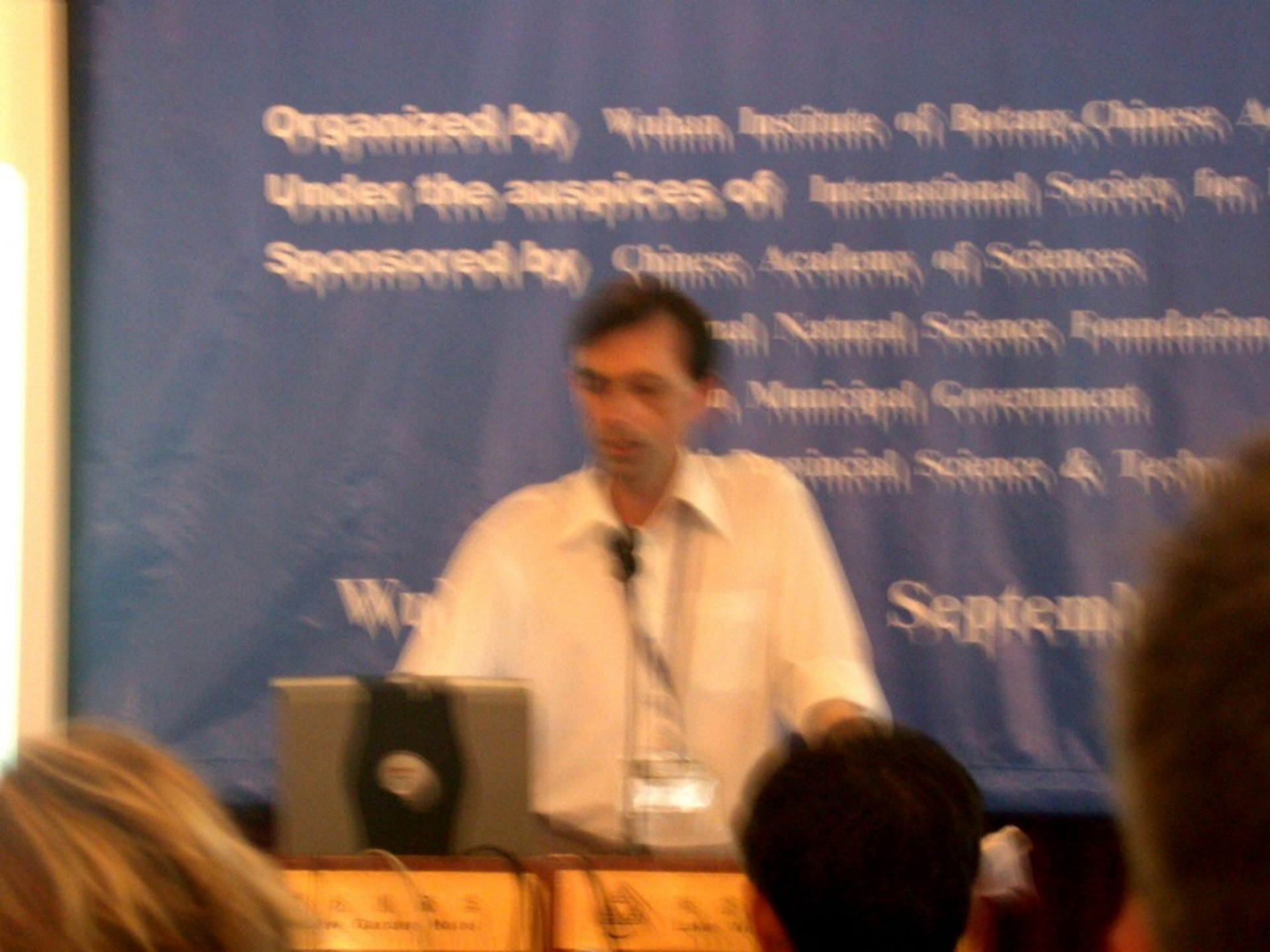
Flowers of a 'Hort16A' pollinizer cultivar.

A range of other exciting new products is being developed for the future.

Fruit slices of novel *Actinidia* hybrids.

Acknowledgement

The HortResearch kiwifruit breeding programme is funded by the New Zealand Foundation for Research, Science and Technology and the ZESPRI Group Ltd.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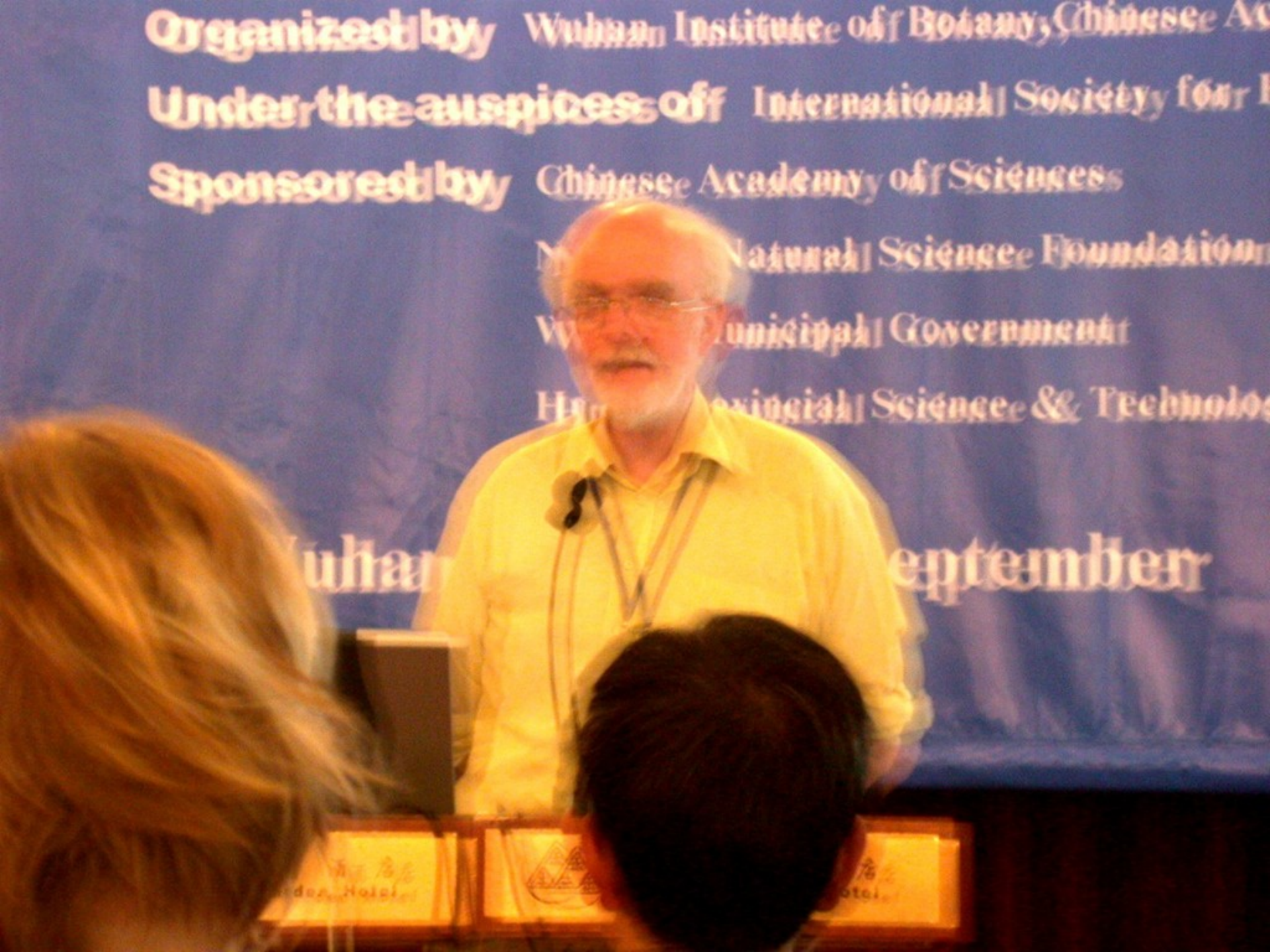
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September

Actinidia arguta - Wha

Actinidia arguta - Tahi

Actinidia arguta - Toru


米良1号
产　　地：西安市户县余下镇新品种繁育中心
联 系 人：王新义
联系电话：029-4965426
邮　　编：710302
现可提供部分商品果和苗木接穗等。
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Wancui----New Cultivar Selected from Sport of Hayward

Fruit, bearing shoot and two years old bearing tree


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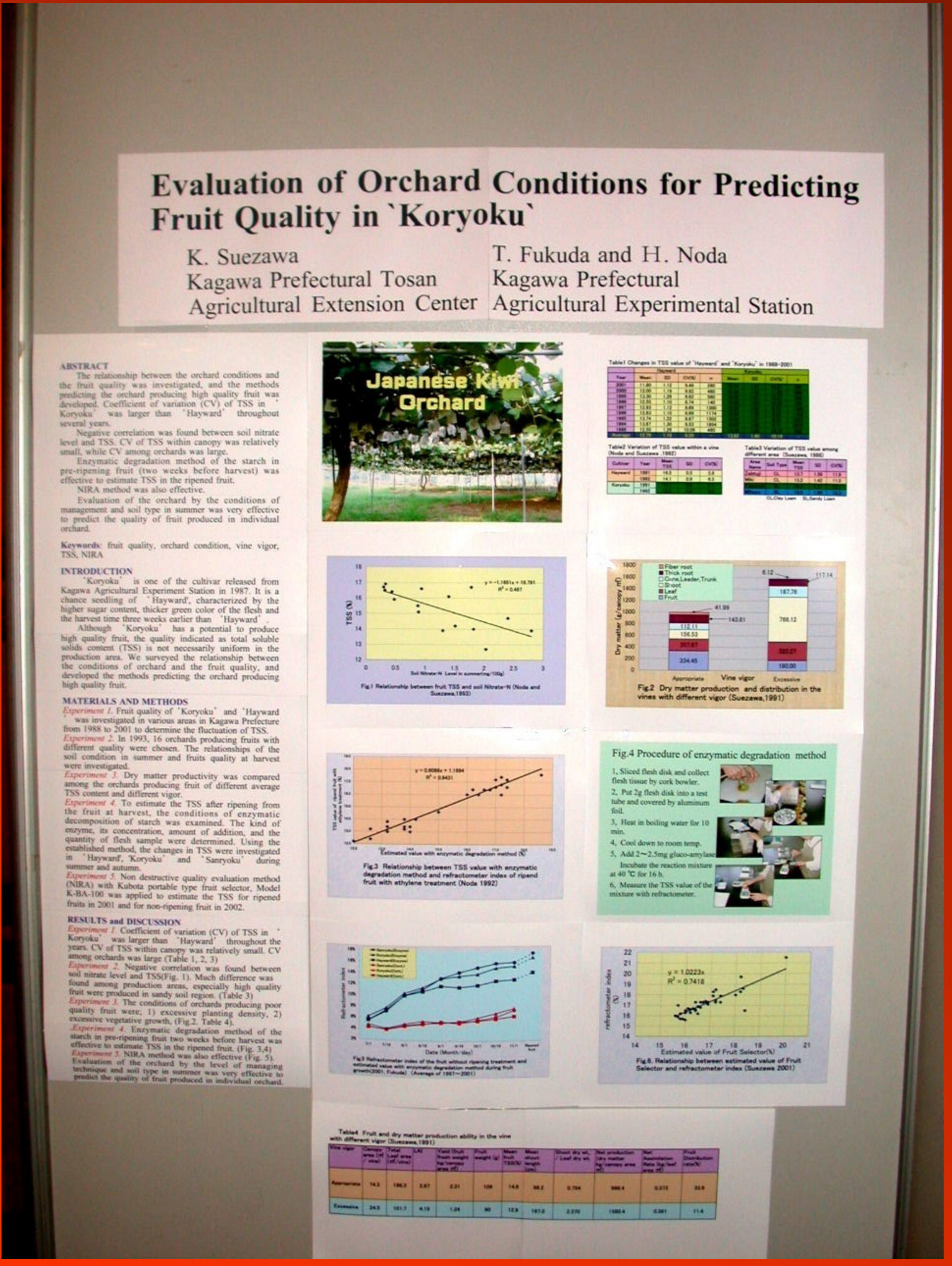
Evaluation of Orchard Conditions for Predicting Fruit Quality in `Koryoku`
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Kagawa Prefectural Tosan Agricultural Extension Center
T. Fukuda and H. Noda
Kagawa Prefectural Agricultural Experimental Station
ABSTRACT
The relationship between the orchard conditions and the fruit quality was investigated, and the methods predicting the orchard producing high quality fruit was developed. Coefficient of variation (CV) of TSS in 'Koryoku' was larger than 'Hayward' throughout several years.
Negative correlation was found between soil nitrate level and TSS. CV of TSS within canopy was relatively small, while CV among orchards was large.
Enzymatic degradation method of the starch in pre-ripening fruit (two weeks before harvest) was effective to estimate TSS in the ripened fruit.
NIRA method was also effective.
Evaluation of the orchard by the conditions of management and soil type in summer was very effective to predict the quality of fruit produced in individual orchard.
Keywords: fruit quality, orchard condition, vine vigor, TSS, NIRA
INTRODUCTION
'Koryoku' is one of the cultivar released from Kagawa Agricultural Experiment Station in 1987. It is a chance seedling of 'Hayward', characterized by the higher sugar content, thicker green color of the flesh and the harvest time three weeks earlier than 'Hayward'.
Although 'Koryoku' has a potential to produce high quality fruit, the quality indicated as total soluble solids content (TSS) is not necessarily uniform in the production area. We surveyed the relationship between the conditions of orchard and the fruit quality, and developed the methods predicting the orchard producing high quality fruit.
MATERIALS AND METHODS
Experiment 1. Fruit quality of 'Koryoku' and 'Hayward' was investigated in various areas in Kagawa Prefecture from 1988 to 2001 to determine the fluctuation of TSS.
Experiment 2. In 1993, 16 orchards producing fruits with different quality were chosen. The relationships of the soil condition in summer and fruits quality at harvest were investigated.
Experiment 3. Dry matter productivity was compared among the orchards producing fruit of different average TSS content and different vigor.
Experiment 4. To estimate the TSS after ripening from the fruit at harvest, the conditions of enzymatic decomposition of starch was examined. The kind of enzyme, its concentration, amount of addition, and the quantity of flesh sample were determined. Using the established method, the changes in TSS were investigated in 'Hayward', 'Koryoku' and 'Sanryoku' during summer and autumn.
Experiment 5. Non destructive quality evaluation method (NIRA) with Kubota portable type fruit selector, Model K-BA-100 was applied to estimate the TSS for ripened fruits in 2001 and for non-ripening fruit in 2002.
RESULTS and DISCUSSION
Experiment 1. Coefficient of variation (CV) of TSS in 'Koryoku' was larger than 'Hayward' throughout the years. CV of TSS within canopy was relatively small. CV among orchards was large (Table 1, 2, 3)
Experiment 2. Negative correlation was found between soil nitrate level and TSS(Fig. 1). Much difference was found among production areas, especially high quality fruit were produced in sandy soil region. (Table 3)
Experiment 3. The conditions of orchards producing poor quality fruit were; 1) excessive planting density, 2) excessive vegetative growth, (Fig.2. Table 4).
Experiment 4. Enzymatic degradation method of the starch in pre-ripening fruit two weeks before harvest was effective to estimate TSS in the ripened fruit. (Fig. 3,4)
Experiment 5. NIRA method was also effective (Fig. 5).
Evaluation of the orchard by the level of managing technique and soil type in summer was very effective to predict the quality of fruit produced in individual orchard.
Japanese Kiwi Orchard
Table1 Changes in TSS value of 'Hayward' and 'Koryoku' in 1988-2001
Fig.1 Relationship between fruit TSS and soil Nitrate-N (Noda and Suezawa,1993)
Fig.2 Dry matter production and distribution in the vines with different vigor (Suezawa,1991)
Fig.3 Relationship between TSS value with enzymatic degradation method and refractometer index of ripend fruit with ethylene treatment (Noda 1992)
Fig.4 Procedure of enzymatic degradation method
1, Sliced flesh disk and collect flesh tissue by cork bowler.
2, Put 2g flesh disk into a test tube and covered by aluminum foil.
3, Heat in boiling water for 10 min.
4, Cool down to room temp.
5, Add 2~2.5mg gluco-amylase
Incubate the reaction mixture at 40 ℃ for 16 h.
6, Measure the TSS value of the mixture with refractometer.
Fig.5 Relationship between estimated value of Fruit Selector and refractometer index (Suezawa 2001)
Table4 Fruit and dry matter production ability in the vine with different vigor (Suezawa,1991)


海 沃 德
Hayward
产 地：中国·云南·会泽
Predicted in:Huize,Yunnan,China
The key of improved fast growing kiwi
cultivating technology

HITOS DEL CONOCIMIENTO DEL KIWI

1.- MEJORAMIENTO GENÉTICO.

- Esfuerzo por que este cultivo deje de ser UNIVARIETAL.
- Nueva Zelanda, China, Japón e Italia lideran.
- Muchas selecciones de *Actinidia deliciosa* que pretenden ser mejores que Hayward y desarrollo de otras especies: ***A. chinensis*** y ***A. arguta*** especialmente, junto a algunos híbridos.
- Variedades de ***A. chinensis*** y de ***A. arguta*** interesantes para nuestro país.
- Dentro de éstas, parecen más interesantes algunos *A. chinensis* de pulpa roja y el “BABY KIWI” (*A. arguta*).

HITOS DEL CONOCIMIENTO DEL KIWI

2.- Mejoramiento de la Calidad I:

•Convencimiento general de que la venta de calidad marginal o deficiente es mucho más limitante que los volúmenes ofertados actualmente para el negocio del kiwi.

•Competencia por lograr la ACEPTABILIDAD del consumidor, por sobre la CALIDAD en sus diversas instancias.

•Desarrollo tecnológico para identificar los frutos con calidad interna satisfactoria y separarlos de aquellos con calidad inferior usando técnicas no destructivas (NIR).

HITOS DEL CONOCIMIENTO DEL KIWI (continuación)

- Búsqueda de explicaciones y soluciones a la variabilidad de calidad interna entre frutos de un mismo “lote”, aún sin resultados clarificadores. ***Faltarían investigaciones dirigidas a identificar factores desde el huerto y su mejoramiento en este nivel.***

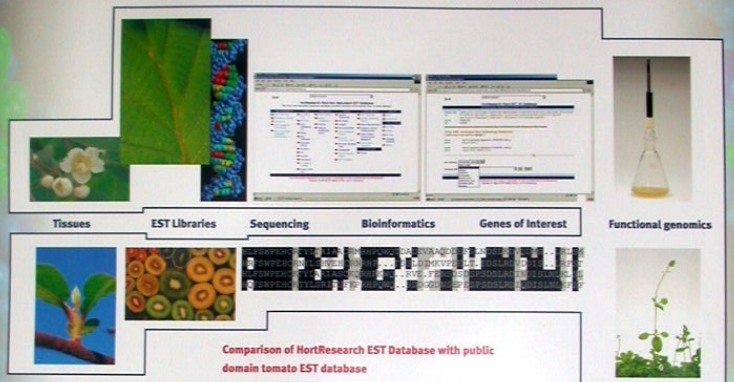
- Conciencia de la demanda por minimizar empleo de agroquímicos y necesidad de conservar imagen de fruto “verde” y “sano”. “An apple a day keeps the doctor away”, debe ser “A kiwifruit per day keeps the doctor away”.

Acknowledgements

HortResearch

Kiwifruit Genomics

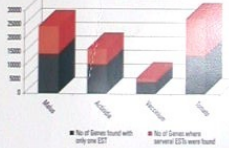
A large programme involving more than 50 staff at HortResearch is developing an EST database and associated bioinformatic tools. Facilities for experiments with microarrays and capability in vector construction have been established to enable proof of gene function studies. Over 22 kiwifruit libraries have been constructed from a range of species and tissues, and 5' EST sequencing has been conducted to depths ranging from 500 to 10,000 ESTs. Among the libraries are several subtracted libraries aimed at discovering genes related to specific processes. To date, over 13,000 individual genes have been identified among over 60,000 ESTs. Many ESTs have been fully sequenced and we have used these to carry out pathway mapping and phylogenetic analyses.



Target areas

- Secondary metabolism e.g. flavour/fragrance
- Health related activities e.g. Vitamin C/Oxalate pathways
- Meristems e.g. plant structure, flowering/vegetative, dormancy.
- Disease/Pest interactions e.g. Biotroph to necrotroph transition (ripe rots)
- Fruit skins e.g. peelability
- Storage e.g. low temperature/CO_2 responses
- Polysaccharides e.g. cell wall metabolism and fruit ripening

Comparison of HortResearch EST Database with public domain tomato EST database



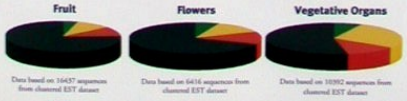
(Tomato data from: Hoeven et al 2002 The Plant Cell 14, 1441-1456)

Species sequenced

Actinidia deliciosa (DA)
Actinidia chinensis (CK)
Actinidia arguta (AA)
Actinidia eriantha (EA)
Actinidia eriantha X hemsleyana[1] (EA x HA)
Actinidia polygama
Actinidia indochinensis
Actinidia setosa (SB)

Homology Based Identification of Sequences From *Actinidia*

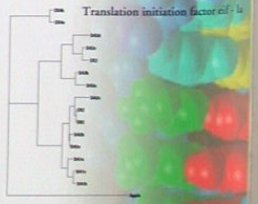
Data based on 39186 *Actinidia* sequences from clustered EST dataset

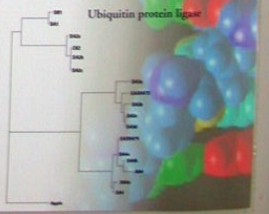


Data based on 16457 sequences from clustered EST dataset
Data based on 6416 sequences from clustered EST dataset
Data based on 10392 sequences from clustered EST dataset

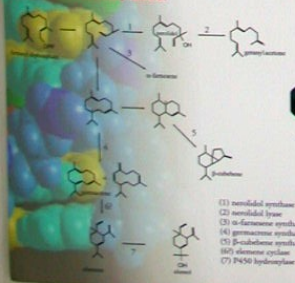
- Unknown (no homology detected using blastx against the nrdb90 database[2]
- Unknown (homology <expectation value 0.1)
- Uncertain (homology with expectation value 0.1 – $1e^{-10}$
- Homolog present in other species but not necessarily with known function

Phylogenetic analysis of highly conserved genes from different *Actinidia* species





Pathway for Sesquiterpene Biosynthesis in Kiwifruit (*Actinidia deliciosa*) flowers.



An Unusual Wood Disease of Kiwifruit in Italy

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[3]Cooperativa Intesa – Faenza (Italy)

INTRODUCTION

Actinidia deliciosa is an important fruit crop in Italy, which is actually the major country of kiwifruit worldwide production.
In Emilia-Romagna and Lazio orchards, we recently observed symptoms differing from those of mca. The disease occurred mainly in plantations more than ten years old. The most obvious symptom is an abnormal diametral trunk growth with an evident bark thickening (Fig. 1A and 1B). The diseased plants tend to send out suckers at the collar. These overgrow at the base and show longitudinal bark cracks. In addition the vegetation of affected plants is poor and progressively declines. Compared to healthy plants, fruits are smaller and more rounded (Fig. 2). Cross sections of symptomatic trunks, larger branches and roots show a marked brown discoloration of the xylem, starting from the central core. Wood rings are also irregularly arranged (Fig. 3A and 3B).
Investigations to find the cause of this disease have excluded the presence of viruses, phytoplasmas and bacteria. The aim of the present study was to identify the mycoflora associated with this unusual kiwifruit trunk hypertrophy.

Fig. 1. Healthy plant (A) and hypertrophic trunk of *A. deliciosa* affected by "elephantiasis" (B).
Fig. 2. Fruits undersized compared to those of asymptomatic plants.
Fig. 3. Cross sections of diseased trunk showing a marked brown discoloration (A) and wood rings irregularly arranged (B).

MATERIALS AND METHODS

Plant material and fungal isolation

During various periods of the year (winter, spring and autumn) samples of all plant parts or only portions of symptomatic trunks were taken, cut into 30 cm pieces and each of these was cut into longitudinal and cross sections.
Two-centimetre thick sections of trunks at different heights (0, 30, 60 cm), branches of various ages, roots and suckers were analysed using traditional laboratory techniques. A total of 2,331 wood fragments were examined.

Molecular analysis

A molecular analysis was performed, comparing the electrophoretic patterns of our presumed eighteen *Phaeoacremonium* isolates with the reference ones (Table 1).
The universal oligonucleotide primer sets ITS4 and ITS5 were used to amplify the ITS regions of the nuclear ribosomal DNA (rDNA) containing ITS1, ITS2, the 5.8 gene and small portions of 18S and 28S rDNA (Table 2).
The PCR products (8 µl) were analysed by electrophoresis in agarose gel 1% in TBE 1X.

Table 1. Strains of *Phaeoacremonium* spp. used as reference.

Strains	Species and origin	Host
CBS 101.006	*alvesphilum* (Italy)	*Actinidia deliciosa*
CBS 101.007	*rubrigenum* (Italy)	*Actinidia deliciosa*
CBS 101.008	*inflatipes* (Italy)	*Actinidia deliciosa*
CBS 102.357	*alvesphilum* (Italy)	*Actinidia deliciosa*
CBS 101.359	*chlamydosporum* (Italy)	*Actinidia deliciosa*
CBS 249.95 LCP 96 3928	*angustius* (USA- California)	*Vitis vinifera*
IMI 181.115 LCP 88 3575	*parasiticum* (USA- California)	*Vitis vinifera*
LCP 93 3586	*viticola* (France)	*Vitis vinifera*

Table 2. Primers used.

Primer	Sequence	Author
ITS4 Reverse	5'-TCCTCCGCTTATTGATATGC-3'	White et al.(1990)
ITS5 Forward	5'-GGAAGTAAAAGTCGTAACAAGG-3'	White et al.(1990)

RESULTS AND DISCUSSION

Table 3. Colonies (%) of fungi isolated from the brown rings (0=inner, 1-2= intermediate, 3= external) of hypertrophic trunk cross sections during different periods, and their percentage of the total fragments analysed.

Fungi	Winter					Spring					Autumn				
	0	1	2	3	Tot (%)	0	1	2	3	Tot (%)	0	1	2	3	Tot (%)
Acremonium spp.	0.0	0.0	0.0	0.0	0.0	7.1	5.4	0.0	0.0	3.1	11.4	0.0	0.0	0.0	2.9
Cylindrocarpon spp.	0.0	0.0	0.0	0.0	0.0	4.5	1.8	6.2	9.8	5.6	0.0	0.0	0.0	0.0	0.0
Fusarium spp.	15.7	13.1	9.8	3.3	10.3	70.5	67.0	48.2	54.5	60.0	0.0	0.00	0.0	0.0	0.0
Phaeoacremonium spp.	3.9	29.5	19.7	13.1	17.1	0.0	0.0	0.0	0.0	0.0	20.0	34.3	28.6	8.6	22.9
Phialophora spp.	15.7	11.5	3.3	4.9	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.1	0.0	4.3
Phomopsis spp.	0.0	0.0	1.6	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.00	0.0	0.0
Basidiomycetes	0.0	3.3	6.6	1.6	3.0	12.5	0.0	0.0	0.0	3.1	40.0	0.0	0.0	40.0	20.0
Others (*)	9.8	6.6	3.3	14.7	8.5	0.00	7.1	14.3	6.2	6.9	5.7	37.1	14.3	20.0	19.3
None	66.7	44.3	57.4	60.7	56.8	5.3	18.7	31.2	30.4	21.4	22.9	28.6	40.0	31.4	30.7

(*)Gliocladium, Cladosporium, Geotrichum, Aureobasidium, Epicoccum, Phoma, Penicillium, Alternaria, Aspergillus, Chalara and sterile mycelia.

Table 4. Colonies (%) of fungi isolated from various parts: trunk, branches (B), suckers (S) and roots (R) during different periods, and their percentage on the total fragments analysed.

Fungi	Winter					Spring					Autumn				
	Trunk (cm)	B	S	R	Tot (%)	Trunk (cm)	B	S	R	Tot (%)	Trunk (cm)	B	S	R	Tot (%)
Acremonium spp.	0.0	0.0	0.0	0.0	0.0	0.0	3.6	7.1	0.0	2.6	0.0	0.0	7.1	0.0	0.0	0.9
Cylindrocarpon spp.	0.0	0.0	0.0	28.1	3.4	14.9	0.0	0.0	32.5	7.2	0.0	0.0	0.0	1.8	0.0	14.3	0.9
Fusarium spp.	14.0	17.9	0.0	0.0	9.1	67.9	33.9	87.5	5.0	51.1	0.0	0.0	0.0	3.6	0.0	14.3	1.1
Phaeoacremonium spp.	34.4	0.0	21.4	0.0	14.7	0.0	0.0	0.0	0.0	0.0	28.6	0.0	42.9	0.0	13.4	0.0	14.3
Phialophora spp.	6.3	7.1	11.9	0.0	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	0.0	0.0	0.0	1.4
Phomopsis spp.	0.0	0.0	1.2	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	1.6
Basidiomycetes	0.0	8.3	0.0	0.0	2.6	0.0	8.3	0.0	0.0	2.6	0.0	25.0	25.0	8.9	0.0	0.0	7.5
Others (*)	6.3	1.2	17.9	0.0	7.6	6.3	14.3	0.0	0.0	9.4	0.0	42.9	5.6	26.8	27.2	0.0	23.4
None	42.2	73.8	52.4	71.9	59.1	11.9	39.9	5.4	62.5	27.0	71.4	32.1	8.9	41.1	59.4	4.8	45.3

(*)Gliocladium, Cladosporium, Geotrichum, Aureobasidium, Epicoccum, Phoma, Penicillium, Alternaria, Aspergillus, Chalara and sterile mycelia.

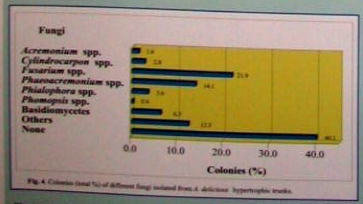

Fig. 4. Colonies (total %) of different fungi isolated from *A. deliciosa* hypertrophic trunks.

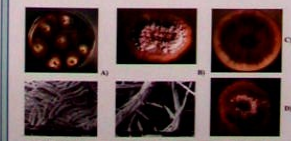

Fig. 5. Colonies and macroconidia, at SEM, of *Fusarium solani* (A); morphology of different *Phaeoacremonium* isolates: K28 (B), K517 (C) and K25 (D).

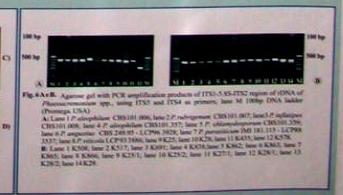

Fig. AA+B. Agarose gel with PCR amplification products of ITS1-5.8S-ITS2 region of rDNA of *Phaeoacremonium* spp., using ITS5 and ITS4 as primers; lane M 100bp DNA ladder (Promega, USA).
A: Lane 1 *P. alvesphilum* CBS101.006; lane 2 *P. rubrigenum* CBS101.007; lane3 *P. inflatipes* CBS101.008; lane 4 *P. alvesphilum* CBS101.357; lane 5 *P. chlamydosporum* CBS101.359; lane 6 *P. angustius* CBS 249.95 - LCP96 3928; lane 7 *P. parasiticum* IMI 181.115 - LCP88 3537; lane 8 *P. viticola* LCP93 3586; lane 9 K25; lane 10 K28; lane 11 K433; lane 12 K578; lane 13 K517; lane 14 K29.
B: Lane 1 K508; lane 2 K517; lane 3 K691; lane 4 K658;lane 5 K862; lane 6 K863; lane 7 K865; lane 8 K866; lane 9 K253/1; lane 10 K253/2; lane 11 K28/1; lane 12 K28/1; lane 13 K28/2; lane 14 K29.

Plant material and fungal isolation

The results are summarized in Table 3 for the fungi isolated from the brown rings in the trunk cross sections, and in Table 4 for the fungi found in the various parts of the plants examined.
Figure 4 shows the total presence of the mycetes isolated from the hypertrophic trunks of *A. deliciosa* plants. The main genera of fungi identified were *Fusarium* spp. (21.9%) and *Phaeoacremonium* spp. (14.1%). Phenotypic and microscopic (SEM) characteristics of *P. solani* colonies (A) and of three different *Phaeoacremonium* isolates (B,C,D) are seen in Figure 5.

Molecular analysis

Figures 6 A and B report the PCR

EFFECTIVENESS OF COPPER COMPOUNDS IN THE CONTROL OF BACTERIAL DISEASES ON KIWIFRUIT PLANTS

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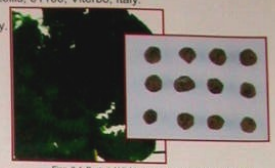

Fig. 3-4. Bacterial blight symptoms caused by *P. viridiflava*.

INTRODUCTION

Different micro-organisms cause diseases on kiwifruit plants and, amongst them, bacterial pathogens are the most dangerous in the main kiwi growing areas of the world (Balestra and Varvaro, 1999). The bacteria responsible for the damage on kiwifruit orchards are *Pseudomonas syringae* pv. *syringae*, *Pseudomonas syringae* pv. *actinidiae* and *Pseudomonas viridiflava* (Figg.1-5). These micro-organisms, especially damage the aerial part of the kiwi plants. In particular they are the cause of damage on trunks, branches, twigs, leaves, buds and flowers (Balestra and Varvaro, 1999). *P. s. pv. syringae* is particularly dangerous on floral buds and flowers (Balestra and Varvaro, 1997b). *P. s. pv. actinidiae* damage in particular trunks, twigs and leaves (Serizawa et al., 1989) and, *P. viridiflava*, is known to cause severe damage on different kiwi vegetal parts (Young *et al.*, 1988; Varvaro *et al.*, 1990).

Within the phytopathogenic bacteria of kiwi orchards, *P. s. pv. syringae* and *P. viridiflava* are the most present and particularly recorded in the main areas of the world where kiwi plants are cultivated. These bacteria are characterized to be epiphytic micro-organisms with a resident phase (*sensu* Leben, 1965) on the host and able to cause disease when favourable conditions occur (Balestra and Varvaro, 1997b; 1998). To control these micro-organisms different compounds are normally suggested (Balestra and Varvaro, 1997a; 1997b).

During the last three years, especially due to the particular environmental conditions (mild and/or sudden decrease of temperature, heavy rains, high % of relative humidity) severe attacks of *P. s. pv. syringae* and *P. viridiflava* were recorded especially in North Italy in different areas where kiwi plants are cultivated.

To verify the effect of different copper compounds to control these micro-organisms a compound containing copper oxychloride, commonly utilised, and a new copper compound containing copper sulphate with a very low cupric concentration, were compared.

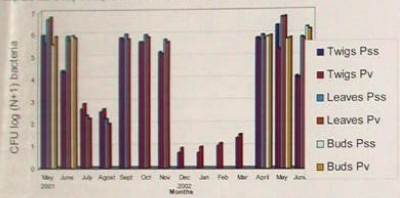

Fig. 6. Monthly fluctuations of *P. s. syringae* (Pss) and *P. viridiflava* (Pv) bacterial populations on control kiwi plots.

RESULTS

Values of *P. s. pv. syringae* range between 1×10^4 and 2.1×10^6 cfu/cm^2; those of *P. viridiflava* between 3.5×10^3 and 5×10^5 cfu/cm^2.

Bacterial pathogens increased their populations especially during spring and autumn seasons when favourable environmental conditions occurred (Fig. 6).

On samples treated with copper compounds, the populations of *P. s. pv. syringae* showed lower values (1×10^2 cfu/cm^2) on twigs in January and higher values (1.7×10^5 cfu/cm^2) on buds in May; the population of *P. viridiflava* showed lower values (2×10^3 cfu/cm^2) on twigs in January and higher values (6.9×10^5 cfu/cm^2) on buds in April.

Copper compounds utilised showed different effectiveness in the control of *P. s. pv. syringae* and *P. viridiflava* populations, related to the time and on which kiwi vegetal material they were spread (Tab. 1).

Bacterial populations of *P. s. pv. syringae* showed the highest values respect to the values recorded for the bacterial populations of *P. viridiflava*.

In particular, in springtime, with the exception of the C thesis (control), *P. s. pv. syringae* showed higher values on buds (1.2×10^6 CFU/gr) respect to those recorded on leaves (1.2×10^5 CFU/cm^2) and on twigs (6.7×10^4 CFU/cm^2) (Tab. 1).

Comparing the effectiveness between the copper compounds on twigs, S1 and S2 treatments (four and five by copper sulphate, respectively) showed a better control on bacterial populations of *P. s. pv. syringae* respect to O treatments (six with copper oxhychloride) (1×10^4, 1.6×10^4, 6.7×10^4 CFU/cm^2, respectively).

On the control of *P. viridiflava* bacterial populations on twigs, the effectiveness of S2 and O treatments were better and equivalent respect to those recorded by S1 treatments (2.1×10^4, 2.2×10^4, 3.8×10^4 CFU/cm^2, respectively).

With respect to the control of bacterial populations of *P. viridiflava* on leaves, the effectiveness of S1 treatments (four with copper sulphate) was almost equivalent (4.2×10^5 respect to 3.5×10^5 CFU/cm2) to those effected in O kiwi plots (six with copper oxhychloride) (Tab. 1).

Comparing S2 treatments (five with copper sulphate) and those labelled O (six with copper oxhychloride), more effectiveness was shown by copper oxhychloride (3.5×10^5 CFU/cm^2) respect to copper sulphate (6.2×10^4 CFU/cm^2) to control the populations of *P. viridiflava* on kiwi leaves (Tab. 1).

S1 treatments (four with copper sulphate) on buds have shown an effectiveness similar to those recorded by O treatments (six with copper oxhychloride) to control both bacterial pathogens (3.2×10^5 and 7.1×10^5 CFU/gr on *P. s. syringae*; 6.9×10^5 and 5.6×10^5 CFU/gr on *P.viridiflava*) (Tab. 1).

To control the bacterial populations of *P. viridiflava* on leaves the best performances were recorded by S1 treatments (4.2×10^5 CFU/cm^2) and by O treatments (3.5×10^5 CFU/cm^2) (Tab. 1).

Both bacterial populations showed INA activity. Seventy eight percent of the tested *P. s. syringae* bacterial cells, at concentration of 10^7 CFU/ml, were effective ice-nucleating agents at temperature between -5/-3 °C while, the same activity was shown by sixty five percent of *P. viridiflava* bacterial cells.

Treatments	Pathogens	Twigs	Leaves	Buds
S1	*Pss*	1×10^4 cfu/cm^2	4×10^5 cfu/cm^2	3.2×10^5 cfu/cm^2
	Pv	3.8×10^4 cfu/cm^2	4.2×10^5 cfu/cm^2	6.9×10^5 cfu/cm^2
S2	*Pss*	1.6×10^4 cfu/cm^2	1.2×10^5 cfu/cm^2	1.2×10^6 cfu/cm^2
	Pv	2.1×10^4 cfu/cm^2	6.2×10^4 cfu/cm^2	1.5×10^6 cfu/cm^2
O	*Pss*	6.7×10^4 cfu/cm^2	1.6×10^5 cfu/cm^2	7.1×10^5 cfu/cm^2
	Pv	2.2×10^4 cfu/cm^2	3.5×10^5 cfu/cm^2	5.6×10^5 cfu/cm^2
C	*Pss*	2.1×10^6 cfu/cm^2	4.9×10^7 cfu/cm^2	1.7×10^6 cfu/cm^2
	Pv	1.9×10^5 cfu/cm^2	5×10^6 cfu/cm^2	6.9×10^5 cfu/cm^2

Table 1. Recording of *Pseudomonas syringae* pv. *syringae* (*Pss*) and *Pseudomonas viridiflava* (*Pv*) bacterial populations on different kiwi organs respect to the different copper compounds used (**S1**: sulphate, four treatments; **S2**: sulphate, five treatments; **O**: oxychloride, six treatments; **C**: control, no treatments). Mean values of 2001-2002 spring (April, May, June) seasons.

MATERIALS and METHODS

In 2001, kiwi orchards selected for the present study were choose in northern Italy and in particular in the province of Verona. Since 2000, in this area, *P. s. pv. syringae* and *P. viridiflava* were isolated in different kiwi orchards and retained responsible of severe damages recorded especially on leaves and on floral buds.

The kiwi orchards investigated were made up of cv. Hayward kiwi plants. The age of the kiwi plants ranged between 3 and 20 years. Experimental treatments were effected in three different kiwi orchards. For each ones, four kiwi plots (S1, S2, O, C) of 100 plants each were singled out. In each experimental kiwi orchard, kiwi plot S1 was treated with the new copper compounds (sulphate) four times (April, May, November, December); kiwi plot S2 was treated five times (April, twice in May, November, December) with the same copper compound; kiwi plot O was treated six times (March, April, twice in May, November, December) with copper oxhychloride 50%, kiwi plot C was not treated with any chemical compounds and was monitored and sampled as control (Tab. 1).

Samplings of twigs were effected almost monthly while those of the leaves were carried out from April to October, and those of the buds in April and in May. For each kiwi area subjected at different copper treatments, to evaluate the mean value of the bacterial populations of *P. s. pv. syringae* and *P. viridiflava* , 60 twigs were collected, 10 cm long, 80 leaves and 60 buds, respectively.

After the samplings, each different kiwi vegetal material, in appropriate amounts of sterile distilled water, was subjected to washing with an orbital shaker for 2 hrs at 150 rpm. After washing, ten-fold dilutions of the washing water were made and plated (0.1ml each), twice, on Petri dishes containing nutrient agar supplemented with 5% of sucrose (NAS) with 2.5 mg 1-1 of crystal violet and on KB medium (King *et al.*, 1954). The plates were incubated at 25 ± 2 °C for 48-72 hrs and then, with a stereomicroscope, the developed colonies on both media were observed and counted to obtain the value of colony forming unit (CFU)/ml of *P. s. pv. syringae* and *P. viridiflava* populations. Number of bacterial colonies was averaged and then related to the number the buds or the area (cm2) of twigs and leaves to obtain the CFU/gr and the CFU/cm2 of *P. s. pv. syringae* and *P. viridiflava* populations, on buds, twigs and leaves, respectively.

From each sampling, 10 colonies counted and presumably similar to *P. s. pv. syringae* and to *P. viridiflava*, were purified on NSA and compared by morphological, physiological and biochemical tests to known strains of *P. s. pv. syringae* (PssB3) and *P. viridiflava* (PvFM16).

Moreover, they were also submitted to the ice nucleation activity (INA) test (Varvaro and Fabi, 1992) to verify their ice-nucleating capacity (Young, 1987; Paulin and Luisetti, 1978).

Figg. 1-2. Symptoms caused by *P. s. pv. syringae* on flowers and buds of kiwi plants cv. Hayward.

Fig. 5. Leaf symptoms caused by *P. s. pv. actinidiae*.

DISCUSSION

The populations of *P. s. pv. syringae* and *P. viridiflava* isolated during the present study confirm their capacity to survive epiphytically during all the different vegetative kiwi phases.

These bacterial pathogens have shown to be able to colonize all aerial vegetal parts and to be potential dangerous micro-organisms with INA on kiwi surfaces.

Both bacteria, *P. s. pv. syringae* and *P. viridiflava*, recorded lower values on kiwi twigs while they were well colonized on buds and leaves. Between the phytopathogenic bacterial populations, *P. s. pv. syringae* showed the higher values on kiwi plant treated by different copper compounds.

Considering the effects of the treatments effected by copper sulphate interesting results were obtained by this new copper compound. In both thesis (S1 and S2) where it was utilised it has showed a particular effectiveness in maintaining lower values of *P. s. pv. syringae* and *P. viridiflava* populations on leaves with respect to those recorded on twigs and bugs.

Moreover, even the number of the copper treatments was different (four for S1 and five for S2) their effectiveness was very similar to that observed in kiwi plots where copper oxhychloride was utilised, and spreading this copper compounds for six times.

Floral buds necrosis and bacterial blight caused respectively by *P. s. syringae* and *P. viridiflava* on kiwi plants, during last years in Italy, are becoming a serious problems in kiwifruit orchards. With the unusual changes of environmental conditions (especially sudden decreases of temperature and heavy rainfalls in spring) sever damages were recorded particularly in the North of Italy. To control these bacterial pathogens different bactericides are normally used, but often, they don't give excellent results. One of main problems is related to the time-treatments; they were not always timely spread, especially after unfavourable environmental conditions. Another important aspect is related to the effectiveness of the copper compounds commercialized, characterized by different kinds of cupric salts as by different concentrations.

Considering the copper compounds tested during this research, the new ones (copper sulphate) showed different positive aspects that induce one to continue using the present ones and to increase this kind of research in an attempt to improve the protection of kiwi orchards against these bacterial pathogens.

The new copper compound utilised it is characterized to be a sulphate; it allows a prolonged action on kiwi phylloplane, protecting the kiwi surfaces respect to the dangerous micro-organisms as those studied in this research. Another positive aspect is that, considering the kind of cupric salt, after the treatments effected by copper sulphate, no damages where observed on different soft kiwi vegetal parts.

The copper sulphate showed its effectiveness even if it was spread less often with respect to the plots where copper oxhychloride was utilised (S1 four treatments and S2 five treatments by copper sulphate, O six treatments by copper oxhychloride, respectively). Moreover it is important to underline that the concentration of the copper sulphate used is 10 fold lower (5%) respect to the other copper compound tested (copper oxhychloride 50%).

In the European Union (EU) since 2002, a new regulation (n° 473/2002) imposes a restriction on the use of copper compounds in agriculture and especially on organic crops. The aim of the EU is to reduce the residues of cupric salts in the soils, the pollution of groundwater resources as to address in the right way the use of these chemical compounds to control, with a low environmental impact, a lot of dangerous micro-organisms on important crops.

The current research shows that it is interesting to improve these kinds of research to find effective alternatives to the common chemical compounds at present utilised in agriculture and, in particular, to control dangerous phytopathogenic bacteria as *P. s. syringae* and *P. viridiflava* on kiwi plants, using copper compounds characterized by low concentrations of cupric salts, prolonged efficacy on the host and a low environmental impact.

REFERENCES

Balestra G.M., and Varvaro, L., 1997a. Epiphytic survival and control of *Pseudomonas viridiflava*. Acta Hort. 444: 745-749.

Balestra G.M., and Varvaro, L., 1997b. *Pseudomonas syringae* pv. *syringae* causal agent of disease on floral buds of *Actinidia deliciosa* (A. Chev) Liang et Ferguson in Italy. J. Phytopathology 145: 375-378.

Balestra G.M., and Varvaro, L., 1998. Seasonal fluctuations in kiwifruit phylosphere and ice nucleation activity of *Pseudomonas viridiflava*. J. Plant Path. 80: 151-156.

Balestra G.M. and Varvaro, L., 1999. Bacterial diseases on kiwifruit orchards in Italy. Acta Hort. 498: 353-356.

Leben C., 1965. Epiphytic microorganisms in relation to plant disease. Ann. Rev. Phytopathol. 3: 209-230.

Paulin, J.P., and Luisetti, J., 1978. Ice nucleation activity among phytopathogenic bacteria. Proceedings 4th International Conference on Plant Pathogenic Bacteria. Angers, 725-731.

Serizawa S., Ichikawa, T., Takikawa, Y., 1989. Occurrence of bacterial canker of kiwifruit in Japan: description of symptoms, isolation of the pathogen and screening of bactericides. Ann. Phytopath. Soc. Japan 55: 427-436.

Varvaro L., Magro, P., Marinelli, P., 1990. Comparsa di *Pseudomonas viridiflava* su *Actinidia deliciosa* in Italia. Inf.fitir. Regal. 4: 49-53.

Varvaro L., and Fabi, A., 1992. The role of ice nucleation active *Pseudomonas viridiflava* in frost injury to kiwifruit plants. Riv. Pat. Veg. 2: 85-90.

Young, J.M. 1987. Ice-nucleation on kiwifruit. Ann. appl. Biol. 111: 697-704.

Young J.M., Cheesmur G.J., Wellham F.V., Henshall, W.R. 1988. Bacterial blight of kiwifruit. Ann appl. Biol. 112: 91-105.

Ctifl

First observations of a wood decay (Esca-like disease) on kiwifruit in France

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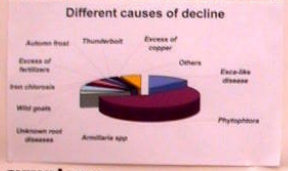
In 2000, growers throughout South-West of France (Landes and Pyrénées-Atlantiques) began reporting decline symptoms in Kiwifruit orchards. Different causes of decline were identified after a survey of 190 orchards. Among the recorded declines, a form of decay previously undescribed in France was observed. We present here a brief description of symptoms and a list of fungi presently associated with this disease very similar with "esca" in grapevine.

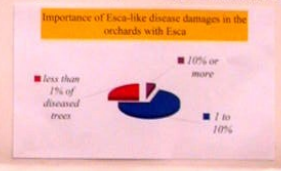
Importance of decline diseases in France : results of a national survey (2001)

Dead or weak trees were found in 68 % of surveyed orchards (198/290). According to growers, 82% of these dieback problems can be attributed to root fungal diseases *(Phytophthora sp., Armillaria,...)*.

Percentage of weak or dead trees	*0 %*	*1 to 5 %*	*6 to 10 %*	*More than 10 %*	*Total*
Number and Percentage	92	119	56	16	290
or surveyed orchards	32 %	42 %	21 %	5 %	100 %

Causes of decline in 190 kiwifruit orchards (SW France, 2001) (defined by M.P. Durpaire; Kiwifruits de France)





External symptoms

- Plant is less vigorous
- Leaf area reduced with sometimes interveinal chlorosis or necrotic spots
- Total decline of the plant or single branches (one arm for example)
- Sometimes abnormal inflatings" (bulges) on trunk
- Lot of vigorous re-growing shoots under diseased woody parts

Internal symptoms

Main fungi isolated from infected wood of some diseased plants (with help of S. Chamont and D. Blancard, INRA) :

- *Phaeoacremonium aleophilum, Phaeoacremonium viticola Phomopsis* sp., *Botryosphaeria obtusa, Cylindrocarpon* sp.
- *Cephalosporium* sp., *Fusarium* sp., *Alternaria* sp.,*Cladosporium* sp., *Paecylomyces* sp., *Penicillium* sp.
- Other fungi unidentified : Aphyllophorales, Sphaeropsidales

A similar decay was reported in Italy by Di Marco *and al.* (2000) but symptom expression was probably slightly different : no inflating on trunk and no re-growing shoots had been described and the presence of white rot areas into the affected wood seemed frequent. Nevertheless we isolated a lot of fungi belonging to the same species than those mentioned by Di Marco (2000). Further work is needed to explain the origin of this form of decay (etiology), to understand the role of involved fungi and to assess the economical consequences for the future. No control method has been developed so far.

Reference. Di Marco *and al.*, 2000. A new wood decay of kiwifruit in Italy. New Zealand Journal of Crop and Hort. Science, 28 : 69-76.

INRA

SPV

The Wood Decay of Kiwifruit and First Control Measures

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Aim

Pathogenicity test

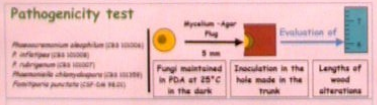
Ability of fungi isolated from discoloured and white rot areas of diseased plants to cause symptoms when inoculated in the wood of potted plants

Control measures

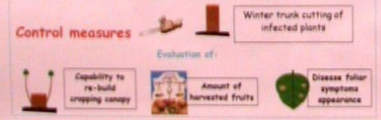
Activity of trunk cutting technique performed on diseased plants

Material and Methods

Pathogenicity test

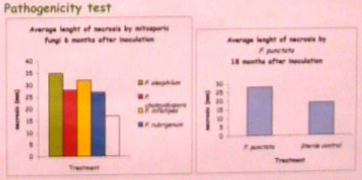


Control measures



Results

Pathogenicity test



All fungi could be re-isolated

Results

Diseased plant

Cut plant showing full yield

Conclusions

Ability of fungi to cause wood deterioration as in the field:

Phaeoacremonium spp. → DISCOLORATION

P. chlamydospora → WHITE ROT

F. punctata → WHITE ROT

First control attempts based on sanitary measures:

- RE-BUILT CROPPING CANOPY
- FULL YIELD 2-3 YEARS AFTER THE TREATMENT

THE FIFTH INTERNATIONAL SYMPOSIUM ON KIWIFRUIT
第 五 届 国 际 猕 猴 桃 研 讨 会

Wuhan China September 2002

DISPLAY OF NEW KIWIFRUIT CULTIVATION TECHNOLOGIES DEVELOPED BY THE YANG KIWIFRUIT RESEARCH INSTITUTE, YANGZHOU,CHINA.

中国扬州杨氏猕猴桃栽培新技术成果展

1.Setting a New Guinness World Record for the Natural Storage of Yang Kiwifruit.

一、创造杨氏猕猴桃自然保鲜时间世界基尼斯纪录

A kiwifruit storage research project conducted over 23 years,drew on the resources of three generations

历时23年的猕猴桃保鲜项目，倾聚了三代人的心血

Kiwifruit Stored at Normal Temperature for 365 days

猕猴桃常温贮存365天

At least eight commercial varieties are now able to be stored naturally for a period exceeding six months

已有8个以上商业性品种能自然保鲜6个月以上

技术价值

(1) 能降低成本，既省去冷库建造费，又节约能源

(2) 能保持风味，保持特有的果汁基味，延长风味的持续时间

(3) 能延长可食期2-3个月，确保生产者、营销商和消费者的利益

Technical Value

(1)Production costs are reduced;no investment in cool store infrastructure required,and savings made on energy costs;

(2)Flavour of fruit is retained;original flavour and juice characteristics retained; flavour sustainable period extended;

(3)Eating period(shelf-life)extended,grow one to three months,protecting the interests of the producers,marketing organizations and the consumers.

Developing New Free-standing Kiwifruit Cultivation Technology

二、创造猕猴桃无架栽培新技术

技术价值

(1) 省去架材等急投入，降低生产成本，推动产业发展

(2) 方便树冠管理，便于规范操作，提高管理效率

(3) 有利于高新技术的实施，生产出优良品质，获得高效益

Technical Value

(1)Savings made on investment in structure materials,reducing production costs and stimulating development of kiwifruit industry;

(2)Vine management made more convenient, making possible more standardised operations and increasing labour Etxe efficiency;

(3)Opening the way for the implementation of new high-tech innovations,to produce first class commercial fruit and to gain high returns.

3.Establishing Five Quality Targets for Growing Hayward Fruit, And Developing New Technology to Meet These Targets

三、创造实现海瓦德五项指标的新技术

A three-year Yang Hayward fruiting orchard using a pergola structure

3年生大棚架海瓦德标志结果园

Chinese and overseas kiwifruit experts assessing the commercial quality of Hayward fruit produced using Yang technology

中外专家在鉴评杨氏生产的海瓦德商品性指标

A three-year Yang Hayward fruiting orchard using the T-bar structure

3年生棚架海瓦德标志结果园

五项指标

1、可溶性固形物含量指标：平均达16%以上

2、口感指标：味甜可口的风味在口腔内保持10秒以上

3、外观指标：整齐漂亮，杨氏生产园内正品果率达95%以上

4、贮存指标：自然保鲜6个月以上

5、可食期指标：从可以食用到不可以食用为40天以上

技术价值

1、能发挥海瓦德的潜在种性

2、能满足消费者对猕猴桃果实的高品位要求

3、能延长海瓦德优良品种的经济利用寿命

4、由于猕猴桃鲜果品质高，风味好，能提高市场销售的速度和数量

Five Quality Targets

1.Soluble solids concentration target: average to exceed 16%;

2.Taste target:flavour to be intense and delicious and the aftertaste should last in the mouth for more than ten seconds;

3.Cosmetic target:neat (true to type) and of good appearance,the percentage of first-class fruit growing in orchards cultivated using Yang technology exceeds 95%;

4.Storage target:able to be stored naturally for over six months;

5.Eating period(shelf-life) target:a shelf-life of 40 days or more after fruit is taken out of storage.

Technical Value

1.Exploit the potential of the Hayward attributes;

2.Satisfy consumer demands for high quality kiwifruit;

3.Extend the economic life of the superior Hayward variety

4.Achieve quicker and more sales because of high quality and good taste.

4.Developing New Technology for Drying of Fresh Kiwifruit

四、创造猕猴桃鲜果干制新技术

The exhibits which Ms Yang Xiaojin received her award

获奖学生杨晓晋作品

The inventor, Ms Yang Xiaojin,being presented with an award by Professor Yang Zhenxing

杨振兴教授给发明人杨晓晋颁发证书

Ms Yang Xiaojin carrying out her work

杨晓晋在进行实验操作

Ms Yang Xiaojin displaying the large number of Chinese and Delicious specimens she has produced

杨晓晋在上报证书的八十个中、外优质猕桃品种标本

技术价值

1、本技术打破古今中外采用药液浸泡保存果菜的传统做法

2、猕猴桃鲜果干制以后，不变色、不变形、不变质，可以长期保存

3、便于携带、便于保管、便于进行科普宣传和科学研究

Technical Value

1.This technology has superseded the centuries-old international technique for preserving pulp fruit using chemical solution immersions;

2.After the fresh kiwifruit is dried, it's colour,shape and qualitative attributes are retained,and it can it can be stored over a long period;

3.The specimens are easily transportable and easily stored, making them valuable for use in general science education projects and in scientific research.

Commercial Hayward fruit produced by Mr Gou Houjin, Mr Yin Chaoneng of Heqing County, Yunnan Province using Yang cultivation technology

云南省会泽县何华金、尹朝能两位先生运用杨氏栽培技术生产的海瓦德商品果

Commercial Hayward fruit produced by Mr Huang Guohua of the Dabie Mountains region of Anhui Province using Yang cultivation technology

安徽省大别山黄国华先生运用杨氏栽培技术生产的海瓦德商品果

Commercial Hayward fruit produced by Yang Kiwifruit Research Institute, Yangzhou, Jiangsu Province

江苏省扬州杨氏猕猴桃科研所生产的海瓦德商品果

Commercial Hayward fruit produced by Mr Wu Dengliang of Hongkou Township, Dujiangyan City, of Sichuan Province using Yang cultivation technology

四川省都江堰市红口乡吴登亮先生运用杨氏栽培技术生产的海瓦德商品果

Commercial Hayward fruit produced by Mr Ke Bowei of the Nanyan Mountains region of Anhui Province using Yang cultivation technology

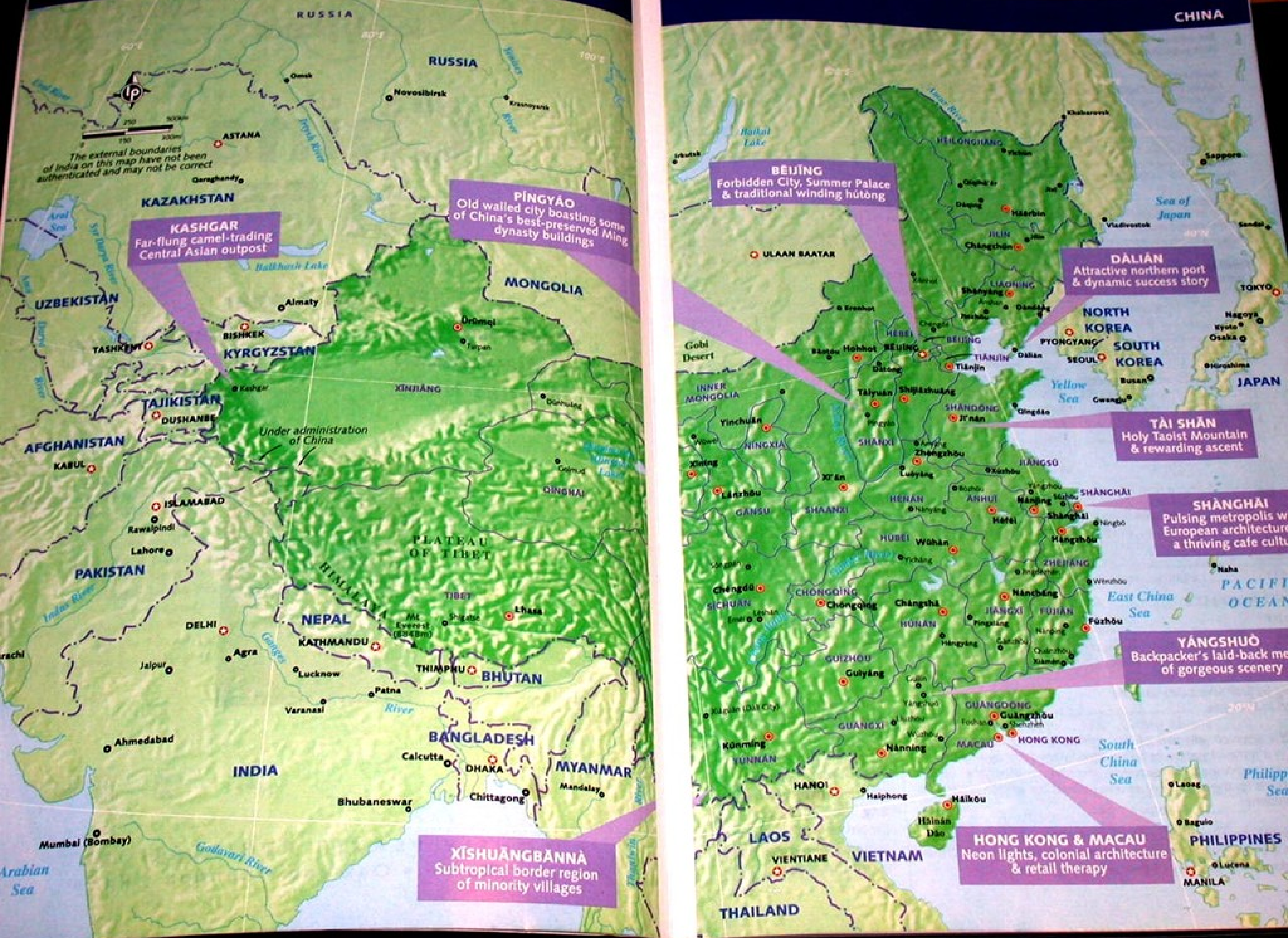
安徽省南云山柯柏威先生运用杨氏栽培技术生产的海瓦德商品果

HACIA EL KIWI EN SU ZONA DE ORIGEN


连果子都
爱喝的果汁!
新口味
新上市
辣
辣
统

GENERALIDADES DE CHINA

CHINA



KASHGAR
Far-flung camel-trading Central Asian outpost
PÍNGYÁO
Old walled city boasting some of China's best-preserved Ming dynasty buildings
BĚIJĪNG
Forbidden City, Summer Palace & traditional winding hútòng
DÀLIÁN
Attractive northern port & dynamic success story
TÀI SHĀN
Holy Taoist Mountain & rewarding ascent
SHÀNGHĂI
Pulsing metropolis w
European architecture
a thriving cafe cultu
YÁNGSHUÒ
Backpacker's laid-back me
of gorgeous scenery
HONG KONG & MACAU
Neon lights, colonial architecture & retail therapy
XĪSHUĀNGBĂNNÀ
Subtropical border region of minority villages
The external boundaries of India on this map have not been authenticated and may not be correct
Under administration of China
RUSSIA
KAZAKHSTAN
UZBEKISTAN
KYRGYZSTAN
TAJIKISTAN
AFGHANISTAN
PAKISTAN
INDIA
NEPAL
BHUTAN
BANGLADESH
MYANMAR
MONGOLIA
NORTH KOREA
SOUTH KOREA
JAPAN
LAOS
VIETNAM
THAILAND
PHILIPPINES
PLATEAU OF TIBET
HIMALAYA
Gobi Desert
Sea of Japan
Yellow Sea
East China Sea
South China Sea
PACIFIC OCEAN
Arabian Sea
Aral Sea
Balkhash Lake
Baikal Lake
ASTANA
Almaty
BISHKEK
TASHKENT
Kashgar
Ürümqi
Turpan
DUSHANBE
KABUL
ISLAMABAD
Rawalpindi
Lahore
DELHI
Agra
Jaipur
Lucknow
KATHMANDU
THIMPHU
Patna
Varanasi
Ahmedabad
Calcutta
DHAKA
Chittagong
Mandalay
Bhubaneswar
Mumbai (Bombay)
Lhasa
Shigatse
Mt Everest (8848m)
Omsk
Novosibirsk
Krasnoyarsk
Irkutsk
ULAAN BAATAR
Khabarovsk
Vladivostok
Hāerbīn
Chángchūn
Shěnyáng
Dàlián
BĚIJĪNG
Tiānjīn
Hohhot
Bāotóu
Dàtóng
Tàiyuán
Shíjiāzhuāng
Jǐ'nán
Qīngdǎo
Zhèngzhōu
Luòyáng
Xī'ān
Lánzhōu
Xīníng
Yínchuān
Chéngdū
Chóngqìng
Wǔhàn
Nánjīng
Shànghǎi
Hángzhōu
Héféi
Nánchāng
Chángshā
Fúzhōu
Guìyáng
Kūnmíng
Nánníng
Guǎngzhōu
HONG KONG
MACAU
Hǎikǒu
Hǎinán Dǎo
HANOI
Haiphong
VIENTIANE
MANILA
PYONGYANG
SEOUL
Busan
TOKYO
Osaka
Sapporo
XĪNJIĀNG
QĪNGHǍI
TIBET
INNER MONGOLIA
NÍNGXIÀ
GĀNSÙ
SHAANXI
SHANXI
HÉBĚI
SHĀNDŌNG
JIĀNGSŪ
ĀNHUĪ
HÉNÁN
HÚBĚI
SÌCHUĀN
CHÓNGQÌNG
HÚNÁN
JIĀNGXĪ
ZHÈJIĀNG
FÚJIÀN
GUÌZHŌU
YÚNNÁN
GUĂNGXĪ
GUĂNGDŌNG
HĒILÓNGJIĀNG
JÍLÍN
LIÁONÍNG

boasting some of Húběi's wildest scenery

Hànkǒu – British, German, Russian, French and Japanese – all grouped around present-


汪集鸡汤馆
复印


武珞路(西)
WULUO LU
武珞路(东)
WULUO LU
丁字桥路
DINGZIQIAO LU
珞狮路
LUOSHI LU
石牌岭路


EPSON
投影机
奥升电脑学校


KFC
肯德基
KFC
KFC
梦的妮


女人街
GIORDANO
GIORDANO
FUN


玉龙岛花园
用友
ERP
中山大道


太清殿

ACTUALIZACIÓN EN TÉCNICAS DE PRODUCCIÓN Y DESAFÍOS DE NUESTRA INDUSTRIA

PODA Y AMARRA

- **200 – 250.000 yemas/há según historiales propios de cada plantación.**
- **Tendencia a aumentar yemas/ha con miras a extinguir brotes débiles (“cajas de fósforos” y “alfileres”), junto a regular la carga por brote según su tamaño.**
- **Renovación anual de cargadores y despunte de 8 mms.**
- ***Amarra:* máxima separación (guatanas y/o ¿ganchos NZ?).**

MANEJO DE CANOPIA

- **Separación de cargadores entre 4ª semana de Septiembre y 2ª semana de Octubre.**
- **Eliminación (“extinción”) de brotes débiles.**
- ***Poda verde zona de fructificación:* pre floración rebaje de brotes indeterminados sobre último botón y eliminación de brotes sin fruta.**
- ***Poda de cordón:* eliminación de “chimuchina” y sobretodo exceso de futuros cargadores y mal ubicados, en floración – cuaja.**
- ***Poda de machos:* inmediatamente después de flor, rebaje a 1 – 2 mts por cada costado. Primera pasada rápida para luz , segunda de rebaje definitivo eliminando cruzados. Poda invernal y amarra similar a hembras.**
- ***Poda verde “de cordón a cordón”:* post-floración, repaso en zona fructificación y zona de reemplazos para mantener filigrana de luz (suelo piel de leopardo).**
- **Muy importante en primeros 50 días después de flor.**

POLINIZACIÓN

- **Principal factor limitante de nuestra producción.**
- ***Mejorar distribución de machos:* 11% es insuficiente. Reinjertos y/o replantes en interior y perímetros.**
- ***Manejo de abejas:* relación con apicultores, preparación de colmenas, actitud "dinámica" y "alerta" durante la floración, controles y registros.**
- ***Polinización asistida:* estrategia según realidades.**
  - **Polinización manual flor a flor.**
  - **Polinización manual con pompón y polen.**
  - **Polinización manual con técnica oriental.**
  - **Polinización con máquina de espaldas, polen + licopodeo (¿o carbón vegetal?).**
  - **Polinización mecánica con equipo tirado por tractor.**
  - **Polinización con aspersor de polen en solución (Nueva Zelanda).**

RIEGO Y NUTRICIÓN

- **RIEGO: fundamental, alta eficiencia en cantidad y CALIDAD, controles fundamentales.**

- **NUTRICIÓN:**
  - **N: 100 – 140 unidades.**
  - **K_2O: 120 – 180 unidades (invierno y/o pri –ver).**
  - **Zinc: según análisis foliares.**
  - **Magnesio: para "enverdecer" según necesidad.**
  - **Bioestimulantes: efectividad "debatible", nada sustituye al CPPU (por ahora).**
  - **Programas nuevos: validar con experiencias controladas.**
  - **¿Aspersiones de Calcio?**

COSECHA

- **Momento: ojo cosechas inmaduras por oportunismo de mercado. Fundamental en calidad, conservación y ACEPTABILIDAD.**

- **Índices de Madurez:**
  - ***Materia Seca:*** **estandarizar técnica.**
  - ***Sólidos solubles iniciales:*** **no basta con cumplir materia seca mínima, también se requieren S.S. mínimos.**
  - ***Sólidos solubles finales:*** **mínimo 13.5ºBrix, complemento de anteriores.**
  - ***Firmeza:*** **ojo para almacenaje prolongado.**

- **Cosecha con bins a piso y carros autocargables.**

- **Trato de fruta en cosecha.**

- **IMPORTANTE: coordinación con centrales frutícolas, planificación de volúmenes y calidad.**

POST COSECHA

- Buen nivel tecnológico en el país.
- Mucho que avanzar en:
  - Curado y control de Botrytis.
  - Descomposición interna por bajas temperaturas.
  - Identificación de lotes para VR, FCL ó AC.
  - Manejo para conservar calidad y ACEPTABILIDAD.
- Adopción racional de tecnología NIR.
- Presentación.
- Trazabilidad.

DESAFÍOS COMO PAÍS

- **Revitalizar Investigación en sector producción:**
  - **Manejos para mejorar conservación y aceptabilidad: Manejo de Canopia, Calcio, Almidón, Materia Seca.**
  - **Enfermedad de Brazos.**
  - **Polinización.**

- ***Variedades:* esfuerzo mancomunado por ampliar espectro varietal. Giras de captura tecnológica, ¿Programa local de mejoramiento genético?, como PAÍS.**

- ***Asociatividad:***
  - **Mayor integración horizontal y vertical.**
  - **Intercambio de técnicas y de Gestión.**
  - **Fondos para financiar investigaciones, estudios de estadísticas y de mercado, junto a promoción.**

- **COMISIONES REGIONALES Y NACIONAL DE KIWEROS, integradas horizontal y verticalmente.**