FIA-CD-V-2005-1-A-023 AXO

GOBIERNO DE CHILE
MINISTERIO DE AGRICULTURA
INIA TAMEL AIKE

GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN AGRARIA

PROGRAMA DE CAPTURA Y DIFUSIÓN TECNOLÓGICA

PARTICIPACIÓN EN EL QUINTO SIMPOSIO INTERNACIONAL DE CEREZAS

PROPUESTA FIA-CD-V-2005-1-A-023

INFORME TÉCNICO Y DIFUSIÓN

COYHAIQUE, SEPTIEMBRE DE 2005

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CONTENIDO DEL INFORME TÉCNICO

Fecha de entrega del Informe
30 Septiembre de 2005
Nombre del coordinador de la ejecución
Diego Arribillaga García
Firma del Coordinador de la Ejecución

Centro Regional de Investigación TAMEL AIKE

1. ANTECEDENTES GENERALES DE LA PROPUESTA

Nombre de la propuesta
Participación en el quinto Simposio Internacional de cerezas
Código
FIA-CD-V-2005-1-A-023
Entidad responsable
Instituto de Investigaciones Agropecuarias
Coordinador(a)
Diego Arribillaga García
Tipo de Iniciativa(s)
Gira Beca X Evento Consultores Documentos
Fecha de realización (inicio y término)
Esta se realizó entre el domingo 5 al viernes 10 de junio

OFICINA DE PARTES - FIA
RECIBIDO
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2. RESUMEN DE LA PROPUESTA

Resumir en no más de una página la justificación, actividades globales, resultados e impactos alcanzados con la propuesta completa. Cuando exista más de una iniciativa, cada una de ellas debe ser resumida en forma específica. Estos resúmenes deben sintetizar los aspectos principales de la propuesta y cada una de sus iniciativas en forma general.

GLOBAL (Completar sólo cuando existe más de una iniciativa)

GIRA TECNOLÓGICA

BECAS

El Centro Regional de Investigación, INIA Tamel Aike, desde el año 1998, ha potenciado el desarrollo de este cultivo, lo que ha permitido incrementar paulatinamente la superficie frutícola en la comuna de Chile Chico, existiendo en la actualidad mas de 90 hectáreas de cerezas.

En enero de 2004, se realizó la primera exportación de cerezas frescas a Europa, con interesantes retornos a productor.

En esta nueva zona cerecera, la más nueva de Chile, se han detectado problemas de manejo, como heladas tardías, presencia de plagas, fertilidad, manejo de post cosecha.

La capacitación, que reciben los productores, es a través de un GTT frutícola, donde resulta de vital importancia la capacitación periódica, del coordinador de este grupo de transferencia tecnológica.

La participación en el V Simposio Internacional de cerezas, realizado en la ciudad de Bursa, Turquía, contemplaba como objetivos, la actualización de conocimientos técnicos y la presentación en modalidad de panel, de un trabajo sobre la evaluación de 9 cultivares de cerezas, evaluados en Patagonia Sur, objetivos logrados en su totalidad.

El Panel, fue instalado durante el primer día del simposio, el cual fue visitado en varias oportunidades, dando respuesta a las consultas de los participantes.

Durante este seminario, existió un programa de charlas, con una duración de 15 minutos, entre una y otra, donde se abordaron diferentes temas, como por ejemplo: cultivares, portainjertos, post cosecha, desórdenes fisiológicos, programas de mejoramiento, enfermedades, plagas, guindas, fertilización, riego, entre otras.

La participación, en cada una de estas charlas, me permitió actualizar conocimientos técnicos en cuanto al manejo del cultivo, nuevos cultivares y evaluación de portainjertos.

Se realizaron dos salidas a terreno, una a la Universidad de Uludag, donde se visitó un jardín de cultivares y portainjertos (ver CD), y otra a la planta de empaque de ALARA, donde el circuito contemplaba desde la recepción de la fruta hasta su embalaje final.

La participación en este simposio, permitió por un lado preparar y realizar tres charlas

técnicas a productores de cerezas y empresarios de Chile Chico y Coyhaique y por otro orientar los trabajos que se realizan en la zona, tanto en el plano técnico como comercial, es decir se podrán aplicar los cocimientos adquiridos, para la selección de cultivares apropiados a la zona, manejo agronómico del huerto, lo que en definitiva permitiría ser altamente competitivo en un mundo globalizado de la producción de cerezas.

CONSULTORES

EVENTOS

DOCUMENTOS TÉCNICOS

3. ALCANCES Y LOGROS DE LA PROPUESTA GLOBAL

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

El principal objetivo planteado en esta propuesta, se cumplió a cabalidad, el cual consistió en la actualización de conocimientos técnicos, por parte del coordinador de la propuesta, profesional del INIA Tamel Aike, que trabaja con 17 productores de cerezas, de la comuna de Chile Chico, Región de Aysén.

Objetivos alcanzados tras la realización de la propuesta

Actualización de conocimientos técnicos.

Transferencia de conocimientos a los productores de cerezas de Chile Chico

Presentación de un trabajo de investigación, sobre la Evaluación de 9 cultivares de cerezas en Patagonia Sur.

Se establecieron los contactos para presentar una propuesta a FIA, para realizar una gira tecnológica, a centros de producción de cerezas bajo sistema de control de heladas.

Metodología de procesamiento de cerezas frescas, para el mercado de exportación.

Resultados e impactos esperados inicialmente en la propuesta

Actualización de conocimientos técnicos

Capacitación directa a 13 productores de cerezas de Chile Chico

Contacto establecido con empresas proveedoras de insumos.

Estrategia para el control de heladas tardías en huertos de cerezos.

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Manejo del huerto definido para la producción de cerezas

Metodología de procesamiento de cerezas para el mercadote exportación.

Resultados obtenidos

Descripción detallada de los conocimientos y/o tecnologías adquiridos y/o entregados. Explicar el grado de cumplimiento de los objetivos propuestos, de acuerdo a los resultados obtenidos. Para consultorías es necesario anexar el informe final del consultor.

Los objetivos y metas propuestos antes de la realización de este simposio, se lograron prácticamente en su totalidad, a excepción de establecer contactos con empresas proveedoras de insumos, debido a que estas no tenían representación en Chile, sino mas bien sólo para Europa.

Durante este simposio, se visitó las Instalaciones de procesamientos de cerezas de ALARA, donde se realizó un recorrido por su planta de empaque, donde la clasificación de tamaño de las cerezas se realiza en forma automatizada, donde la fruta es trasladada por medio de corrientes de agua enfriada, hasta la línea de clasificación final, donde se eliminan los frutos dañados. (La secuencia del procesamiento de cerezas, se aprecia en CD adjunto).

Resultados adicionales

Describir los resultados obtenidos que no estaban contemplados inicialmente como por ejemplo: formación de una organización, incorporación de alguna tecnología, desarrollo de un proyecto, firma de un convenio, entre otros posibles.

En Chile David del Curto, posee la patente de cultivares tardíos de cerezas, del Centro de Investigación de Summerland, en Canadá. El Gerente Enrique Urrejola, se manifestó muy interesado en evaluar estos cultivares tardíos en la región de Aysén, lo que permitiria disponer de un jardín con más de 20 cultivares.

En Agosto se presento una propuesta de Gira tecnológica a FIA, para conocer la experiencia de los productores de cerezas en Trelew, Republica Argentina, por medio del Dr. Eduardo Cittadini, del INTA, quien organizó el programa de visita, actividad que se realizará entre el 3 al 7 de octubre de 2005.

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).

En este seminario, existió un consenso entre los expositores, que la tendencia mundial es trabajar en la determinación o selección de cultivares tardíos, a objeto de prolongar la oferta de fruta, lograr un mayor calibre, sabor, firmeza, resistencia a pittin. De los cultivares bajo estudio, existió un consenso en que los cultivares mas promisorios, serian Kordia, Lapins, Sweet Heart, Regina, Alex, y Stacato.

En la Región de Aysén, se esta desarrollando un proyecto, cuyo principal objeto es evaluar cultivares tardíos, como por ejemplo Lapins, Kordia, Regina, Sweet heart, Alex, Fercer, Bing, Van, Rainier, Katalin y Late María.

Es decir, en el corto plazo, se obtendrían resultados del comportamiento y potencial productivo de estos nuevos cultivares, en tres zonas agro climáticas bien definitivas, como Chile Chico, Valle Simpson y Manuales.

El Instituto de Desarrollo Agropecuario, INDAP, dispone de líneas especiales de créditos, a los cuales los agricultores pueden acceder por medio de proyectos de desarrollo, que son presentados a los jefes de área de cada provincia.

En este sentido, las futuras plantaciones que se realicen en Chile Chico, serían con aquellos cultivares que presenten un adecuado potencial productivo, es decir que conjugue calidad de fruta y época de cosecha.

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.

Uno de los objetivos que perseguía esta gira, fue el establecer contactos con centros de investigación del Hemisferio Sur, como por ejemplo, Australia y Nueva Zelandia, sin embargo a este simposio, no asistieron profesionales investigadores, de dichos países.

Dentro del Hemisferio Sur, estos países presentan su cosecha, desde mediados de enero en Australia, hasta la primera semana de febrero en Nueva Zelandia.

El programa de mejoramiento del Sur de Australia, ha permitido obtener, según la exposición del Dr. Frank Kappel, nuevos cultivares, los que se mencionan a continuación:

- Sir Tom, 1998 - Sir Don,1998 - Dame Roma, 2001
- Dame Nancy, 2002 - Sir Hans, 2002 - Sir Douglas, 2002
-

Por lo señalado anteriormente, uno de los vacíos, que aun quedan por abordar, es conocer el comportamiento y manejo de cultivares tardíos en Nueva Zelandia y en el sur de Australia (Isla de Tasmania), donde en esta latitud, se podrían presentar problemas comunes a los existentes en la Región de Aysén, como heladas tardías, viento y la comercialización, dado que por la época de cosecha, se deberían obtener mejores precios al ser la última cereza cosechada en le temporada.

Quedan algunas interrogantes, las cuales se deberán abordar, para conocer la experiencia de los países del Hemisferio Sur, que obtienen cosechas tardías, mediante la traída de expertos o bien por medio de giras tecnológicas.

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4. ASPECTOS RELACIONADOS CON LA EJECUCIÓN DE LA PROPUESTA

Programa Actividades Realizadas

Nº	Fecha	Actividad	Iniciativa
1	28 Julio 2005	Charla técnica	
2	29 julio 2005	Reunión GTT	
3	4 Agosto 20045	Charla técnica	

Detallar las actividades realizadas en cada una de las Iniciativas, señalar y discutir las diferencias con la propuesta original, y rescatar lo más importante de cada una de ellas. Por ejemplo, en el caso de Giras discutir las actividades de cada visita; Becas, analizar las exposiciones más interesantes; Consultores, detallar el itinerario y comentarios del consultor; Eventos, resumir y analizar cada una de las exposiciones; y Documentos, analizar brevemente los contenidos de cada sección.

GIRAS

BECAS

Sin duda que las exposiciones mas interesantes, dicen relación con la evaluación de nuevos cultivares tardíos, que se enmarca dentro de la línea de investigación que se esta desarrollando en la región, por medio de un proyecto financiado por el FIA.

El Dr. Frank Kappel, Agricultute ang Agri-Food, Summerland, B C, Canadá, presento un trabajo de los cultivares del nuevo mundo, señalando los principales centros de investigación en cultivares, que trabajan en la obtención de nuevos cultivares, donde se menciona:

Washington, cultivar Rainier

British Columbia, cultivar Van, Stella, lapins, Sylvia y Sweet Herat.

Hungría, cultivar Kordia, Katalin y Alex

Lo interesante de este cultivares, que se encuentran en evaluación en la Región de Aysén, a través de un proyecto financiado por el FIA.

Estos centros de investigación, persiguen obtener nuevos cultivares, con características definidas, como por ejemplo, tamaño grande, firmeza, flores autofetiles, resistente a pittin, buen sabor, baja susceptibilidad a cracking.

Muchos de los trabajos presentados en el Symposio, señalaron que dentro de los cultivares mas promisorios, se destacaba Lapins y Sweet Heart. Estos cultivares de reciente introducción en el País, se encuentran en los jardines de cultivares, que el INIA Tamel Aike, estableció en tres localidades de la Región.

Al analizar los resultados preliminares obtenidos en estos cultivares, se aprecia que son tardíos, con cosecha de mediados de enero. (Ver presentación en CD), con excelentes características de calibre y firmeza.

CONSULTORES

EVENTOS

DOCUMENTOS

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
David del curto	Enrique Urrejola	Gerente	2/3622777		eurrejola@ddc.cl
Asmena	Juan Carlos Pujó	Asesor en fruticultura	0299-4421909	Neuquen	asmena@ciudad.com.ar

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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
CD	Charla técnica realizada en Chile Chico y Coyhaique	Diego Arribillaga G	1

Recopilado

Tipo de Material	Nº Correlativo (si es necesario)	Caracterización (título)
Artículo	1	Investgation of isozyme polymorphism in open-pollinated sweet cherry and mahaleb. seedling
	2	Micropropagation of two cherry rootstocks and their behaviour in the nursey and in the orchard.
	3	Mineral composition of sweet cherry orchards in canakkale and applying gis for determination of local distributions.
	4	Rootstock and management practices evaluation to avoid cherry replant disease in Chile.
	5	Some result of using "Van cultivars for the improvement of the sweet cherry range of cultivars in Bulgaria.
	6	The effects of different pollinators on the fruit set and pomological characteristics of 0900 ziraat, sweet cherry cultivar.
	7	Promising sweet cherry cultivars in slovenia.
	8	New sweet and sour cherry selection in

INVESTIGATION of ISOZYME POLYMORPHISM in OPEN–POLLINATED SWEET CHERRY (*Prunus avium* L.) and MAHALEB (*Prunus mahaleb* L.) SEEDLINGS

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ABSTRACT

Sweet cherry cultivars are propagated traditionally on seedling rootstocks in Turkey. For this purpose, wild cherries (*Prunus avium* L.) and mahaleb (*Prunus mahaleb* L.) have been used extensively. The utilization of clonal (vegetative) rootstocks for sweet cherries is fairly low in Turkey due to high expenses of nursery plants. The seeds are collected from certain trees with unknown origin due to their uniformity by nurserymen. The objectives of this study were to compare the seedlings of the two *Prunus* species for morphological characteristics and to detect isozyme polymorphisms in seedling populations. During the study, germination rates, leaf area variations and seedling sizes were evaluated. For determination of seedling heterogeneity, isozyme variation was surveyed for five enzymes including alcohol dehydrogenase (ADH, EC 1.1.1), isocitrate dehydrogenase (IDH, EC 1.1.1.42), malate dehydrogenase (MDH, EC 1.11.1.37), peroxidase (PRX, EC 1.11.1.7) and phosphogluco mutase (PGM, EC 2.7.5.1) in the populations. The investigation showed that wild cherry seedlings exhibited greater variations than mahaleb. Cherry seedlings had leaf areas ranging from 25.43 to 60.28 cm². Isozyme polymorphism has been observed at various levels in seedling population within the two *Prunus* species at 7 enzyme loci and 33 alleles in total (18 alleles in cherries and 15 alleles in mahaleb). Isozyme variability was higher in sweet cherries than mahaleb due to high level of heterozygosity. The study demonstrates the value of clonal rootstocks for eliminating of genetic variability within seedling rootstocks.

RODUCTION

of sweet cherry cultivars are propagated traditionally on seedling rootstocks in Turkey. For this purpose, wild cherries and mahaleb have been used extensively. The fruits of wild cherries and mahalebs are having no commercial value t rootstock characteristics. Mahaleb is very popular rootstock for sweet cherries in Turkey due to more resistance to abiotic factors like calcareous soils than cherry seedlings. The seedlings of wild cherry and mahaleb have important characteristics like ation to certain soil conditions, good affinity and resistance to some biotic factors. **The utilization of clonal (vegetative) rootstocks for stone fruits is fairly low in Turkey.** The seeds are collected from certain trees with unknown origin that been chosen for nurserymen due to their uniformity. Then, seeds extracted, germinated and grown for using as rootstocks. Propagation by seed has significant advantages for the nurserymen; in particular, it is both more simple and cheaper to ve than propagation by vegetative methods.

e of stone fruit species are self-sterile and highly heterozygous, so most of seedlings do not come true-to-type. It has been observed that significant variation exits in the phenotype and performance of seedlings of *Prunus* species. As d and sweet cherries need cross pollination to produce fruits, seedlings differ remarkably within themselves and from their parent plants, giving rise to a high polymorphism. Mahaleb which is used as rootstock for sweet cherries show great natural ility. Rootstock characteristics have been less studied than those of the scion; consequently, rootstock selection has been somehow neglected and traditionally, different stone fruit seedlings from unknown origin have been used like in Turkey. **ifferences among rootstocks result high tree heterogeneity among trees affecting vigor, productivity, precocity, pest resistance etc. in the same orchard.**

bjective of this study was to detect isozyme polymorphisms in cherry and mahaleb seedlings.

TERIALS AND METHODS

seedling populations were obtained from the seeds of open-pollinated wild cherry [*Prunus avium* L.] types and wild mahaleb [*Prunus mahaleb* L.] types which are used only as seed sources for seedling production traditionally in Turkey for long time. seeds were selected from each sources and then, the seeds were remained in the stratifying medium until sown in the nursery. Appropriate cultural conditions were provided during germination and growth of seedlings.

ermination rate and seedling morphology

nination rates were determined at the end of growing season by counting of each plant within the populations. For determination of seedling morphology, samples were measured for leaf areas and final seedling sizes.

area (cm²): The average area of fully developed three leaves of 50 seedling samples was measured by a digital planimeter.

dling size: All seedlings were divided into four length groups at the end of growing season (in December) when plants were dormant period. The groups were very small (from 0 to 10 cm); small (10-20 cm); medium (20-40 cm) and large (greater 40 cm).

lectrophoretic analysis

plant materials used for the electrophoretic separation of isozymes were obtained from the seedling populations and parent types. When the seedlings had leaves with actual sizes, young leaves were sampled for electrophoretic studies.

eedlings of each species were sampled and analyzed to obtain isozyme polymorphisms in five isozyme system.

his survey, each seedling was taken as a genetic unit called genotype, isozyme pattern was called as zymogram, each isozyme locus was named as gene and each band was considered as an allele on the locus according to its fast or slow trophoretic migration. Alleles were designated from fastest to slowest migration level as F (most anodal), I (faster migrating than M), M (slower migrating than I) or S (slowest migrating allele or most cathodal).

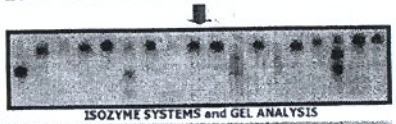
PARENT TREE

SEEDS

SEEDLINGS

ELECTROPHORETIC ANALYSIS

ISOZYME SYSTEMS	ABBREVIATION	ENZYME CODE
MALATE DEHYDROGENASE	MDH	EC 1.11.1.37
ISOCITRATE DEHYDROGENASE	IDH	EC 1.1.1.42
ALCOHOL DEHYDROGENASE	ADH	EC 1.1.1
PEROXIDASE	PRX	EC 1.11.1.7
PHOSPHOGLUCO MUTASE	PGM	EC 2.7.5.1



ISOZYME SYSTEMS and GEL ANALYSIS

SULTS

Germination rate and seedling morphology

data in Table 1. indicates that germination rate varied among the two *Prunus* ies. **The highest germination rate was found in mahaleb, 58,4%, reas the lowest, in cherry had a rate of 29,2%.**

dlings were not similar by leaf areas and final sizes within the populations. The area varied with small differences in mahaleb. Moreover, most of those dlings had similar leaf areas to their parents. However, cherry seedlings bleed greater variations than the mahaleb seedlings. Cherry seedlings had leaf s ranging from 25.43 to 60.28 cm². At the end of growing season, the surements showed that few plants in mahaleb population was very small (less 10 cm in height). However, most of cherry was very small and small. **observations and measurements exhibited that the mahaleb dlings was more uniform than the cherries.**

e 1. Germination rate and morphologic characteristics of the seedlings

SEED SOURCES	Germination rate (%)	Average leaf area (cm²)	SEEDLING LENGHT				
			Very small (0-10 cm)	Small (10-20 cm)	Medium (20-40 cm)	Large (>40 cm)	Total
Cherry	29,2	39,13	33	28	12	0	73
leb	58,4	28,65	9	17	63	57	146

e 2. Modal genotypes of isozyme alleles of cherry and mahaleb seedlings

ECIES	ENZYME LOCI							NUMBER OF SEEDLINGS
	MDH-1	MDH-2	IDH	ADH	PRX	PGM-1	PGM-2	
Wild herry	IS	FI	FF	MM	IN	FF	FF	
	IS	FI	FF	MM	IN	FF	FF	14
	MS	FM	II	FF	II	MM	FI	12
	MS	FS	FM	MM	MM	FM	FI	7
edlings	IS	FI	FS	FF	IN	FM	FI	7
	MS	FI	FS	FF	II	MM	FI	4
	MS	FS	FS	MM	MM	MM	FI	6
	TOTAL							50
ahaleb	IS	FS	FI	MM	IN	FF	II	
	IS	FS	FI	MM	IN	FF	II	24
	MS	FM	FS	MM	II	FM	II	11
edlings	MS	FS	FM	MM	MM	FM	II	8
	IS	FM	FF	MM	IN	FF	II	4
	MS	FM	FF	MM	MM	FF	II	2
	TOTAL							50

b) Electrophoretic analysis

The seedlings of each population that were found to have an isozyme pattern that varied from the other plants.

Isozyme polymorphism has been observed in seedling population of the two *Prunus* species. **Isozyme variation was detected in 5 isozyme systems resulting 7 loci and 33 alleles in total (18 alleles in cherries and 15 alleles in mahalebs).** Isozyme allele patterns of cherry and mahaleb seedlings were summarized in **Table 2.** Isozyme variabilities were highest in sweet cherries due to their high level of heterozygosity. So, wild cherries exhibited more variability than mahalebs.

MDH isozymes occurred in two regions of a gel run under the conditions experimented. The regions called as MDH-1 for slower migration and MDH-2 for faster migration. MDH-2 locus was the most anodal isozyme in the consideration of whole enzymes. All individuals exhibited two or four bands. The observations showed that MDH-2 locus have 3 alleles for mahalebs (F, M, S) and 4 alleles for cherries (F, I, M, S).

IDH isozymes of leaf extracts appeared clearly in only one gel region. The data indicated that IDH isozymes controlled by single gene having allelic variation. The observations showed that IDH enzyme system have four alleles for cherries (F, I, M, S) and three alleles for mahalebs (F, I, M). Cherries had two bands (F, S) in 17 seedlings and (F, M) bands in 7 seedlings which show isozyme polymorphism due to heterozygosity. Most of mahaleb seedlings (32 of 50 genotypes) were also found as heterozygous. The number of alleles showed that IDH is highly polymorphic for cherries and mahalebs. The most common alleles were 'F' (50 of 50 genotypes) among mahalebs and (38 of 50 genotypes) among cherries.

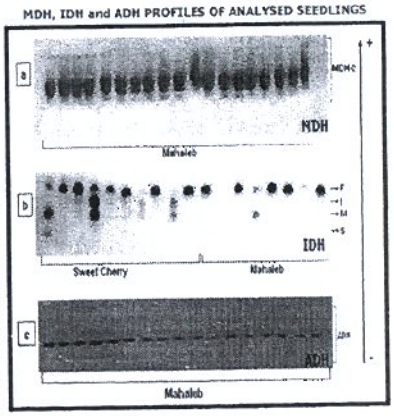
ADH isozymes occurred in a single region of the gel and the zymograms consist of one or two bands. In the present study, no ADH enzyme variability was detected for mahaleb genotypes. All of them had exhibited the same homozygous ADH pattern (MM). Cherries were polymorphic for ADH system. Cherry seedlings had showed (F, M) alleles. Homozygous 'MM' allele was found in 27 cherry genotypes.

PRX isozymes showed high activity in one zone of gel and produced clear bands with reddish-brown color under the electrophoretic conditions given. The data indicated that PRX isozymes controlled by single gene having allelic variation similar to IDH enzymes. The electrophoretic migration of peroxidase showed that PRX enzyme system have two alleles for cherries and mahalebs (I, M). There were 28 genotypes which have heterozygous profile (I, M) for mahalebs and 21 genotypes for cherries.

Under present conditions, **PGM** isozymes showed activity in two zone of gel called PGM-1 and PGM-2 loci similar to previous researches. PGM-1 which was slow migrated locus had two or three bands within the species. Zymograms exhibited that the species had two alleles for cherry and mahaleb (F, M). Most of genotypes (153 of 250 seedlings) were heterozygous due to presence of different alleles. There were three alleles in PGM-2 locus (F, I, S). Mahalebs were homozygous for this locus due to presence of one allele ('I' allele for mahalebs). One or two banded genotypes were detected only in sweet cherries. Among cherries 36 genotypes were heterozygous having (F, I) alleles.

As a result of whole isozyme profiles surveyed on seedling populations showed that 48% of mahalebs and 24% of cherries were found to be having same isozyme profiles with their parents.

MDH, IDH and ADH PROFILES OF ANALYSED SEEDLINGS



CONCLUSIONS

When the heterozygous seeds used as rootstock, tree homogeneity would be affected negatively due to great divesity. **One of the main problems of stone fruit growing is low productivity especially for cherries due to lack of plant homogeneity and good management techniques. For this reason, it is clear that selected plant material both of varieties and rootstocks should be planted. Clonal rootstocks should be utilized for stone fruit species for better tree performance.**

These results would be used for the identification and description of cherry and mahaleb cultivars, types and seedlings and to elaborate genetic similarity and relationships in the *Prunus* genus. The results may be also used in breeding of the *Prunus* species for early screening and selection of plant materials.

MICROPROPAGATION OF TWO CHERRY ROOTSTOCKS AND THEIR BEHAVIOUR IN THE NURSERY AND IN THE ORCHARD.



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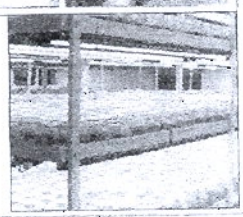
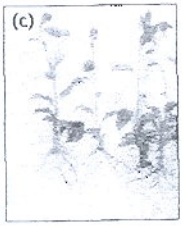
INTRODUCTION

Where fruit science aims at improving product quality and at a sustainable use of resources, selection of the most suitable rootstock is of primary importance. There is no ideal rootstock for all varieties and all situations of soil and climate, but several rootstocks having different characteristics, which can be matched to a given variety according to the soil type and climatic conditions of the growing environment, *and* according to farm organization and the availability of irrigation water.

MATERIALS AND METHODS

The experiments were carried out in Greece. The cherry rootstocks CAB 6P (*P. cerasus*) and SL 64 (*P. mahaleb*) were propagated in vitro in a commercial tissue culture laboratory. Explants from actively growing shoots were collected from controlled virus-free mother plants and sterilized using a solution of sodium hypochlorite at 2% for 20 minutes. The culture medium used for the first stage was WPM, while for shoot proliferation the modified MS culture medium was used for both rootstocks. Shoot elongation was achieved with the MS medium modified differently for each rootstock, and the rooting medium was half-strength MS containing 1mg/l IBA for CAB 6P and 2mg/l IBA for SL 64.



Multiplication (a) and rooting (b) of CAB 6P; rooting of SL64 (c).

CAB 6P acclimation; in the inset after 40 days.

CAB 6P in the nursery (June '05).

RESULTS AND DISCUSSION

The rate of multiplication was 2.5–3.0 for CAB 6P and 4.0–5.0 for SL 64. Rooting reached 80–85% with CAB 6P and 90–95% with SL 64. Survival of the plantlets during acclimation was 90-95% for CAB 6P and 85-90% for SL 64. After approximately 40 days in the greenhouse, the plants were 20-25cm tall and 3-4mm in diameter.

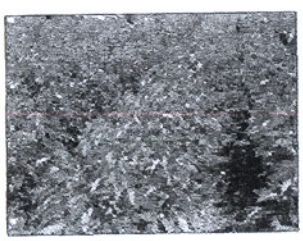
They were transferred to the nursery in May and by the end of August had reached a height of 120-150cm and a diameter at the point of grafting of 8-10mm. Grafting was effected from the end of August to mid September using two dormant buds for each plant of four varieties (Tragana, Ferrovia, Bigarreau Burlat, Ziraat) and was 100% successful for both rootstocks with all four varieties.

By December of the following year the plants were 150-180cm tall and showed perfect compatibility at the point of grafting.

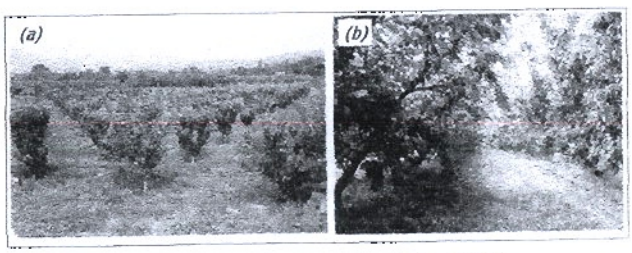
One-year-old trees planted in orchards in northern Greece presented no compatibility problems with any of the four varieties over the subsequent 4-5 years. CAB 6P showed a tendency to suckering depending on soil management practices, as well as earlier cropping and lower vigour compared to SL 64.

CONCLUSIONS

The two rootstocks tested showed good multiplication rates for commercial micropropagation. Both performed extremely well in the nursery: rapid growth, successful grafting and no compatibility problems. Both can be recommended – each according to its specific characteristics - to overcome problems deriving from certain biotic and abiotic stress conditions.



Sweet cherry varieties grafted on CAB 6P (nursery June '05)



Two year-old sweet cherry (cv Tragana) grafted on CAB 6P (a) and four year-old (cv Ferrovia) on SL 64 (b).

MINERAL COMPOSITION OF SWEET CHERRY ORCHARDS IN ÇANAKKALE AND APPLYING GIS (GEOGRAPHICAL INFORMATION SYSTEM) FOR DETERMINATION OF LOCAL DISTRIBUTIONS

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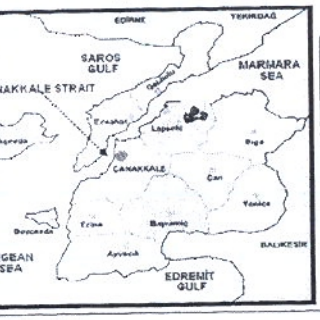


ABSTRACT

Çanakkale is one of the main sweet cherry production regions in Turkey. Sweet cherries produced in Umurbey, Lapseki and Çardak locations are mostly used for export due to their very high fruit quality. In recent years there has been significant new plantings including many in Bayramiç and Ezine counties in Çanakkale province. Nutritional problems of sweet cherry trees are resulted in poor fruit yield and tree health. In this study, leaf analysis program and soil tests were performed in order to evaluate mineral composition (N, P, K, Ca, Mg, S, B, Cu, Fe, Mn, Mo and Zn) of '0900 Ziraat' sweet cherry cultivar grafted on three rootstocks: Mazzard (*Prunus avium*), Mahaleb (*Prunus mahaleb*) and Gisela 6. For this purpose, leaf and soil samples were collected in 21 sweet cherry orchards through the main production belt. Moreover, a Geographical Information System (GIS) was used to identify locations and their attributes, particularly soil characteristics and referenced as maps. Chemical analyses showed that there were differences in macro and micronutrient concentrations in leaves among the orchards sampled. Rootstock type and soil characteristics influenced the leaf concentrations of N, P, K, Ca, Mg, B, Fe and Zn. The highest influence of rootstock and soil type was observed with respect to N, P, K, Mg, Zn and Fe. Considering that sweet cherry growing areas in Çanakkale have variations in soils, rootstock type and orchard management, further studies are needed in order to find out how cherry growers should manage their orchards to ensure that trees and fruits be nutritionally balanced. Fertilizer use efficiency in Çanakkale cherry orchards can be enhanced by scheduled fertilization program after considering of orchard characteristics.

ODUCTION

ovince of Canakkale situated on both sides of the Dardanelles which connects the Marmara Sea to the Aegean Sea and includes also Gökçeada and Bozcaada islands. Its shores touch both Europe (with the Gallipoli ula) and Asia (with the Biga Peninsula). In Canakkale, agro-ecological conditions favor the production of high quality fruits such as olives, table and wine grapes, peaches, sweet cherries, apples, apricots, persimmons, its, vegetables etc. Fruit species are cultivated in the district for thousands of years.

ercial production of sweet cherries in Çanakkale district is concentrated in Lapseki where producing an average of 3500 tons annually. '0900 Ziraat', 'Van', 'Lambert' and 'Early Burlatt' are the major cultivars. 'Stella', ', 'Sweet Heart' are promising cultivars for new plantations. The common rootstocks are Mazzard, Mahaleb and Gisela rootstocks.

uality and acceptable yields of cherry orchards can only be made possible by proper scheduled fertilization program. Hence, some physical and chemical properties of the soil need to be determined, and an analysis m should be made of the amount of nutrient elements in soil and trees via scanning the orchards. The best method of determining the kind and amount of fertilizer to apply to fruit trees is by leaf analyses. It effectively res macro and micronutrients and indicates the need for changes in fertilizer programs.

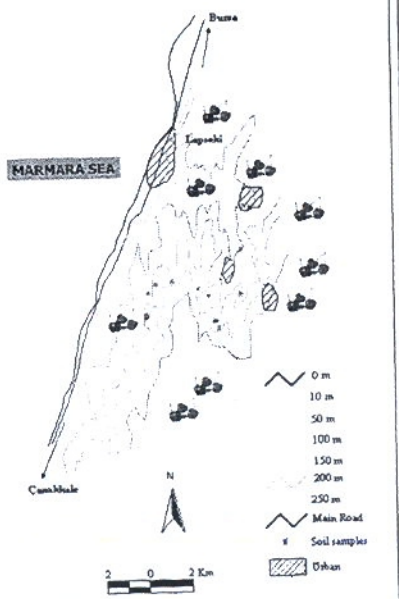
rpose of this research is to determine the nutritional condition of commercial '0900 Ziraat' plantations in terms of the soil and trees in Lapseki-Çanakkale.

RIALS AND METHODS

udy was carried out in 2004 and 2005 in 21 sweet cherry rds located in Lapseki county of Çanakkale province of y. The trees were planted on different soils, whose main cteristics are reported in Table 1. Local rainfall averages een 600-800 mm per year mostly concentrated in spring utumn. The soil excavated from two different depths (0- , 30-60 cm) representing the selected orchards. In the amples salinity, pH, organic matter, $CaCO_3$ and texture investigated.

e orchards, the soil was completely tilled and drip- ted. The four to six drip emitters per tree, located at 1 m the trunk on the tree row, ensured a soil moisture, under mitters, near to the field capacity all summer long. The were more than 5 years old and grafted on Mazzard *us avium*), Mahaleb (*Prunus mahaleb*) and Gisela 6 tocks. The leaf samples were selected from four different tions of the trees representing the orchards at the end of the accepted stable period.

the leaf samples had been dried at 70 °C, total nitrogen analysed by Kjeldahl's method. In extracts obtained by ing wet burning, P was determined by colour-metric; K, were determined by flamephotometric; Mg and elements (Fe, Zn, Mn, Cu, B, Mo) by using Atomic rption Spectrophotometer.



RESULTS

Table 1. summarize some physical and chemical characteristics of soils which sampled in the region. The soil texture was generally loamy and the reaction was slightly and medium alkaline. The calcium carbonate content of the soil was generally low and there was no salinity problem. The levels of organic matter were generally low in the top soils. According to the obtained results the soils are suitable for sweet cherry growing except one plantation which sampled.

Table 2. summarize macro and micro element contents of cherry leaves in the region. Ca, Mg, Mn, B and Mo contents of the leaves were found to be at sufficient level in all orchards.

There were nutritional disorders of N in 28,57%, P in 14,29%, K in 66,67%, Fe in 47,62% and Zn in 61,90% of orchards.

Rootstock type and soil characteristics influenced the leaf concentrations of N, P, K, Ca, Mg, B, Fe and Zn.

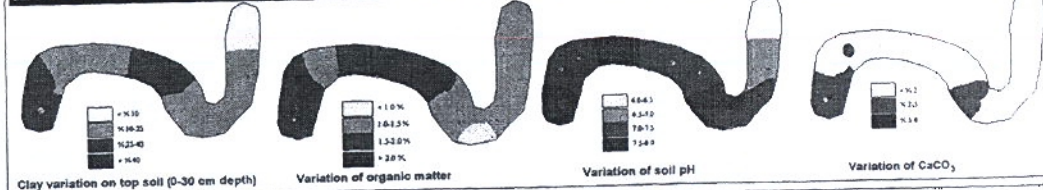
Micro element contents were found below especially on the trees grafted on Mazzard rootstocks.

Table 1. Some chemical and physical characteristics of soil samples

Sample Number	EC dS/m	pH	Org. Mat. %	$CaCO_3$ %	Sand %	Silt %	Clay %	Texture
1. (0-30 cm)	0,030	7,42	1,58	6,98	27,52	59,55	12,93	SIL
1. (30-60 cm)	0,017	7,82	1,00	12,41	30,49	44,13	25,38	L
2. (0-30)	0,016	7,96	1,43	0,93	15,42	28,87	55,70	C
2. (30-60)	0,016	8,03	0,96	1,55	22,73	25,91	51,37	C
3. (0-30)	0,020	7,81	2,14	3,03	41,61	26,63	31,77	CL
3. (30-60)	0,015	7,89	1,32	3,34	45,83	24,51	29,65	SCL
4. (0-30)	0,015	7,4	2,05	0,10	35,04	30,96	34,00	CL
4. (30-60)	0,017	6,98	1,64	0,10	43,45	24,63	31,91	CL
5. (0-30)	0,033	7,28	1,08	2,25	67,61	17,80	14,59	SL
5. (30-60)	0,017	7,86	0,58	15,75	39,99	34,77	25,24	L
6. (0-30)	0,018	7,68	1,64	0,31	56,47	22,35	21,18	SCL
6. (30-60)	0,018	7,69	0,68	1,86	58,35	20,36	21,29	SCL
7. (0-30)	0,022	7,64	1,12	1,55	63,58	21,87	14,55	SL
7. (30-60)	0,013	7,77	1,01	0,78	63,51	21,91	14,58	SL
8. (0-30)	0,028	7,56	1,06	4,27	52,85	24,16	22,99	SCL
8. (30-60)	0,027	7,65	0,82	4,19	54,98	24,13	20,89	SCL
9. (0-30)	0,061	6,8	0,86	0,10	74,06	13,54	12,40	SL
9. (30-60)	0,065	6,65	0,67	0,10	74,01	13,57	12,42	SL
10. (0-30)	0,016	6,54	1,21	0,10	73,88	13,63	12,48	SL
10. (30-60)	0,061	6,97	0,52	0,10	73,81	11,61	14,58	SL
11. (0-30)	0,085	6,46	1,03	0,10	84,39	9,38	6,23	LS
11. (30-60)	0,085	6,46	1,03	0,10	84,39	9,38	6,23	LS
12. (0-30)	0,021	6,58	1,98	0,78	36,66	35,46	27,88	CL
12. (30-60)	0,014	6,85	1,92	0,85	32,60	35,36	32,05	CL
13. (0-30)	0,016	6,95	1,52	1,32	39,86	32,75	27,39	CL
13. (30-60)	0,017	7,22	1,10	1,47	39,25	30,97	29,78	CL

Table 2. Macro and micro element contents of cherry leaves

Sample Number	N %	P %	K %	Ca %	Mg %	Fe ppm	Cu ppm	Zn ppm	Mn ppm	B ppm	Mo ppm
1	3,55	0,15	0,77	2,61	0,32	14,00	17,00	11,00	112,00	52,00	0,20
2	3,98	0,19	0,75	2,26	0,30	18,00	17,00	10,00	67,00	48,00	0,20
3	4,11	0,19	0,85	2,26	0,33	13,00	19,00	11,00	49,00	55,00	0,21
4	1,88	0,13	0,89	2,26	0,31	13,00	24,00	11,00	49,00	55,00	0,21
5	2,00	0,19	0,87	2,13	0,35	19,00	24,00	11,00	98,00	45,00	0,20
6	4,18	0,19	4,11	2,70	0,66	53,00	15,00	64,00	70,00	45,00	0,20
7	4,00	0,86	1,97	2,55	0,30	13,00	28,00	57,00	74,00	37,00	0,29
8	4,17	0,65	0,67	2,58	0,36	87,00	26,00	11,00	56,00	35,00	0,18
9	3,15	0,28	0,91	2,70	0,50	88,00	24,00	65,00	154,00	45,00	0,20
10	3,85	0,19	2,27	2,70	0,56	68,00	16,00	63,00	59,00	45,00	0,20
11	4,68	0,51	3,12	2,45	0,30	110,00	20,00	31,00	132,00	45,00	0,26
12	2,00	0,32	1,65	2,55	0,30	13,00	20,00	7,00	54,00	45,00	0,24
13	4,34	0,14	0,85	2,45	0,60	87,00	25,00	14,00	74,00	43,00	0,27
14	3,94	0,11	0,89	2,95	0,47	107,00	28,00	11,00	114,00	40,00	0,29
15	3,75	0,19	0,85	2,45	0,30	48,00	13,00	5,00	74,00	43,00	0,27
16	4,15	0,61	0,88	2,11	0,35	33,00	17,00	5,00	74,00	43,00	0,27
17	3,55	0,51	0,88	2,61	0,35	33,00	17,00	11,00	74,00	43,00	0,27
18	4,65	0,39	3,95	2,66	0,63	83,00	19,00	60,00	70,00	50,00	0,20
19	2,15	0,17	0,96	2,31	0,59	16,00	13,00	16,00	121,00	40,00	0,19
20	2,09	0,39	1,55	2,85	0,30	11,00	20,00	46,00	79,00	48,00	0,26
21	1,89	0,36	0,55	2,55	0,30	11,00	20,00	5,00	114,00	59,00	0,26
Min	1,88	0,11	0,55	2,11	0,30	11,00	13,00	5,00	49,00	35,00	0,18
Max	4,68	0,86	4,11	2,95	0,66	110,00	28,00	65,00	154,00	59,00	0,29



CONCLUSIONS

In this study, leaf and soil analysis data showed there are various nutrition problems in the sweet cherry orchards. Problems from the growers in the research area are small fruits, low yield and some leaf symptoms might be related to nutrition deficiency. Considering that sweet cherry growing areas in Çanakkale have variations in soils, rootstock type and orchard management, further studies are needed in order to find out how cherry growers should manage their orchards to ensure that trees and fruits be nutritionally balanced.

A fertilization program including macro and micro elements has been suggested.

ootstock and management practices evaluation to void cherry replant disease in Chile

Reginato, G.; Córdova, C. and Mauro, C.

Replantación de Frutales

Objective

To determine, in different cherry production area of Chile, the detrimental effects of cherry replant disease, rootstock tolerance to the problem, and management practices to avoid it.

Methodology

All trials compared tree growth achieved on fumigated soil (Non replanting condition) in relation to non treated soil. In Rancagua (34°10' S, 70°45' W), a cherry/*P.mahaleb* orchard was pulled out and 10 rootstocks were established: 'Bing' on F12-1, Colt and Cab 6; 'Summit' on Maxma 14, Weiroot 158, Gisela 5, Gisela 6 and Maxma 60; 'Sweetheart' on Santa Lucia 64; and 'Regina' on *P. mahaleb*. In Curicó (34°55' S, 74°12' W), 'Bing' over *P. mahaleb*, Maxma 14; Maxma 60; F12-1; Gisela 6; Cab 6; Colt and Pontaleb were used.

Results

Rootstock trials

In Rancagua all rootstocks were affected in comparison to fumigated soil, obtaining 40 to 75% of the growth achieved on it. The most affected were *P. mahaleb*, Maxma 14; F12-1 and Maxma 60; while Gisela 6; Cab 6; Colt and Gisela 5 were affected in a lower magnitude (Figure 1 and 2). In Curicó trial, established under furrow irrigation, tree growth was less than expected, but all rootstocks showed less growth on non fumigated soil (Figure 2), reaching from 33% to 67% the growth of those on fumigated soil, being statistically different, only in Cab 6, Gisela 6, *P. mahaleb* and Maxma 60 (Figure 3).

Figure 1. Comparative growth of trees growing in a replant condition. General view of the trial.

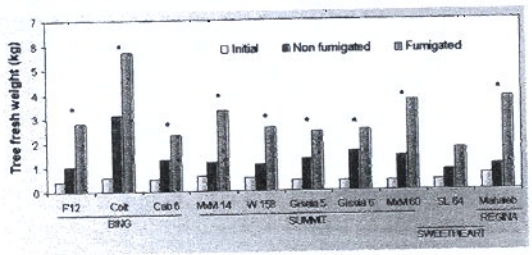


Figure 2. Growth at the end of the first year, with different cherry rootstocks, on a replant condition, over fumigated (methyl bromide) and non fumigated soil. Methyl bromide at 68 g/m² was used as soil fumigant.

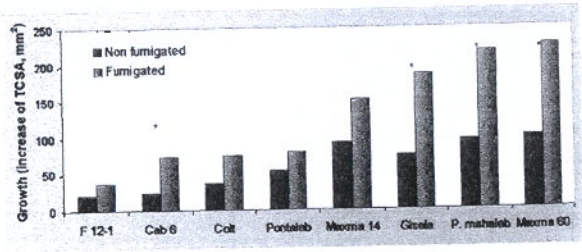


Figure 3. Growth at the end of the first year, with different cherry rootstocks, on a replant condition, over fumigated and non fumigated soil. 1.3-D at 300 L/ha was utilized as soil fumigant.

Response to waiting time

In Rancagua, planting right after orchard removal, or 1 and 2 years of waiting before replant, were evaluated, under fumigated and non fumigated soil. Comparative tree growth of 2.5 : 1 (fumigated:non fumigated), were obtained for 0 or 1 year waiting, and 1.4 : 1 after 2 years waiting (Figure 4).

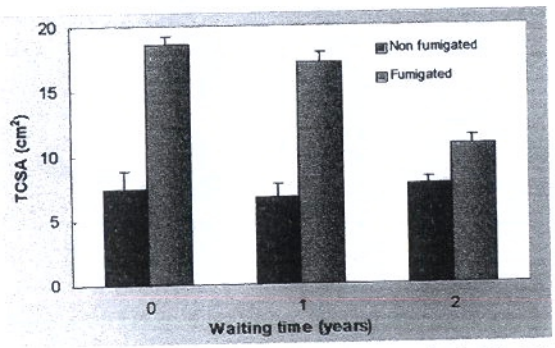


Figure 4. Comparative growth of cherry trees, on fumigated and non fumigated soil, planting 0; 1 or 2 years after orchard removal.

Growth response to different soil fumigants

In a replant condition, a comparison among commercial treatments was established. 1.3-dichloropropene (1.3-D); chloropicrin (C) and the mix of both (MIX) were applied to approximately 1 ha. Fifteen trees in each condition were evaluated. Response to methyl bromide (MB) was obtained from an adjacent plot of 10 trees. The best response was obtained with MB and 1.3-D. The MIX was intermediate between C alone and 1.3-D alone (Figure 5).

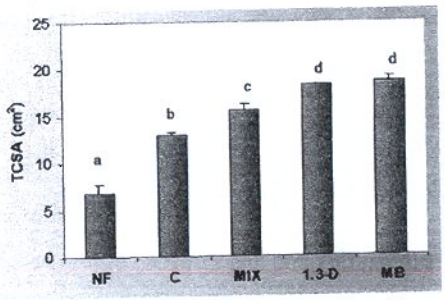
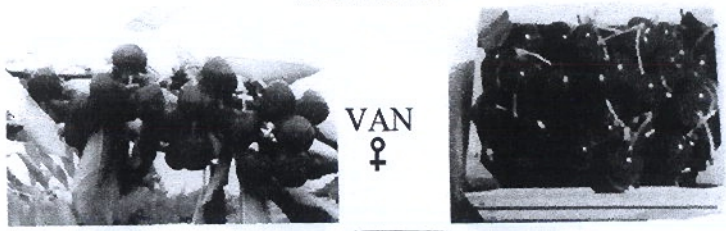


Figure 5. Tree growth for cherry trees planted in a replant condition, on soil treated with different soil fumigants.

SOME RESULTS OF USING 'VAN' CULTIVAR FOR THE IMPROVEMENT OF THE SWEET CHERRY RANGE OF CULTIVARS IN BULGARIA

A.Zhivondov*



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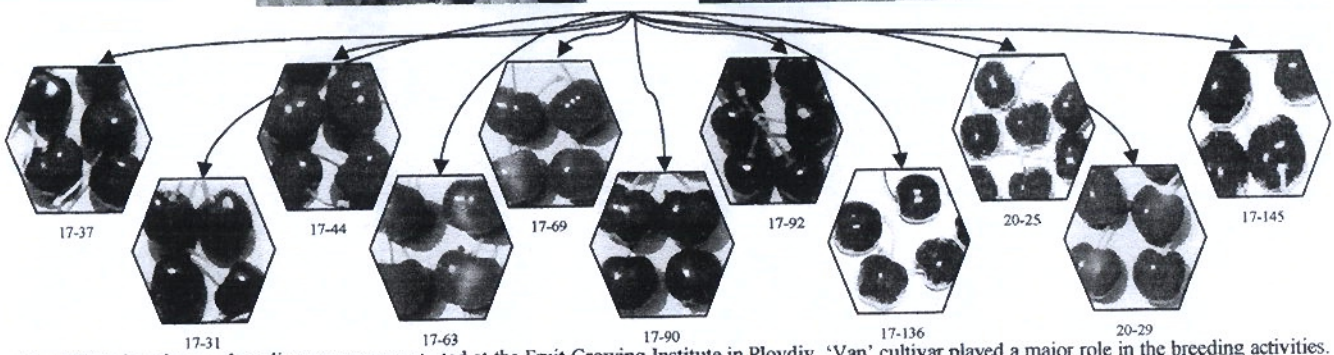

After 1987 when the new breeding programme started at the Fruit Growing Institute in Plovdiv, 'Van' cultivar played a major role in the breeding activities. It has been grown in a collection orchard including 164 sweet cherry cultivars. In 1990 and 1991 great amounts of fruits were obtained from it by open pollination. During the two-year cultivation of the seedlings in the breeding nursery, a mass selection by phenotype characteristics was carried out. 140 hybrids were selected, which were transferred into the breeding orchard. After they started fruiting, a breeding assessment was conducted twice in accordance with the pomological and phenological characteristics. Fruit biometry was studied in the period 2000-2003. Initially 19 elites were bred, the fruit of 18 of them ripening before 'Van'. After further observations, 8 of the elites dropped out due to their unstable pomological characteristics.

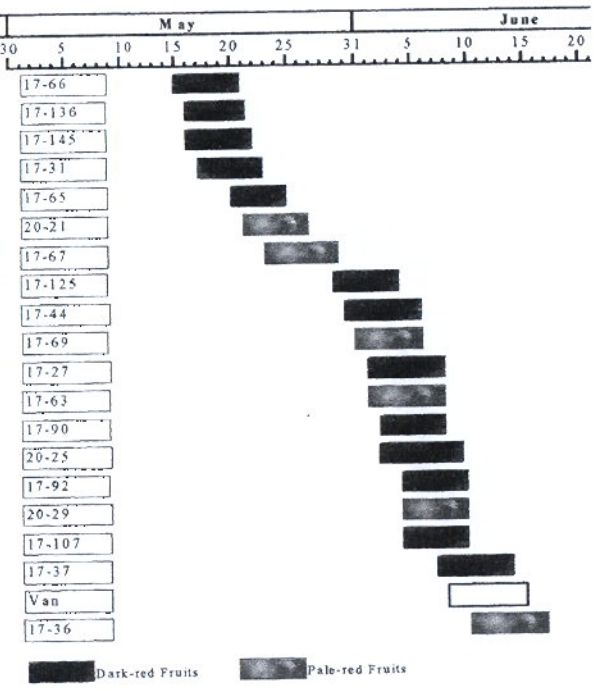

Figure 1. Phenogram of sweet cherry elite ripening

After the hybrids started fruiting, a mass selection was carried out twice in accordance with the pomological and phenological characteristics of the hybrids looked for. The biometric indices were studied in the period 2000 – 2003 following the adopted in Bulgaria methods of breeding and cultivar studies

Table 1. Biometric characteristics of the fruits of sweet cherry elites in the period 2000-2003

Elite No.	Weight (g)	Height (mm)	Width (mm)	Thickness (mm)	Fruit Stalk Length (mm)	Stone Relative share (%)
'Van'	8.17 a	22.8 a	26.5 a	21.7 a	27.5 a	4.65
17-92	8.08 a	22.5 a	25.8 a	22.2 a	24.8 a	4.70
17-90	7.98 a	21.1 a	26.8 a	21.7 a	28.8 a	5.01
17-44	7.93 a	21.5 a	25.3 a	20.7 a	25.6 a	5.04
17-63	7.37 a	21.0 a	25.5 a	21.6 a	37.0 a	4.88
20-25	7.04 a	20.4 a	24.9 a	21.0 a	32.2 a	5.26
20-29	6.83 a	21.7 a	24.3 a	19.9 a	30.7 a	6.15
17-69	6.82 a	21.2 a	25.6 a	21.1 a	29.9 a	4.40
17-37	6.53 a	20.7 a	25.7 a	21.4 a	30.5 a	5.05
17-31	5.55 a	20.4 a	22.2 a	18.6 a	27.4 a	6.49
17-136	5.18 a	18.3 a	22.3 a	18.5 a	26.7 a	6.56
17-145	4.81 a	18.7 a	21.9 a	18.5 a	25.4 a	7.90
GD 5%	4.57	12.8	15.34	12.8	17.84	

The fruit weight of elites 17-92, 17-90 and 17-44 have almost the same values as 'Van'. The three elites 17-145, 17-136 and 17-31 have the smallest fruits but that is partially compensated by the much earlier period of ripening (Table 1). The lack of statistically proven differences (GD 5%) in all the studied pomological characteristics of the elite fruits shows their similarity to the qualities of 'Van'.

Elites 17-92, 17-90 and 17-44 have big size fruits resistant to cracking and broadly cordate in shape. The skin is dark red and shiny. Fruit flesh is of very firm consistency, red in colour, with strong acidity and excellent taste. The stones are medium in size. The fruit stalks can be easily separated without destroying the skin. The trees have moderate growth and the crown of elite 17-44 is of a compact habitus.

The three elites 17-63, 17-69 and 20-29 have big size fruits, broadly cordate in shape. The background skin colour is creamy-yellow and pale-red above occupying about half of the fruit surface. The fruit flesh is creamy-yellow, very firm, saturated with acids, rich in aroma and of excellent taste. The stones are very small. The fruit stalks separate easily without destroying the skin. The trees are of moderate growth.

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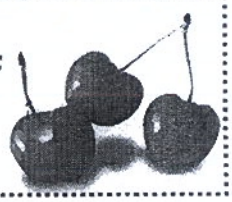
THE EFFECTS OF DIFFERENT POLLINATORS ON THE FRUIT SET AND POMOLOGICAL CHARACTERISTICS OF '0900 ZİRAAT' SWEET CHERRY CULTIVAR



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STRACT

Ziraat" is the leading cultivar with high quality fruit eristics among sweet cherry cultivars in Turkey. Although the nce of the cultivar, pollination problems resulting in poor fruit ifferent ecological conditions of the country. In this research, it med to determine the effects of different pollinators on the fruit fruit quality parameters in "0900 Ziraat" sweet cherries. For this e, Primer Giant, Van, Stark's Gold, Celeste, Sunburst, Merton ing, Lapins, Bigarreau Gaucher, Sweet Heart, Canada Giant, North r, Early Burlatt and Lambert cultivars were chosen as pollen for fruit set of "0900 Ziraat" cherries. During the research, om and full bloom dates were recorded in 2002 and 2003 ng time in Çanakkale ecological conditions. After the fruit set, ere counted monthly for determination of fruit set percentage ss compatibility. After the fruits matured, they were analyzed for gical characteristics such as fruit and stone weight, fruit size, pH, l and external fruit coloration, stem length, titrable acidity and luble solids.

TRODUCTION

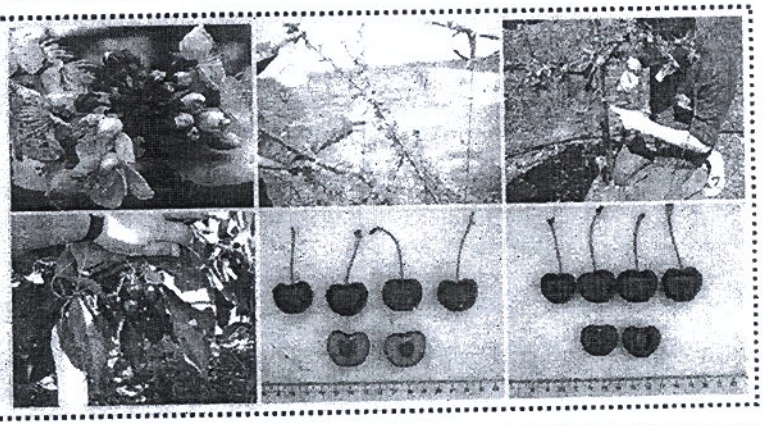
Ziraat' is self-incompatible, requiring cross pollination to obtain fruit set. Hence, important decisions must be made when establishing a new orchard this cultivar. A cultivar selected for use as a pollinizer should have fruit with the highest possible economic value while fulfilling its other requirements. It produce abundant, viable pollen with proven cross-compatibility with the main cultivar. Bloom time of pollinizers and main cultivar must be reliably hronous so that pollen is available as soon as flowers begin to open.

ATERIALS AND METHODS

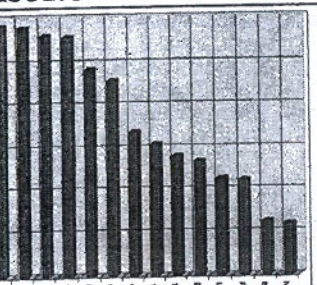
experiment was carried out during 2002 – 2003 with 1 maternal cultivar 0 Ziraat) and 14 potential pollinizers (Primer Giant, Van, Starks Gold, ste, Sunburst, Merton Late, Bing, Lapins, Bigarreau Gaucher, Sweet t, Canada Giant, North Wonder, Early Burlatt and Lambert) in Bayramiç Çanakkale. The 90 trees grafted on Gisela-6 rootstock were selected for nation studies.

e phenological characteristics including pre-bloom, full-bloom and petal dates of above cultivars were recorded for estimating of overlapping ming dates. Pollen was harvested from pollinizer cultivars at anthesis stored in a refrigerator. Hand-pollination studies were performed at the oon – full bloom stage of '0900 Ziraat' trees and 23194 flowers were nated in total. The combinations resulting in 10% or more fruit set were idered to be compatible.

pomological characteristics including fruit and stone weight, fruit size, internal and external coloration, stem length, titrable acidity and total ble solids of '0900 Ziraat' were determined.



ESULTS



ET OF '0900 ZİRAAT' BY DIFFERENT POLLINATORS (%)

Our observations indicated that '0900 Ziraat' is late blooming cultivar and had unstable blooming period in Çanakkale ecological conditions.

The length of blooming period 12-15 days in '0900 Ziraat' in Çanakkale ecological conditions.

No fruits were obtained from self-pollinated '0900 Ziraat' flowers.

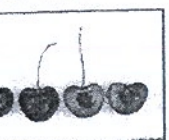
In cross-pollination studies, 4024 fruits were obtained out of 23194 flowers, in other words, the fruit set was 17,35%. The fruit set was the highest on the trees pollinated with 'Lapins' (29,39%), 'Lambert' (29,20%), Starks Gold (28,30%) and Van (28,06%).

Based on cross-compatibility and overlapping of blooming periods, best pollinizers for '0900 Ziraat' are 'Lambert', 'Starks Gold', 'Van', 'Bigarreau Gaucher' 'Lapins' and 'Canada Giant'.

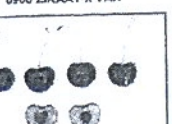
Pomological characteristics were changed slightly due to the effect of pollinators.

CULTIVARS	BUD BURST	PETAL FALL
PRIMER GIANT	18 March	11 April
VAN	21 March	7 April
STARKS GOLD	22 March	7 April
CELESTE	21 March	6 April
SUNBURST	30 March	11 April
MERTON LATE	18 March	8 April
BING	28 March	9 April
LAPINS	15 March	7 April
BIGARREAU GAUCHER	18 March	3 April
SWEET HEART	15 March	1 April
CANADA GIANT	30 March	11 April
NORTH WONDER	29 March	12 April
EARLY BURLATT	21 March	10 April
LAMBERT	18 March	19 April
0900 ZİRAAT	30 March	19 April

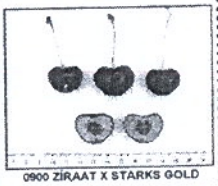
AVERAGE BLOOMING TIME in ÇANAKKALE



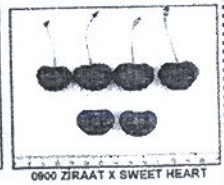
0900 ZİRAAT X VAN



POLLINATORS	Average fruit set (%)	Fruit weight (g)	Fruit length (mm)	Fruit width (mm)	Stem length (mm)	Stem thickness (mm)	Fruit color (Pantone)	Flesh color (Pantone)	Flesh firmness (kg/cm²)	pH	TSS (%)	Total acidity (%)	Stone weight (g)	Stone length (mm)	Stone Width (mm)
SWEET HEART	14,11	8,46	22,63	25,61	48,01	1,35	216	210	2,82	3,60	20,00	0,96	0,43	11,25	8,83
STARKS GOLD	28,30	8,06	23,43	24,01	46,03	1,35	215	214	2,96	3,40	19,00	1,14	0,36	10,69	8,82
LAPINS	29,39	8,91	22,90	26,28	45,95	1,45	215	210	2,78	3,42	17,70	0,96	0,41	10,71	8,89
VAN	28,06	8,16	23,32	25,51	46,29	1,48	216	213	3,10	3,47	17,15	0,97	0,36	10,70	8,73
BING	6,41	8,19	22,11	25,65	45,85	1,40	215	211	3,12	3,37	19,40	1,04	0,45	10,16	8,97
B. GAUCHER	24,31	8,33	23,71	26,35	61,39	1,60	216	212	2,90	3,43	20,70	1,04	0,41	10,63	9,31
PRIMER GIANT	11,31	7,74	23,34	25,80	49,30	1,51	215	217	2,76	3,43	18,60	1,66	0,42	10,63	8,98
MERTON LATE	11,49	8,50	23,14	25,71	45,07	1,25	215	213	2,70	3,47	19,00	1,11	0,43	10,42	9,03
SUNBURST	15,64	7,13	22,64	25,11	44,04	1,35	216	216	2,27	3,43	22,00	1,24	0,44	10,68	9,00
CELESTE	17,06	8,61	22,33	25,99	44,31	1,28	216	211	2,79	4,04	18,70	1,11	0,42	10,45	8,87
CANADA GIANT	23,03	7,95	23,73	26,39	50,13	1,45	216	214	3,01	3,43	19,30	0,95	0,41	10,68	8,90
NORTH WONDER	6,03	7,76	23,43	26,03	48,66	1,49	215	213	2,78	3,47	18,90	1,04	0,39	10,74	8,96
EARLY BURLATT	13,49	8,34	22,90	26,31	49,12	1,66	216	212	2,89	3,34	20,30	1,21	0,44	10,78	9,11
LAMBERT	29,20	7,88	23,70	26,30	46,45	1,38	215	216	2,70	3,47	17,90	1,32	0,40	10,43	8,83



0900 ZİRAAT X STARKS GOLD



0900 ZİRAAT X SWEET HEART

PROMISING SWEET CHERRY CULTIVARS IN SLOVENIA

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key words: cherry, cultivars, yield, vigour, physical-chemical fruit characteristics, fruit quality

abstract: Sweet cherry growing in Slovenia has a more than a hundred and forty-year-long tradition. The Gorica region has a leading position in cherry cultivation. Systematic research on sweet cherry cultivars started after 1959 when a collection orchard was planted in Šempeter near Gorica. According to the research outcomes the assortment as a list of proposed cultivars for sweet cherry growing in Slovenia has been changed several times. In 1993 the Fruit Growing Centre Bilje was established and since then, the research on sweet cherry cultivars and rootstocks has been one of the most important activities in the Centre. During this period we have tested 72 cultivars planted in two collection orchards on two locations. After a several-year-long investigation into recent cherry cultivars of foreign origin the most important cultivars for general growing have been proposed in Slovenia: 'Burlat', 'Celeste', 'Giorgia', 'Van', 'Sunburst', 'Germersdorfska' and 'Lapins'. 'Early Lory', 'Burlat C1', 'Biggareau Moreau', 'Isabella', 'Prime Giant', 'Garnet', 'Brooks', 'New Star', 'Big Lory', 'Canada Giant', 'Summit', 'Kordia', 'Regina' and 'Sweet Heart' are cultivars for local growing. Among cultivars of limited importance the promising cultivars are medium-maturing Slovene cultivar 'Vigred' and late-maturing local cultivars 'Petrovka' and 'Pavliška'.
In the paper the results of vigour and productivity of some of the most promising sweet cherry cultivars in Slovenia as well as physical and chemical characteristics of the cherry fruits are evaluated.

introduction:

Great contribution to the cherry production development in the last decade has been achieved by the research into weaker cherry rootstocks (Callesen, 1998; Fajt in Komel, 2004; Usenik in Štampar, 2004), by the introduction of newer cultivars (Kappel in Lane, 1998; Lugli et al., 2004) and by modern training systems (Štampar, 2002).

materials and methods:

From 1985 till 2004 we tested 72 cultivars of sweet cherries on two locations Bilje and Stara gora. Each cultivar was presented by 3-6 trees. The cultivars were observed over 3-5 years. The yield was measured per tree. An average sample of 50 fruits was used for the measurements of fruit and stalk weight, a sample of 20 fruits was used for the measurements of fruit and stone dimensions and stalk length. The content of soluble solids was determined with a refractometer Atago WM-7, the content of total acids was measured with an automatic titrator Metrohm 719 S Titrino.
Data of tree vigour of the cultivars planted in Stara gora (circumference 20 cm above the graft union; height (h), width (w) and length (l)) were collected annually at the beginning of the growth period per tree, from which tree volume was calculated V = (π*h*(l/2)*(w/2))/3. Yield efficiency (kg/cm2) was calculated using the ratio of cumulative yield to trunk cross section area (TCSA). We evaluated external fruit characteristics (colour and skin shine) and organoleptic characteristics (firmness, taste, aroma). The results of tree vigour, yield and yield efficiency of the cultivars planted in Stara gora the programmes EXCEL 97 and STATGRAPHICS Plus 4.1 were used. Statistically significant differences were determined using the Duncan's multiple range test at the level of probability p = 0,05.

results and discussion:

The cultivar characteristics encompassed vegetative parameters among which we were the most interested in tree vigour defined by trunk growth and crown volume (Table 1) and generative parameters among which were yield per tree, yield efficiency and average fruit weight (Table 2, Fig 1). The results of some sensory characteristics (firmness, taste and general characteristics) of the best evaluated cultivars are displayed in Table 3. Fig 2 shows the contents of soluble solids and total acids.
Tree vigour, regular production and high yield depend on numerous factors, mostly on a genotype, its adaptability to pedo-climatic conditions of the area, weather conditions during the growth period, production technology (Predieri et al. 2003). The differences in tree vigour, yield and organoleptic fruit characteristics among the cultivars in our experiment were the consequence of a genotype and weather conditions during growth periods, while the production technology was equal and optimal.

Table 1: Vegetative parameters of sweet cherry cultivars on the location of Stara gora.

Cultivar	Trunk growth (cm) 1995-2004	Tree volume (m³) 2004
Burlat	47,6 abc*	16,6 abcde
Bigg. Moreau	43,1 bcde	23,0 abc
Bigg. Burlat	48,2 abc	20,1 abcde
Burlat C1	45,3 abcd	14,8 bcde
Isabella	38,8 cdef	16,3 abcde
Ljubljanska	34,5 defg	15,4 abcde
Celeste	54,5 a	21,0 abcde
Prime Giant	33,1 defg	12,6 bcde
Big Lory	51,8 ab	22,6 abcd
Giorgia	40,4 bcdef	23,5 ab
Brooks	30,2 fg	12,4 ef
Glorius Star	31,0 efg	10,8 e
New Star	41,9 bcdef	16,54 abcde
Canada Giant	34,2 defg	13,9 abcde
Anellone	39,6 cdef	23,0 abc
Van	41,3 bcdef	15,7 abcde
Summit	40,3 bcdef	11,2 de
Sunburst	38,6 cdef	17,7 abcde
Germersdorfer	39,0 cdef	16,8 abcde
Ferrovia	24,3 g	10,2 e
Hedelfinger	34,5 defg	11,6 cde
Elisa	33,0 defg	11,3 de
Pavliška	37,2 cdef	16,8 abcde
Durone III	39,2 cdef	25,3 a
Sweet Heart	23,3 g	11,7 cde

* Means separation at 5 % level (Duncan Multiple Range Test)

Table 2: Generative parameters of sweet cherry cultivars on the location of Stara gora.

Cultivar	Ripening time with regard to "Burlat"*	Cummulative yield (kg) 2000-04	Yield (kg) /tree	Yield efficiency (kg/cm²)	Fruit weight (g)
Burlat	0	78,96 bcdef	15,8	0,37 fghij	7,1
Bigg. Moreau	0	51,97 cdef	13,4	0,24 j	7,0
Bigg. Burlat	0-3	77,49 bcdef	15,5	0,34 ghij	7,0
Burlat C1	+3	65,04 cdef	13,0	0,30 ij	6,9
Isabella	+7	54,22 cdef	10,8	0,35 ghij	7,8
Ljubljanska	+7-10	34,65 f	6,9	0,31 hij	7,8
Celeste	+10	88,58 bcde	17,7	0,28 ij	9,1
Prime Giant	+10	59,84 cdef	12,0	0,54 defg	10,0
Big Lory	+10-15	56,17 cdef	11,2	0,21 j	9,8
Giorgia	+11	142,03 a	28,4	0,92 b	6,0
Brooks	+12	94,75 bcd	19,0	0,70 cd	8,4
Glorius Star	+12-16	48,51 cdef	9,7	0,47 efghi	7,8
New Star	+13	97,65 abc	19,5	0,84 bc	7,2
Canada Giant	+17	74,51 bcdef	14,9	0,57 def	7,6
Anellone	+17-19	40,34 ef	8,1	0,29 ij	9,1
Van	+18	118,85 ab	23,8	0,71 cd	7,7
Summit	+19	55,02 cdef	11,0	0,37 fghij	10,7
Sunburst	+20	79,83 bcdef	16,0	0,60 de	10,1
Germersdorfer	+20-23	78,65 bcdef	15,8	0,55 defg	9,3
Ferrovia	+22	44,04 def	8,8	0,52 defgh	8,4
Hedelfinger	+22	57,81 cdef	11,6	0,61 de	7,7
Elisa	+26-28	40,49 ef	8,1	0,34 ghij	10,3
Pavliška	+26-28	43,24 def	8,6	0,28 ij	9,7
Durone III	+26-28	74,35 bcdef	14,9	0,46 efghi	7,5
Sweet Heart	+35	88,97 bcde	17,8	1,20 a	8,2

* Ripening time defined with regard to the cultivar 'Burlat' (in the Fruit Growing Centre Bilje ripes 20 th of May).
* Means separation at 5 % level (Duncan Multiple Range Test)

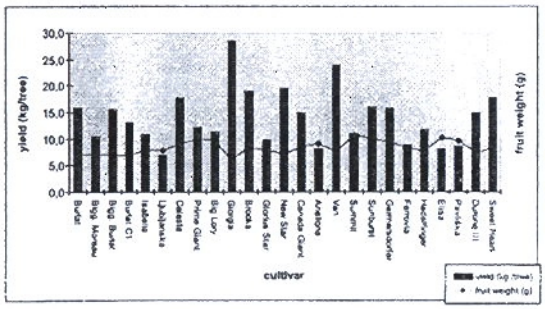
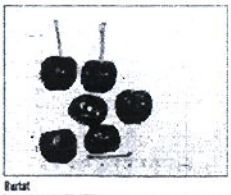
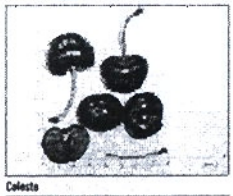


Figure 1: Yield (kg/tree) and fruit weight (g) of cultivars on the location of Stara gora.

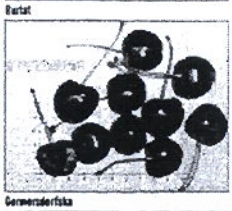
Table 3: Some of the fruit characteristics of selected sweet cherry cultivars.

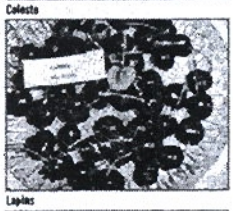
Cultivar	Firmness	Taste	General fruit characteristics
Bigg. Burlat	semi-firm	good-excellent	excellent
Burlat C1	semi-firm	good-excellent	very good
Celeste	semi-firm -firm	good	excellent
Prime Giant	firm	excellent	excellent
Big Lory	firm	excellent	excellent
Vigred	firm	excellent	excellent
Brooks	firm	good	very good-excellent
Canada Giant	semi-firm	good	very good-excellent
Anellone	firm -very firm	good	excellent
Van	firm	good-excellent	very good-excellent
Summit	semi-firm	excellent	excellent
Sunburst	semi-firm	good	excellent
Elisa	very firm	good-excellent	excellent
Pavliška	firm	excellent	excellent
Regina	very firm	excellent	excellent
Kordia	firm	excellent	excellent

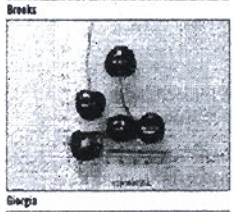

Burlat


Celesta

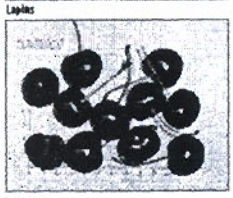

Brooks

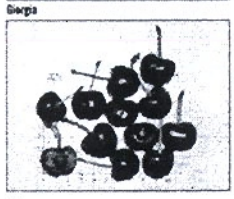

Germersdorfska


Lapins


Giorgia


Vigred with its breeder prof. dr. Julija Snoilo


Sunburst


Van

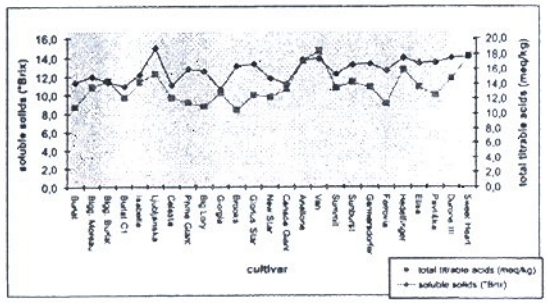


Figure 2: Soluble solids (°Brix) and total titrable acidity (meq/kg) in sweet cherry cultivars of Stara gora.

conclusions:

In the last 20 years of the research into sweet cherry cultivars in Slovenia we have investigated 72 cherry cultivars of foreign and local origin. The outcomes of the research into phenological phases, yield and yield efficiency, physical-chemical and organoleptical characteristics of cultivars, were the basis for the changes in the national fruit variety list which in Slovenia, as a rule, alters every 4 years.
Nowadays the national fruit variety list of 2002 provided cultivars which have obtained the best results and are therefore recommended for the intensive sweet cherry production in Slovenia. Those cultivars are 'Burlat', 'Celeste', 'Giorgia', 'Van', 'Sunburst', 'Germersdorfer' and 'Lapins'. Less important cultivars are 'Early Lory', 'Biggareau Burlat', 'Burlat C1', 'Bigarreau Moreau', 'Isabella', 'Vigred', 'Prime Giant', 'Garnet', 'Brooks', 'New Star', 'Big Lory', 'Canada Giant', 'Summit', 'Bing', Hedelfinger', 'Ferrovia', 'Petrovka', 'Kordia', 'Regina' and

New Sweet and Sour Cherry Selection in Hungary

J. Apostol: Research Institute for Fruitgrowing and Ornamentals, H-1223 Budapest, Park u. 2. Hungary.

The Hungarian sweet and sour cherry breeding has been going on since 1950.
In the frame of this programme are 9 reliesed, 5 candidate sweet cherry and 8 releised and 2 candidate sour cherry varieties. Relised sweet cherries on the last 10 years: Alex (1997), Kavics (1999), Vera (2002), Rita (2004); sour cherry: Piramis (2004).
Candidat varieties:
Sweet cherries: IV (6/12) Sándor, IV 6/5 (Petrus), 6/39 (Paulus), IV 13/20 (Aida), III 42/114 (Carmen)
Sour cherry: Du-1 (Dukát)

Alex® It ripens on the 6-8th of July, 40-45 days after Bigarreau Burlat.Fruit size: 24-26 mm, 7-9- g. Deep purple, glittery. Flesh is medium firm. The stalk is medium long, green and flexible. Tree vigour is moderate. Early blooming. Autofertile. Pollinators for: Rita, Vera, Anita, Carmen. Not sensitive to cracking, and to Cytospora infection.

Rita. ® Rripen on the 20th of May, 14 days before Bigarreau Burlat. Fruit size: 25-28 mm, 7 - 8 g. Deep red, glittery. Firm. The stalk is medium long and flexible. Tree habit is a little pendula. Early blooming. Self sterile. Good pollinators are for this: Van, Aida, Petrus, Vera, Bigarreau Burlat. oderately sensitive to cracking, and to Cytospora infection.

Vera® Ripen: 10-12th of June, about 10-12 days after Bigarreau Burlat. Fruit size: 24-27 mm, 9-10 g.. Deep red, glittery. Firm. The stalk is long, green and flexible. The tree vigour is moderate. Early blooming. Self sterile. Both Bigarreau Burlat and Vera are good pollinators for each others, Sándor, Anita, Petrus and good pollinator for: Valerij Tskalov, Alex, Sándor, Péter, Anita. Not sensitive to cracking, and Cytospora infection.

IV-6/12 (Sándor) ®Ripen: 26th of May, 4-6 days before Bigarreau Burlat. Size: 23-25 mm, 7 g. Fruit like vell shouldered Stella. Deep red, glittery. The stalk is medium long and flexible.The tree habit is a little upright. Early blooming. Autofertile. Good pollinator for: variety Bigarreau Burlat, Vera, Valerij Tskalov. Moderately sensitive to cracking, and to Cytospora infection.

III-42/114 Carmen® It ripes the 10-12th of June, 10-12 days after Bigarreau Burlat. Size: 27-30 mm, 10-12 g. Flatted round shaped. Colour is deep red, glittery. Firm. The stalk is long, green and flexible. Tree vigour is moderate. Medium-early blooming. Selfsterile. Good pollinators for this variety: Katalin, Aida, Van, Sumburst, Paulus, Germersdorfi, Krupnoplodnaja. Not sensitive to cracking, and Cytospora infection.

IV-6/5 Petrus® Rripes 6th of June, 6-7 days after Bigarreau Burlat. Size: 25-26 mm, 8-9- g. Deep purple, glittery. Medium. Stalk is medium long, green and flexible. The tree vigour is moderate. Early blooming. Autofertile. Good pollinator for: Vera, Anita, Rita, Tünde. Not sensitive to cracking, and to Cytospora infection.

IV-3/41 Anita® Ripes 2nd of June, 2-4 days after Bigarreau Burlat. Size 23-25 mm, 7 - 8 g. Heart shaped. Purple red, glittery. Extremely firm. The stalk is medium long and flexible. Tree habit is a little bit upright, of medium vigour. Early blooming, self sterile. Good pollinators for thise: Katalin, Sumburst, Petrus, Paulus, Valerij Tskalov, Carmen and Van. Not sensitive to cracking, and Cytospora infection.

IV-6/39 Paulus® Ripes on the 10-12th of June, 10 days after Bigarreau Burlat. Fruit size: 25-27 mm, 8-9- g. Purple-red, glittery. Firm. Stalk is medium long, green and flexible. The tree vigour is moderate. Mid-early blooming. Autofertile. Good pollinator for: Rita, Carmen, Vera, Anita, Kavics, Krupnoplodnaja. Not sensitive to cracking, and to Cytospora infection.

IV-13/20 Aida® Ripes 10-12th of June, 10-12 days after Bigarreau Burlat. Size: 28-32 mm, 11-13 g. Purple red, glittery. Firm and. The stalk is long, green and flexible. Tree vigour is moderate. Medium-early blooming. Self sterile. Good pollinators for this: Vera, Sándor, Tünde, Katalin. Not sensitive to cracking, and Cytospora infection.

Du-1. (Ducat) is a candidate variety from the landrace selection Ripes: 20-22nd of May. More than 1 month earlier than Montmorency in Hungary. Fruit size: 23-25 mm, 6-7 g. Fruit shape is flatted round. Skin colour is deep red, glittery. The flesh is firm and red. Juice is light red. Taste is delightfully sourich-sweet. Very good for fresh consumption too. Stalk is medium long and flexible. Tree habit is a little upright and not too vigorous, and suits for mechanical harvesting. It bears fruits on the spurs mainly. Early blooming. Autosterile. Good pollinators for this variety: Érdi bötermõ (TM name is Danube), and sweet cherries: Bigarreau Burlat, Van, Vera , Petrus, and Paulus

Piramis® Ripens: 2-5th of June. The fruit size is 25-28 mm, 8-9 g. Fruit shape is flatted round. Colour is deep red, glittery. The flesh is firm like a sweet cherry, and red. Juice is red, and stainy. Taste is delightfully sour-sweet savoury. Very good for both fresh eating and processing. Extra quality early-season fruit. Stalk is medium long and flexible. Tree habit is upright and not too vigorous. It gives fruits on the spurs of branches older than 3. years only. Mid-early blooming. Partly autofertile, its autofertility is about 5-7%. Sweet cherries are good pollinators for this variety: Margit, Linda, Katalin, Carmen, Aida. It has a low sensitivity to leaf spot

SWEET CHERRY CULTIVAR AND ADVANCED SELECTION EVALUATION IN NORWAY

The Norwegian Crop Research Institute
Ullensvang Research Centre

O.Frøynes and M. Meland, Planteforsk Ullensvang Research Centre, N-5781 Lofthus, Norway
Email: oddmund.froynes@planteforsk.no

Introduction

Due to a late harvesting season compared to other European countries, the sweet cherry industry in Norway is now expanding, aiming for export fresh markets. Cultivars producing high quality fruit that ripen late (late July and throughout August) and that are suitable to grow in high density production systems are wanted. In addition, early ripening cultivars are interesting for local marketing in early and middle July. The last decade a number of 130 cultivars and advanced selections have been evaluated in this test program. Key characteristics of the most interesting cultivars/selections are described in this paper.

Materials and methods

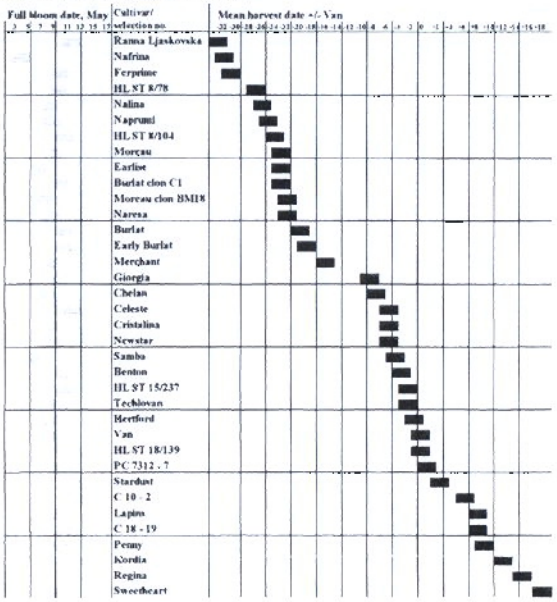
New cultivars and advanced selections were grafted on the rootstock *Prunus avium* L. seedling, grown in field trials and assessed for 6-8 years. Trees were planted in two-tree plots as randomised complete blocks with three replicates and trained as free spindles. Soil management consisted of frequently mowed grass in the alleyways and herbicide strips 1-m wide along the tree rows. Annual records of trunk girths, bloom dates, yield, fruit size, sensitivity to rain induced cracking, contents of soluble solids and fruit firmness were taken.

Table 2. Important characteristics of flower density, productivity, fruit weight, fruit firmness and soluble solids of cultivars evaluated at Ullensvang Research Centre the last decade

Ranna Ljaskovska	Bulgaria	8.4	7.6	5.8	16.4	30.8
Nafrina	Germany	7.1	2.6	5.3	14.5	38.0
Ferprime	France	4.2	3.6	7.5	13.8	47.7
HL ST 8/78	Czechia	5.3	4.1	9.1	14.7	48.7
Nalina	Germany	5.8	2.6	7.7	13.6	43.6
Naprumi	Germany	4.4	4.3	6.9	16.4	48.2
HL ST 8/104	Czechia	5.2	3.6	8.6	14.4	36.2
Moreau	France	7.1	4.3	7.4	17.6	53.2
Earlise	France	6.2	3.7	8.8	17.1	43.5
Burlat clon C1	France	3.9	4.2	7.6	18.3	46.0
Moreau clon BM18	France	4.0	4.1	7.3	17.4	60.5
Naresa	Germany	7.1	4.9	7,0	15.6	43,4
Burlat	France	5.8	5.3	7.4	16.6	37,4
Early Burlat	France	7.4	5.1	7.1	17.7	39.3
Merchant	UK	6.8	6.9	7,6	16.9	43.6
Giorgia	Italia	6.1	7.5	7.5	16.8	67.2
Chelan	USA	8.0	6.9	7.8	18.2	64.1
Celeste	Canada	4.7	7.6	8.6	16.4	58.9
Cristalina	Canada	6.5	5.1	9.2	17.8	60.4
Newstar	Canada	7.7	4.2	9.0	17.4	69.8
Samba	Canada	6.4	4.3	9,2	17.3	63.3
Benton	USA	5.5	4.8	10.6	18.8	58.6
HL ST 15/237	Czechia	6.6	4.3	10.4	18.1	61.0
Techlovan	Czechia	7.4	5.6	9.9	19.6	62.7
Hertford	UK	7.1	5.5	9.1	17.3	70.9
Van	Canada	7.7	7.2	8.1	18.4	66.9
HL ST 18/139	Czechia	6.7	5.9	9.5	17.9	58.0
PC 7312 - 7	USA	7.5	5.0	10.2	20.2	53,4
Stardust	Canada	6.6	6.1	9.9	16.9	63.9
C 10 - 2	UK	5.8	2.3	10.4	17.2	59.0
Lapins	Canada	6.6	6.4	8.1	17.5	62.0
C 18 - 19	UK	6.6	6.6	8.9	17.0	61.3
Penny	UK	5.9	4.5	9.3	20.0	68.0
Kordia	Czechia	7.0	6.9	8.7	17.2	61.3
Regina	Germany	6.9	6.2	8.9	18.1	65.5
Sweetheart	Canada	7.4	8.0	8.1	17.4	70.7

[1] Flower density scores 1 – no flowers, 9 - maximum flower amount
[2] Crop scores. 1 – no crop, 9 – over cropping
[3] Fruit firmness measured with Durofel, Copa-Technologie SA

Table 1. Dates of full bloom and mean harvest (related to the cultivar Van) on 36 different sweet cherry cultivars/selections in Norway



Results

Cultivars are selected to meet the requirements of large fruits, high productivity and fruit quality, resistance to rain-induced cracking and adequate firmness. Cherries with red to dark red in colour are preferred. Over the years the cultivar Van has been the most outstanding and planted cultivar in Norway and cultivar characteristics are related to this cultivar. Results from the evaluation are presented in the Tables 1 and 2. Based on these cultivar requirements a limited number of cultivars are recommended .

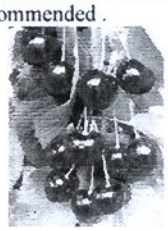


Fig. 1. The cultivar Samba produces large, attractive fruits

Fig. 2. The cultivar Chelan is more early blooming and precocious when grafted on the rootstock Gisela 5 (left) compared to grafted on *P. avium* seedling (right)

Conclusion

Recommended cultivars for commercial production:
Early season: Burlat, Moreau and Merchant
Mid-season: Giorgia, Chelan, Samba, Techlovan and Van
Late season: Lapins, Kordia, Regina and Sweetheart

ALARA

CHERRY SYMPOSIUM GUIDELINES

1. Dividing the guests into groups. Each group will have 20 people. Explaining the safety rules and distributing written brochures by ALARA Personnel.

2. Explanation of hygiene, handing uniforms and hairnets.

3. Presentation in regards of process introduction.

4. **FEEDING** The tour will start from the feeding point. The labels that are inside creates are so important for traceability. There is a connection between the final product traceability and labels inside the crates.

5. **CLUSTER CUTTER** Cluster Cutter separates doubles. After, cherries flow to the pre-sizer to separate under sizing.

6. **SORTING LINE** At the sorting line employees separate the cherries by the color, size, and some other defects. We have 6 sorting lines and with 120 working ladies.

7. **WATER TANKS** In order to increase hydro-cooler's performance, we use 3x25 tons of water tanks for pre-cooling the water. By doing this we save time and energy.

8. **HYDRO COOLER** After exit from the sorting lines, cherries flow through hydro-cooler for cooling down in between 0 to +2 °C. At this point the cooled water is distributed to entire system by pumps and by doing this; we can have cold chain system.

9. **SIZER** After hydro-cooler, we separate the cherries in different sizes which are 24-26mm, 26-28mm and 28+. Then cherries flow to the final selection lines. We have 31 filling points which means we are capable of making 31 different consumer packages. According to the orders, ALARA personnel who work at the filling points make loose, punnets and bags. Then we weigh, label and send them to the palletizing room.

10. **FLOWPACK-HOT SEAL-QUALITY CONTROL** We have 2 different systems. The first one is flowpack and the other is hot sealing. In the flowpack system, we automatically fill, weigh and cover the entire punnet with MA film. In the hot sealing system we use MA film too but we just cover the top of the punnet. Our package sizes vary from 250g to 10 kg; we are also capable of using MAP system. One of them is Active (adding gas inside package) the other one is Passive. At the quality control point we do water temp control, final product defect control, chlorine ppm measurement, performance control of pre-sizer and sizers. We put all these datas in our online system where all ALARA personnel and Customers can follow.

11. **MANUEL LINES** During the pick time we use Automatic line and Manuel line together to reach the busy daily capacity which is 400 tons / 22 hrs.

12. **PALLETIZING** We have different palletizing system for different packages, and we keep palletizing room temp at 4-5 °C.

13. **BOX MAKING** We make carton boxes according to the customer daily orders. In every box we put MA bags and water absorber pad into the MA bag. Then we supply these boxes to the production area by carousel system.

14. **STOCK ROOM** We keep enough materials (box, internals bags, punnets etc.) in our stock room in order to reach seasonal orders. We design our carton boxes depends on our customer spects. We care about all hygienic rules in this area as well as in production. Annually, we use approximately 3 million boxes, during cherry and fig seasons.

15. **RAW MATERIAL QUALITY CONTROL** First quality control starts in the region. After purchasing the product, ALARA personnel make the second quality control and send the report to the main pack house. After, we put cherries in the hydro-cooler at +2 °C as soon as possible. Then, we send cherries to the pack house by frigo trucks. When the product arrives, our unloading team put cherries in our cold storage room and Q.C. makes general quality controls. EurepGap certified products arrive with blue color labels and go through the same process but we pack separately.

16. **RAW MATERIAL STORAGE** We store raw materials according to FIFO standards. We stock the raw materials by regional codes and store EurepGap and Conventional product separately.

17. **MANUEL LINES** At the Manuel lines we use the same system. ALARA workers select second quality and out of spect products, then process first quality product to be packed.

    OPTIC SIZER It grades the cherries into different sizes and colors. There are only two companies which use that machine in the world. One of them is ALARA.

18. **FINAL PRODUCT STORAGE AND SHIPMENT** We transfer the palletized products to the cold stores. Technical department checks the cold store rooms' temperature on a definite period of time. We do last control of the trucks before loading and temperature of the trucks should be at +2 °C. During the loading, we check all pallets temperature and keep track all temperatures on the loading plan. After each loading, we take 1 sample from each product. Lastly, to keep the truck temperature under control we use spy (digital temperature recorder).

19. **EXIT** Exit the building and serve some cherry to our guests.

		Hungary.
	9	Sweet cherry cultivar and advanced selection evaluation in Norway.
	10	Cherry Symposium Guidelines.
Foto		
Libro		
Diapositiva		

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.

Previo a la realización de las actividades de difusión, se envió a la ejecutiva del FIA, un detalle de las invitaciones para su revisión. Posterior a ellos, se despacharon a los interesados.

Se entrega un detalle con las invitaciones realizadas, a cada uno de los eventos de difusión.

GOBIERNO DE CHILE
INIA TAMEL AIKE

GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN AGRARIA

DIEGO ARRIBILLAGA GARCIA., participante del "V Simposio Internacional de Cerezas", realizado en Turquía, entre el 6 y 10 de junio de 2005, tiene el agrado de invitarle a una charla para dar a conocer las experiencias obtenidas con la asistencia a dicho evento. La participación en el mencionado Simposio contó con el apoyo del Programa de Captura y Difusión Tecnológica de la Fundación para la Innovación Agraria (FIA).

Esta actividad de difusión se realizará a las 15:00 hr., el día Viernes 29 de Julio de 2005, en la Chacra de la Sra. Norma Barrientos, en Chile Chico.

Se agradece su asistencia y la difusión de esta invitación a los interesados que usted conozca. Como es una actividad sin costo se pide cconfirmar su asistencia a los teléfonos 67-237754 o 67-233366 o al e-mail darribil@inia.cl.

Coyhaique, julio 2005

GOBIERNO DE CHILE
INIA TAMEL AIKE

GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN AGRARIA

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Esta actividad de difusión se realizará a las 15:00 hr., el día Jueves 28 de Julio de 2005, en la Sala de la Cultura de Chile Chico, ubicado en Av. B. O" Higgins, esquina Lautaro s/n, Chile Chico.

Se agradece su asistencia y la difusión de esta invitación a los interesados que usted conozca. Como es una actividad sin costo se pide cconfirmar su asistencia a los teléfonos 67-411842 o 67-237754, o al e-mail darribil@inia.cl.

Coyhaique, julio 2005

GOBIERNO DE CHILE
INIA TAMEL AIKE

GOBIERNO DE CHILE
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Esta actividad de difusión se realizará a las 16:00 hr., el día Jueves 4 de Agosto de 2005, en el Auditórium, de la Asociación Chilena de Seguridad, ubicado en Av. Ogana 1018, Coyhaique.

Se agradece su asistencia y la difusión de esta invitación a los interesados que usted conozca. Como es una actividad sin costo se pide cconfirmar su asistencia a los teléfonos 67-237754 o 67-233366, o al e-mail darribil@inia.cl.

Coyhaique, julio 2005

GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN AGRARIA

5. PARTICIPANTES DE LA PROPUESTA

GIRAS, BECAS: Ficha de Participantes
CONSULTORES: Ficha de(l) Consultor(es)
EVENTOS: Ficha de Expositores y Organizadores
DOCUMENTOS: Ficha de Autores y Editores

Nombre	**Diego**
Apellido Paterno	**Arribillaga**
Apellido Materno	**García**
RUT Personal	**9.926.630-9**
Dirección, Comuna y Región	**Las Lengas 1450. Coyhaique, XI Región**
Fono y Fax	**237754**
E-mail	**darribil@inia.cl**
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	**Instituto de investigaciones Agropecuarias**
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	**61.312.000-9**
Cargo o actividad que desarrolla	Investigador programa de frutales
Rubro, área o sector a la cual se vincula o en la que trabaja	Frutícola

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Participantes en actividades de difusión

Es necesario registrar los antecedentes de todos los asistentes que participaron en las actividades de difusión. El listado de asistentes a cualquier actividad deberá al menos contener la siguiente información:

Se entrega asistencia a las tres actividades de capacitación.

REUNION GRUPO DE TRANSFERENCIA TECNOLOGICA

PARTICIPACION V SIMPOSIO INTERNACIONAL DE CEREZAS EN BURSA, TURQUIA.

29 de Julio de 2005, Chile Chico.

	NOMBRE	FIRMA
1.	Ernesto Gutiérrez R.	
2.		
3.	ROBERTO VALDEBENITO	
4.	OMAR Fics	
5.	RICARDO VALDEBENITO R.	
6.	Alicia Jara Troncoso	
7.	Mónica Jara Valdés	
8.	Norma Barrientos	
9.		
10.		
11.		
12.		
13.		
14.		
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18.		
19.		

CHARLA TECNICA

PARTICIPACION V SIMPOSIO INTERNACIONAL DE CEREZAS EN BURSA, TURQUIA.

28 de Julio de 2005, Casa de la Cultura Chile Chico.

	NOMBRE	FIRMA
1.	PATRICIO SALGADO ESPINOZA	
2.	ELMO PACHECO	
3.	[illegible]	
4.	Ernesto Gutiérrez D.	
5.	H Valdebenito	
6.	OMAR FICA	
7.	ESTEBAN MILLAR C	
8.	RICARDO VALENZUELA R	
9.	Alejandra Araya Rojas	
10.	Lorena Urra Acuña	
11.	PATRICIO VENEGAS DINAMARCA	
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		

ASISTENTES A CHARLA TECNICA

PARTICIPACION V SIMPOSIO INTERNACIONAL DE CEREZAS

Coyhaique, Agosto 04 de 2005

Nº	Nombre	Actividad	Institución o Empresa	Teléfono	Firma
1	Juan Calzado	Agricultor	Particular	213339	[firma]
2	Quesdoleño Silva.	ganadería	Particular	098268911	[firma]
3	PATRICIO Almonacid	TEC. AGRICOLA	INIA	086121523	[firma]
4	Pablo ALARCÓN	Ing. Agrícola	INIA	085028770	[firma]
5	Rolando Zambrano	Agricultor	Particular	210065	[firma]
6	Arnaldo Cuevas Díaz	Agricultor	Particular	240538	[firma]
7	Lorena Díaz D	Téc. Agrícola	Part.	255978	[firma]
8	Hector Cardenas	M. Veterinario	FUNDESA.	234415	[firma]
9	Delfina Castillo.	Agricultora	Partic.	210065	[firma]
10	Elby ZAMORA	ESTUDIANTE	PARTICULAR	210065	E. Zamora
11	DRINA MONTENEGRO	Ing. (e) Agríc.	✓	231768	[firma]
12	SERGIO TEJEDA	Estud.	✓	86278017	[firma]
13	DARÍO JUÁREZ	ING. AGRONOMO	INDAP	212242	[firma]
14	Marcelo Aliste A.	Ing. Agron.	Indap	411318	[firma]
15	M. PAZ MARTINEZ	Biol	INIA	233366	[firma]
16					
17					

GOBIERNO DE CHILE
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INNOVACIÓN AGRARIA

6. EVALUACIÓN DE LA PROPUESTA

Evaluación de la actividad para cada INICIATIVA

En esta sección se debe evaluar la actividad en cuanto a los siguientes ítems:

a) Efectividad de la convocatoria (cuando corresponda)

Este evento contó con la participación de 360 personas, siendo Chile, después del país anfitrión, el que tubo una mayor participación, con 32 personas, entre investigadores alumnos de post grado, empresarios, viveristas y productores.

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

El grado de participación fue muy alto, dado que en este simposio, participaron los principales investigadores de cerezas de América y Europa.

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)

Esta actividad no contaba con mecanismos de evaluación.

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

No existieron problemas, estuvo adecuadamente coordinado.

Aspectos relacionados con la postulación al programa de Captura y Difusión
a) Información recibida por parte de FIA para realizar la postulación __x__ amplia y detallada ____ aceptable ____ deficiente Justificar: Existe buen nivel de comunicación entre los ejecutivos del FIA, con los Coordinadores de propuestas
b) Sistema de postulación al Programa de Formación o Promoción (según corresponda) ____ adecuado ____ aceptable ____ deficiente Justificar:
c) Apoyo de FIA en la realización de los trámites de viaje internacionales (pasajes, seguros, otros) (sólo cuando corresponda) __x__ bueno ____ regular ____ malo Justificar: La colaboración de empresas de turismo, con las cuales el FIA trabaja, resulta de vital importancia, para cotizar, coordinar compra de pasajes, seguros en viaje y reservas en hoteles.
d) Recomendaciones (señalar aquellas recomendaciones que puedan aportar a mejorar los aspectos administrativos antes indicados).

7. Conclusiones Finales de la Propuesta Completa

En el caso de Giras Tecnológicas, en lo posible presentar conclusiones individuales por participante.

No corresponde