5th International Cherry Symposium

June 06-10, 2005, Bursa-Turkey

ISHS

5th Internationa Cherry Symposiu

June 06-10, 2005, Bursa-T

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A meeting of the ISHS Fruit Section Working Group on Cherry Production

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TUBITAK

ABSTRACTS

5th International Cherry Symposium

June 06-10, 2005, Bursa-Turkey

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- Lars Sekse (Norway)
- Matthew Whiting (United States)

05 June 2005, Sunday

09:00-19:00 Registration

19:30 Welcome Reception OLMUKSA

06 June 2005, Monday

09:00-09:30 Opening Ceremony

Session I (Chairperson: G. A. Lang)

09:30-10:00 Trends in sweet cherry cultivars and breeding in Europe and Asia
S. Sansavini, S. Lugli (Invited Speaker)

10:00-10:30 New horizons in Turkish sweet cherry production and export
N. Kaska (Invited Speaker)

10:30-10:45 Coffee Break

Session II (Chairperson: F. Kappel)

10:45-11:15 Sweet cherry orchard management – from shifting paradigms to computer modeling
G.A. Lang (Invited Speaker)

11:15-11:30 Loss of pollen function in self-compatible 'Cristobalina' sweet cherry
A. Wünsch, J.I. Hormaza, R. Tao

11:30-11:45 Investigations on fertility of sour cherries (*Prunus cerasus* L.)
M. Schuster

11:45-12:00 Studies on floral biology of *Prunus* in vivo and in vitro conditions
E. Dziedzic, M. Małodobry, W. Lech, M. Bieniasz

12:00-12:15 Self and cross compatibility studies on commercial sweet cherry (*Prunus avium* L.) cultivars in Iran
K. Arzani, S. Goharkhay

12:15-12:30 Discussion

12:30-13:30 Lunch

Session III (Chairperson: S. Sansavini)

13:30-14:00 The physiology of high density orchard systems: sources, sinks, and solutions
M. D. Whiting (Invited Speaker)

14:00-14:15 Where will cherries be grown?
G. Ing †

06 June 2005, Monday

14:00-14:15 13C- Photoassimilate partitioning in sweet cherry (*Prunus avium* L) during fruit development
M. Ayala, G. A. Lang

14:15-14:30 Sweet cherry trees decay and managements on replanted cherry land
M. Meland, M. E. Moe and O. Frøynes

14:30-14:45 Testing of sweet cherry varieties in Belgium
J. Vercammen, G. van Daele, T. Vanrykel

14:45-15:00 Evaluation of sweet cherry cultivars and advanced selections adapted to the Pacific Northwest, USA
L. E. Long, R. Núñez-Elisea, H. Cahn

15:00-15:15 Discussion

15:15-15:30 Coffee Break

Session IV (Chairperson: L. E. Long)

15:30-15:45 Rootstock and plant spacing influence sweet cherry growth in four locations of Portugal
A. Santos, V. Cordeiro, P. Parente, R. Santos-Ribeiro, J. L. Lousada

15:45-16:00 Rootstock effect on yield and fruit quality of two sweet cherry cultivars in central Chile
E. Gratacós , M. Kulczewski, A. Cortés

16:00-16:15 The current situation and future of sweet cherry production in the eastern Mediterranean region (Hatay/Turkey)
A. A. Polat, C. Durgaç and S. Serçe

16:15-16:30 The effect of ion exchange substrate and succinic acid on morphophysiological and biochemical parameters of rootstock VSL-2 plants during ex vitro adaptation.
T. Krasinskaya, N. Koukhartchik, V. Matushevich

16:30-16:45 Evaluation of some sweet cherry cultivars on Gi.5 and Gi.6 rootstocks in Bayramic, Turkey
A. Kankaya, M. A. Aşkin, B. Balci, F. A. Yildirim

16:45-17:00 Variability of pomological properties in Oblacinska sour cherry clones on different rootstocks
M. Milutinovic, D. Nikolic, V. Rakonjac, M. Fotiric

17:00-17:15 Discussion

07 June 2005, Tuesday

Session V (Chairperson: N. Kaska)

09:00-09:30 Progress in cherry rootstock research
K. Hrotko (Invited Speaker)

09:30-09:45 In vitro propagation of dwarfing sweet cherry rootstocks P-HL
J. Sedlak, F. Paprstein, M. Erbenova

09:45-10:00 Performance of Gisela rootstocks in six high density sweet cherry training systems in Northeastern United States
T. L. Robinson, R. L. Andersen, S. A. Hoying

10:00-10:15 Induction of lateral branching of '0900 Ziraat' sweet cherry cultivar in nursery with 6-Benzyladenine+GA_{4+7}
F. Koyuncu, A. N. Yıldırım

10:15-10:30 Discussion

10:30-10:45 Coffee Break

Session VI (Chairperson: K. Hrotko)

10:45-11:00 Further experiences with dwarfing sweet cherry rootstocks in Northern Germany
R. Stehr

11:00-11:15 Evaluating of semi-dwarfing rootstocks for sweet cherry orchards in the Rhine river valley (Germany)
M. Balmer

11:15-11:30 Evaluation of new rootstocks for a sweet cherry cultivar in Polish climatic conditions
Z. S. Grzyb, M. Sitarek, B. Koziński

11:30-11:45 A nine year study on the performance of twelve cherry rootstocks under rainfed conditions in Apulia (southern Italy)
A. Godini, M. Palasciano, S. Camposeo, A. Pacifico

11:45-12:00 Effect of some clonal rootstock on growth and earliness of 0900 Ziraat sweet cherry cultivar
M. Burak, M. Emin Akçay, E. Yalçınkaya

12:00-12:15 Discussion

12:15-12:30 Country presentations for the next meeting

12:30-13:30 Lunch ANADOLU SİGORTA

13:45-19:00 İznik (Nicea) Tour and Technical Visit

19:00-21:00 Garden Party

08 June 2005, Wednesday

Session VII (Chairperson: A. B. Kuden)

09:00-09:15 Carbon partitioning in sweet cherry (*Prunus avium* L) on dwarfing precocious rootstocks
M. Ayala, G. A. Lang

09:15-09:30 Leaf gas exchange, morpho-histological and chemical characteristics of sweet cherry tree (*Prunus avium* L.) under drip-irrigation
B. Gonçalves, J. Moutinho-Pereira, A. P. Silva, E. Bacelar, A. Santos, C. Correia

09:30-09:45 The effect of irrigation, gibberellic acid and nitrogen on the occurrence of double fruit in 'Van' sweet cherry
H. Engin, A. Ünal

09:45-10:00 Fruit dry weight and quality of 'Bing' sweet cherries grown without resource limitations
E. D. Cittadini, M. J. Rodríguez, H. van Keulen, P. L. Peri

10:00-10:15 Pruning affects carbohydrate accumulation and fruit bud formation in cherries
A. Küden, T. Tamdoğan, B. Imrak

10:15-10:30 Discussion

10:30-10:45 Coffee Break

Session VIII (Chairperson: A. Granger)

10:45-11:15 Breeding cherries in the "New World"
F. Kappel (Invited Speaker)

11:15-11:30 Plant Breeder Rights – essential for progress in breeding of new varieties
M. Röhrig

11:30-11:45 Linkage maps in sweet cherry (*Prunus avium* L.) and map comparison between sweet cherry and other *Prunus* species
E. Dirlewanger, G. Capdeville, Y. Tauzin, P. Cosson, A. Moing, J. Claverie, F. Laigret

11:45-12:00 On the origin of *Prunus cerasus* (sour cherry) genomes
A. Horvath, A. Zanetto , M. Tavaud, H. Christmann, F. Laigret

12:00-12:15 Assessment of genetic diversity and relationship among some sweet cherry cultivars using AFLP™ markers
H.Gulen, A. Ipek, M. Burak, A. Eris

12:15-12:30 Discussion

12:30-13:30 Lunch türker

13:30-14:30 Poster* Discussion I (P01-P70)

14:30-15:30 Poster* Discussion II (P71-P143)

16:00-19:00 Technical Visit

19:30 Turkish Night ALARA

*Posters will be displayed continuously during the Symposium

09 June 2005, Thursday

Session IX (Chairperson: T. Ağar)

09:00-09:15 Nitrogen uptake efficiency and partitioning in sweet cherry is influenced by time of application
A. N. Azarenko, A. Chozinski

09:15-09:30 Architectural analysis of vegetative growth of 2-year-old 'Bigarreau Van' sweet cherry trees grown on two rootstocks under varied nutrient regimes
D. Andersone, I. De Wit, H. Wustenberghs, J. Keulemans, N. C. Cook

09:30-09:45 Season-long deficit irrigation has little effect on sweet cherry gas exchange, growth, yield, and fruit quality
M. D. Whiting, A. Antunez

09:45-10:00 Estimation of sweet cherry water status by spectral reflectance
A. Antunez, M. Whiting, F. Pierce, C. Stockle

10:00-10:15 Diurnal variation of some indices on young sweet cherry trees in subhumid climate conditions
S. Yazgan, E. S. Koksal, B. N. Candogan

10:15-10:30 Discussion

10:30-10:45 Coffee Break

Session X (Chairperson: M. D. Whiting)

10:45-11:15 Sweet cherry tree architecture, physiology and management – towards an integrated view
P.E. Lauri, J. Claverie (Invited Speaker)

11:15-11:30 On the advancement of bud breaking and fruit ripening induced by Hydrogen Cyanamide (Dormex®) in sweet cherry: a three-year study
A. Godini, M. Palasciano, G. Ferrara, S. Camposeo, A. Pacifico

11:30-11:45 Determination of the chill units of cherry cultivars suitable to subtropical conditions
A. B. Küden, B. İmrak, M. Tanır, S. Bayazit, S. Comlekcioglu, A. Küden

11:45-12:00 Chilling requirement of ten sweet cherry cultivars in a mild winter location in Chile
E. Gratacós, A. Cortés

12:00-12:15 Phenology , productivity and fruit quality of ten sweet cherry cultivars in a low winter chilling area of central Chile
E. Gratacós , A. Cortés

12:15-12:30 Discussion

12:30-13:30 Lunch türker

09 June 2005, Thursday

Session XI (Chairperson: P.E. Lauri)

13:30-14:00 Fruit cracking in sweet cherries (*Prunus avium* L.) – some recent advances
L. Sekse (Invited Speaker)

14:00-14:15 Cracking of sweet cherries: Past tense ?
J. Vercammen, G. van Daele, T. Vanrykel

14:15-14:30 Plastic covering against sweet cherry fruit cracking also affects fungal fruit decay
J. Børve, A. Stensvand, M. Meland, L. Sekse

14:30-14:45 Forced cultivation of sweet cherry under overall cover from rain
M. M. Blamer, M. M. Blanke

14:45-15:00 Tree cover and water stress affect microclimate and retard maturation of sweet cherry
D. Khvostov, M. M. Blanke

15:00-15:15 Discussion

15:15-15:30 Coffee Break

Session XII (Chairperson: L. Sekse)

15:30-15:45 The tart cherry integrated orchard management project: Management strategies and perceptions of integrated pest management in the United States
N. Rothwell, A. Coombs, J. Haley, S. Thornsbury, M. Whalon

15:45-16:00 The tart cherry integrated orchard management project: Reduced-risk management of disease and insect pests in the United States
A. Coombs, N. Rothwell, M. Whalon, L. Gut, G. Sundin, D. Alston, P. McManus

16:00-16:15 Viral diseases diagnosed by DAS-ELISA and RT-PCR of sour and sweet cherry trees from different provinces of Turkey
C. Ulubas

16:15-16:30 Viruses and virus diseases of cherry in the Mediterranean
A. Myrta, V. Savino

16:30-16:45 Anthracnose - An emerging disease on sweet cherry
J. Børve, A. Stensvand

16:45-17:00 Investigations on the biology of cherry fruit fly [*Rhagoletis cerasi* l. (Diptera:Tephritidae)]
A. Ozdem, N. Kılıncer

17:00-17:15 Discussion

20:30 Gala Dinner

10 June 2005, Friday

Session XIII (Chairperson: S. Lurie)

09:00-09:15 Mechanical harvest of fresh market quality sweet cherries: economics and key orchard system components
M. D. Whiting, D. Peterson, D. Elfving, E. Kupferman, J. McFerson, C. Seavert

09:15-09:30 Maintaining cherry quality: supply chain challenges.
E. W. Hewett, N. Weaver, I. Hofma

09:30-09:45 The bigger the cherries the better the income?
J. Ladner, T. Schwizer, M. Zürcher

09:45-10:00 Consumer sensory evaluation of sweet cherry cultivars in Oregon, U.S.A
J. Turner, A. Colonna, C. F. Seavert, L. E. Long

10:00-10:15 The epidermal characteristics of fruit skin of some sweet cherry cultivars
L. Demirsoy, H. Demirsoy

10:15-10:30 Discussion

10:30-10:45 Coffee Break

Session XIV (Chairperson: U. Aksoy)

10:45-11:00 Pre-harvest applications of gibberellic acid and calcium for improving post-harvest handling and storage quality of Sunburst sweet cherries
A. B. Pugh

11:00-11:15 High antioxidant- Effect of consumer size modified atmosphere packaging bags on postharvest storage and shelf-life quality of cherry cv. 0900 Ziraat
F. Küçükbasmaci, O. Özkaya, T. Ağar

11:15-11:30 Optimizing short term storage of sour cherries
S. Lurie, A. Weksler

11:30-11:45 Summarize physical, physiological and quality parameters of selected sour cherry cultivars (*Prunus cerasus* L) growing in Hungary
E. Kovács

11:45-12:00 Analytical composition and bioactive substances of juices and wines from different sour cherry cultivars
F. Will, H. Dietrich

12:00-12:15 High antioxidant-and anthocyanine-contents of sour cherry cultivars may benefit the human health: international and Hungarian achievements on phytochemicals
Z. Veres, I. Holb, S. Thurzó, T. Szabó, J. Nyéki, Z. Szabó, M.G. Fári

12:15-12:30 Discussion

12:30-13:30 Lunch türker

13:30-14:30 Vote for next meeting and Closing Session

5th International Cherry Symposium

June 06-10, 2005, Bursa-Turkey

Invited Lectures

Trends in sweet cherry cultivars and breeding in Europe and Asia

S. Sansavini and S. Lugli

Dipartimento di Colture Arboree, University of Bologna, viale Fanin 46, 40127 Bologna, Italy

The dynamism in the available range of sweet cherry cultivars and their rootstocks in many European and Asian countries has played a major role not only in reviving interest in an industry that in the last few decades had seen its fortunes stall and even wane to a certain extent but in driving the engine of its modernization and in lifting cherry to the very top of the standings of the most profitable crops in terms of farmgate. The source of this dynamism is, and has been, the formidable breeding efforts of the public and, to a certain extent, the private sector in such countries as France, Germany, Hungary, Italy, Denmark, the UK, the Czech Republic, Romania, Estonia and Ukraine in Europe and Japan and China in Asia. Important too in this picture have been a number of new varieties from North America, which in some cases have even provided the impetus to cultivar innovation.

The last decade has been especially notable, with more than 120 novel varieties, most marked by enhanced fruit traits, having been released by breeders in the Old World countries. A number of factors have contributed to this success. (i) First and foremost is improved cherry quality. Indeed, average size has increased, going from 6-8 g to 9-12 g, and flesh is firmer, with the resulting phase-out of softer local varieties. Colour too has been upgraded: European fruits have a deeper red verging almost on black while the Asian varieties, which have a lighter, almost melting flesh, tend towards a bright pinkish-orange blush over a yellow ground. Resistance to cracking, a much sought-after trait, has improved to the point where there are now nearly a dozen cultivars with a rate of now more than 5-10% of cracking induced by heavy rains.

Another area of notable improvement has been (ii) an extension of ripening date of at least one week at the early and 2-4 weeks at the late end. Thus, if we take into account the climatic variations at different latitudes and elevations, the seasonal calendar in both hemispheres is now 3-4 instead of the usual 2 months. The introduction of (iii) self-fertility from a pollen mutation at the S-locus first bred in the UK and further developed in new selections derived from the Canadian Stella represents another significant advance. Given that this trait is readily segregated, there are many of these varieties today, especially in Italy.

While in this connection we might mention compact tree habit, a much sought-after trait in recent years, it has now become a secondary pursuit of breeders because of irradiation-induced problems like fruit size and yield reduction and, especially, the dwarfing achieved with new rootstocks. Indeed, with rare exceptions like the Burlat C1 clone, the success of the original standard has not been bettered. Similarly, resistance to pathogens, long an ambition of breeders, has so far had rather limited success, that to the cherry fly in southern districts and bacterial canker in Germany being two examples.

Perhaps the most notable novelties produced by breeders in Europe to date are the early-season cvs. Primulat and Early Bigi (France), the self-fertile Sweet Early and Grace Star (Italy), the mid-ripener Giorgia (Italy) and Vera (Hungary), the mid-late Kordia, Vanda and Techlovan (Czech Republic) and Black Star (Italy), and the late-season Regina (Denmark) and Alex (Hungary).

2 problem: chilling requirement, Effect of rootstock on flowering GI 5 delayed flowering! We, root not good survival GI 6 and Max Ma → good.

New horizons in Turkish sweet cherry production and export

N. Kaska

University of Cukurova, Faculty of Agriculture Adana, Turkey

Quite an important development in sweet cherry production and export occurred during the last decade in Turkey. In this development an old but suitable to export variety, "0900 Ziraat" played the main role. When the high value of this variety from the stand point of export was understood and increased demand from the European markets was seen, the Turkish sweet cherry growers paid more attention to modernization of the sweet cherry growing. Eventually, the area under sweet cherry was increased gradually. As a result production and export were also increased.

In the new orchards dwarfing and semi-dwarfing rootstocks such as Gisela-5, Gisela-6, Ma x Ma, SL-64 etc. are being used therefore early fruit set occurs and it results with increasing production. In old orchards pruning became one of the main cultural practices. Farmers are aware of importance of "zero" worm and pesticide residues. Post harvests procedures are being well applied. In Turkey sweet cherry harvests start in May and continue in June and finish at the end of July in different growing regions.

Several research works are being carried out in various Universities and research Institutes of Ministry of Agriculture. Among these works looking for differences among the "0900 Ziraat"by molecular markers and determining of S-alleles, obtaining self fertile variety of "0900 Ziraat", rootstocks-scion relationships of the same variety, extending of sweet cherry growing seasons can be mentioned.

According to all these developments one can say that Turkish sweet cherry growing is in a positive way.

0900 Ziraat → cracking resistant
→ artificial rain 2% cracking

Fertilization biology problem ¡Bombus!

Stella
Bigarreau gaucher
Stark Gold

P. avium Mazzard Seedling
P. mahaleb SL 64
GI 5, GI 6
Max Ma
W 158
Tabl. Edirne

Sweet cherry orchard management – from shifting paradigms to computer modeling

G. A. Lang

Department of Horticulture, Michigan State University, East Lansing, MI 48824, USA

Sweet cherry orchard management has evolved during the last 25 years from 1) minimal inputs a very large trees to 2) extensive efforts to contain excessive vigor and promote earlier, hea cropping to 3) intensive efforts to promote more vigor and to reduce cropping levels on dwar rootstocks. Increasingly, technologies that add to or preserve high crop values, such as orch covers and organic production practices, also are being adopted. The past decade has se significant shifts in many orchard management paradigms. These are being driven by pract orchard experiences with new precocious, vigor-controlling rootstocks and elegant studies of sw cherry growth and cropping physiology, as well as dramatically improved varieties and competit for high value markets in a global economy. In essence, as orchard densities have increased, t stature and/or canopy complexity has become more simplified, leading to a greater potential micro-manage sweet cherry cropping and fruit quality. An outgrowth of this has been development of an interactive computer model of sweet cherry growth and cropping, VCHER (Virtual Cherry Tree), to simulate and predict tree, yield, and quality responses to orch management decisions. The model begins with a nursery tree, adding seasonal development new and existing shoots, spur and non-spur leaves, and ultimately flowers and fruit, based sweet cherry phyllotaxy and meristem determination. VCHERRY is quantitative, with the capac to predict leaf area, light interception, yield, and fruit quality. The model also uses compu animation to illustrate progressive canopy and crop development under different input paramete such as rootstock and pruning strategies, providing estimates of immediate and probable long-te impacts of annual orchard management decisions.

The physiology of high density orchard systems: sources, sinks, and solutions

M. D. Whiting

Irrigated Agriculture Research and Extension Center Washington State University Prosser, USA

It is the goal of every sweet cherry grower to be profitable. Fundamentally, profitability may be achieved or improved upon via reductions in the costs of production and/or improvements in the yield and quality of fruit. Ideally, both components are realized concomitantly, yet too often, successfully accomplishing one occurs at a loss in the other. In most production regions, profitability will require the evolution of sweet cherry production systems to high density/efficiency while consistently producing sustainable yields of high quality fruit. Developing solutions to facilitate this transition is the overall goal of the sweet cherry research program at Washington State University. Solutions are developed from a thorough investigation and identification of the key factors limiting productivity and fruit quality in high-efficiency orchards. Specifically, our research has investigated the role of distinct orchard system components (e.g., scion and rootstock genotype, canopy architecture, water relations) on fundamental yield and quality parameters, but focused on the physiology underpinning fruit productivity and quality (e.g., whole-tree carbon balance, source-sink relations). For example, net photosynthesis of sweet cherry appears to be source-limited during the bloom – harvest interval. The partitioning of limited assimilates to fruit often restricts their development and genetic potential for quality is lost. Therefore maximizing the canopy's acquisition of assimilates and balancing competing sinks will be critical for producing high quality fruit. This presentation will discuss the physiology underlying fruit quality and productivity within high density orchard systems, reviewing current research and highlighting areas in need of investigation.

Progress in cherry rootstock research

K. Hrotko

Department of Pomology, Corvinus University of Budapest, Hungary H-1518 Budapest, Pf. 53, Hungary

Cherry rootstock research over the last decade has been focused more on rootstock evaluation than on breeding new rootstocks. There are only few new breeding projects and new rootstocks successfully introduced. This attitude of researchers can be well justified considering the large number of rootstocks in the evaluation stage. However, the knowledge on rootstock/scion interactions, mechanism of rootstock effect on growth and crop development is not enough and the progress in this field is also not satisfying. The investigations on grafting compatibility as a decisive factor of rootstock usage confirmed that the performance of a scion/rootstock combination is individual, there are no general rules, however, the virus sensitivity of rootstocks may cause similar response.

The cherry rootstock breeding activity achieved a complete scale of growth vigour, which was the dream of growers from 30-40 years ago. Dwarfing rootstocks are used first of all for sweet cherries in intensive orchards, but they can be planted for sour cherries too, since some mechanical harvesters for small trees can be used, or are in development. Though the usage of dwarfing rootstock is spreading, there are still little knowledge and only few research projects on growth control mechanism in cherry rootstock/scion composite trees. There are some indications that this mechanism differs from that of the apple. The interactions between rootstock vigour, precocity, fruiting wood development, renewal capacity and crop load are more specific, but essential for an appropriate rootstock selection. The vigour of site, orchard system, training and pruning also should be matched with the selected scion/rootstock combination performing sometimes very individually. The rootstock role related to these factors also has been investigated; the results may help now to understand the complex problem of rootstock selection for intensive orchards.

The importance of regular water supply for the growing cherry fruit is well known both for growers and researchers, but the role of rootstock and grafting unit in the water regime of the composite cherry tree is less investigated, similarly to the rootstock effect on the tree nutrition. The rapidly growing cherry industry in the southern hemisphere and Asian countries emphasizes the rootstock adaptability to different site conditions, low and high temperature, winter hardiness, soil type, drought and wet soil. In this consideration interstem trees may gain importance as possible form of rootstock use.

Recent breeding projects utilized mainly the *Prunus cerasus* genom, followed by crosses between European and Asian *Prunus* species. Less attention has been paid to *Prunus avium* and *Prunus mahaleb*, however the last one is a basic rootstock for dry conditions and calcareous soils. The mainly practiced breeding methods are classical: crosses between selected genotypes within species, crosses between species within *genus Prunus* and the successive selection among the progeny for vegetative propagated genotypes. Seed tree or inbred line selection are rarely used breeding methods.

Breeding cherries in the "New World"

F. Kappel

Agriculture and Agri-Food Canada Pacific Agri-Food Research Centre Summerland, BC V0H 1Z0, Canada

An inventory of cherry breeding in North and South America, and Australia will be presented. Information provided will include history and size of the programs, breeding objectives, cultivars released, attributes evaluated and general comments about the programs. Programs that will be discussed include: in the U.S.A., the programs in Michigan, New York, and Washington; in Canada, the programs in Ontario, British Columbia, and Saskatchewan; and in Australia, the program in South Australia. Brief discussions for both tart and sweet cherries will be provided.

Sweet cherry tree architecture, physiology and management – towards an integrated view

P. E. Lauri[1] and J. Claverie[2]

[1]INRA. UMR 1098. Équipe 'Architecture et Fonctionnement des Espèces Fruitières' (AFEF). 2, Place Pierre Viala. 34060 Montpellier Cedex 1. France.
[2]INRA. Unité de Recherches sur les Espèces Fruitières et la Vigne (UREFV). BP 81. 33883 Villenave d'Ornon Cedex, France

On sweet cherry, as with other fruit tree species, there is an increasing interest in further insi into growth and fruiting strategies of the tree to improve tree training in the orchard, especially high-density planting. The objective of this paper is to give an overview of current knowledge tree architecture and physiology, and their bearing on training improvement. From an architectu viewpoint, the cherry tree is characterized by two main features: 1) it has upright scaffold branch (secondary bending is due to weight) with lateral flowering on the preformed portion of both sh and long shoots, and 2) it is characterized by a strong dimorphism between short and long shoc with a marked acrotony, i.e., longer laterals are in top position just below the annual growth arre As with other fruit crops, all training and pruning methods are multifunctional, i.e., they have varic effects on both tree architecture (e.g., distribution of the laterals in the canopy, shoot demograp and light interception and distribution within the tree canopy. Both of these subsequently influen fruit quality. The same technique may have synergistic and/or antagonistic effects on architect and light environment. A critical step is then to improve knowledge on the consequences of t techniques used for canopy management. A second one is to develop methods which allow anticipation of branching and flowering for the following years and not only ones that correct curr problems. These critical steps are the basis to implement the emerging concept of *detail precision tree management* to achieve sustainable yield of high fruit quality.

Fruit cracking in sweet cherries (*Prunus avium* L.) – some recent advances

L. Sekse

Norwegian Crop Research Institute, Ullensvang Research Centre N-5781 Lofthus, Norway

Fruit cracking in sweet cherries causes serious losses in many production areas. Researchers have been occupied with the problem since the 1920's. Epoch-making work was carried out by developing the cracking index test in the 1950's and further with the comprehensive studies of many aspects of cherry fruit cracking in Denmark in the 1970's. Over the last decade, particular interest has been paid to two fundamental aspects of cherry fruit cracking; the morphology of the cuticle and outer epidermal layers of the fruit and their water conductive properties on one side, and the malfunction of the fruit cuticle when it forms fractures on the other. These recent works, together with more basic cracking related studies in other fruit species such as apples, tomatoes and grapes, have added valuable knowledge to the understanding of the mechanisms involved in cherry fruit cracking. The development of the cuticular membrane (CM) and of stomatal density of the cherry fruit have been thoroughly studied. CM mass per unit area decreased in stage II and III, while its wax content was unchanged. The conductance of CM differed by localisation on the fruit surface and by fruit development and was negatively related to its thickness. However; its permeability coefficient did not show this relationship, which was explained by strain rate associated with fruit growth that increased permeability. Contents of substances contributing to osmotic potential differed between tissue types in the cherry fruit and by cultivar. The stomatal density of the cherry fruit surface differed by cultivar and localisation on the fruit surface. Due to contact angles of water on the fruit surface and critical surface tension, Poiseuille-flow of water through the stomata was regarded unlikely. Potometric studies have revealed that water uptake to the fruit over the fruit pedicel was influenced by fruit development, fruit surface water status and cuticular fractures (CF) in the fruit surface. Other studies have dealt with the influence of cations on the water transport over the fruit pedicel. The cherry fruit developed CF mainly in growth stage III. Discontinious water supply to the tree increased the amount of CF, and their development was influenced by cultivar and rootstock. CF was shown to promote postharvest fruit rot. In sum, valuable contributions have been added to our understanding of the mechanisms involved in cherry fruit cracking over the last years, and it still appears as a complicated matter being challenging to the cherry growers.

5th International Cherry Symposium

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Oral Presentations

O - 1

Testing of sweet cherry varieties in Belgium

J. Vercammen, G. van Daele and T. Vanrykel

Fruittuinweg 1 3800 Sint-Truiden, Belgium

The 3 main varieties grown in Belgium are Kordia, Lapins and Regina. However these also have some disadvantages. Kordia is susceptible to frost, with Regina the fruit setting is not really easy and Lapins is susceptible to cracking. In addition to these 3 varieties Schneiders Sp. Kn., Summit, Sweetheart, Karina and Sylvia are also being planted in Belgium. The latter 2 are especially recommended as pollenizers for Regina. As is the case with Regina, the fruit setting is also difficult with Schneiders Sp. Kn. and Summit. Sweetheart on the other hand is a very productive variety, but it is prone to cracking and rotting. Furthermore the cherries on the tree have a limited life.

The assortment is best completed with a self-fertile variety that is not susceptible to frost or cracking. The ideal variety is productive and has in addition a late picking time, a weak vigour and a good fruit quality (hard and thick). This variety is best grafted on Gisela 5, because this rootstock is more productive and less susceptible to frost than Colt and Prunus Avium.

In the 1st screening 3 trees per variety are planted, each time Kordia is planted for comparison. These varieties are being followed for at least 4 production years. The best varieties from the 1st screening are being planted at a larger scale (2nd screening) as soon as possible, with the intention of finding solutions to the negative qualities of these new varieties. In addition a technical production chart will be drawn up. From the 54 varieties planted in the 1st screening of 1999, Coralise, Vanda, Summersun, Noire de Meched and Skeena have been planted in the 2nd screening at present. Other interesting varieties in this series are Tieton, Columbia and Hertford. With the exception of Skeena these varieties are all situated in the 3rd to 6th cherry week. We still have to find really interesting varieties that are ripe very early and very late in the season. For the 37 varieties that have been planted in the 1st screening in 2000 it is still too early to give an opinion.

O - 2

Further experiences with dwarfing sweet cherry rootstocks in Northern Germany

R. Stehr

Fruit Research Station Jork, Moorende 53, D-21635 Jork, Germany

In a rootstock trial with 'Regina' begun in 1995, Gisela 5 had given the best cumulative cropping results, compared to Weiroot 13, Weiroot 53, Weiroot 154, Weiroot 158, Mazzard and Colt. In summer 2001 the trees on Weiroot 53, Weiroot 154 and Weiroot 158 got very heavy incompatibility problems. Since that time these Weiroot-rootstocks are out of interest for Norhern Germany.

Another trial with 'Regina' which was planted in 1998 including the Czech rootstocks P-HL-A and P-HL-B, as well as the PiKu series from Dresden-Pillnitz compared to other well known standards like Mazzard, Colt and Gisela 5. Vigour-data as stem-diameter and tree volume were recorded to describe the vegetative growth. Best yields were still obtained with rootstock Gisela 5.

Finally first impressions are given on another trial planted in 1999 with variety 'Kordia' with 14 different rootstocks again including the Weiroot-series but also further selection-numbers from the Gießen-breeding programme like 148/13, 195/20, 196/13, and 497/8.

Summarizing all experiences under Northern Germany conditions Gisela 5 seems to be the best rootstock for the most of the grown varieties. Nursery production now takes place more than 90% on rootstock Gisela 5. For very heavy cropping and less vigorous varieties there is still some need for a stronger rootstock with also good cropping efficiency. For high density systems and under rain cover protection Gisela 3 is coming more into the focus.

O - 3

A nine year study on the performance of twelve cherry rootstocks under rainfed conditions in Apulia (Southern Italy)

A. Godini, M. Palasciano, S. Camposeo and A. Pacifico

Dipartimento di Scienze delle Produzioni Vegetali, Università di Bari, Italy

The recent spread of sweet cherry industry in Apulia (Southern Italy) mainly depends on the limited height of adult trees. The naturally self-controlled growth of the trees is the consequence of three concurring factors: poor and shallow soils, rainfed conditions and use of Pruns mahaleb Mill. (St. Lucie) as the sole rootstock. Nevertheless, the possibility of a further reduction of the three height by the use of roostocks dwarfer than P. mahaleb is intriguing and a trial has been set up on the subject. The data reported in the present paper concern the results obtained in Apulia from 1996 throughout 2004 as a part of a national trial funded by the Italian Ministero delle Politiche Agricole e Forestali elf- compatible cv. Lapins was budded onto the following 12 roostocks: 'Mazzard' and 'Mazzard F12/1' (P. avium); 'CAB 6P', 'CAB 11E', 'Weiroot 158' (P. cerasus); 'Damil® GM 61/1' (P. dawyckensis); 'SL 64' (P. mahaleb); 'Avima®-Argot', 'MaxMa Delbard® 14', 'MaxMa Delbard® 97' (P. mahaleb x P. avium); 'Colt' (P. avium x P. pseudocerasus); 'Gisela 5' (P. cerasus x P. canescens).

The design of the trial is a randomized complete block with 13 single-tree replicates, 5m x 5m spaced, vase shape trained and rainfed grown. The local annual average rainfall is about 600mm, 80% between November and April. Within the nine-year study the mortality onto 'Gisela 5' was total; less than 50% was the survival onto 'Damil Ò GM 61/1' and 'Mazzard F12/1'. The highest trunk cross-sectional area was recorded by 'Avima® -Argot', 'Colt', and 'SL 64'; the lowest TCSA's were performed by 'Damil® GM 61/1' and 'Weiroot 158'. Active suckering was produced only by 'CAB 6P' and 'CAB 11E', not by the third P. cerasus rootstock, i.e. 'Weiroot 158'. In 2004 the maximum height of the trees did not exceed 4.5m; onto 'Ma x Ma Delbard® 14' and 'Damil®' GM 61/1' the height was less than 4.0m and only 'Weiroot 158' produced trees smaller than 2.6m.
The earliest bearing roostock was 'Weiroot 158' (3rd leaf) and the latest one F12/1 (6th leaf). Cumulative 1998-2004 yield ranged from a minimum of 2.5 kg/tree ('Damil®' GM 61/1') and a maximum of 45.5 kg/tree 'SL 64'. In terms of crop efficiency the best results have been obtained with 'Weiroot 158', 'SL64' and 'Avima® -Argot'; the worst results with 'Colt', 'Ma x Ma Delbard® 97', 'Mazzard', 'Mazzard F12/1' and 'DamilÒ GM 61/1', in decreasing order. Results obtained confirmed the satisfactory performance of 'SL64', the clonal version of the traditional P. mahaleb seedling; promising results have been given by dwarfing 'Weiroot 158' and semi-dwarfing 'Ma x Ma Delbard® 14'. Absolutely unsuited to the environment resulted 'DamilÒ GM 61/1', Gisela 5' and 'Mazzard F12/1'.

O - 4

Effect of some clonal rootstock on growth and earliness of 0900 Ziraat sweet cherry cultivar

M. Burak, M. E. Akçay and E. Yalçınkaya

Atatürk Bahçe Kültürleri Merkez Araştırma Enstitüsü Yalova, Turkey

The importance of sweet cherry (*Prunus avium* L.) growing in Turkey has recently increased very sharply. This study was carried out in order to solve the problems due to rootstocks and thus increase the yield and quality of cherries in a modern and economical way. Therefore, the trials were conducted at six different locations by using Prunus avium, Gisel A 5, Ma x Ma 14, Weiroot 158, Mahalep SL 64, Mazzard F 12/1, and Tabel(Edabriz) as rootstocks and 0900 Ziraat as the main cultivar and Bigarreau Gaucher and Stark's Gold as pollinators. The results of Yalova location will be presented here. In the trials, the plants were planted at 5mx3m distances, the design were randomised block design with for replicates and 4 trees per plot, and irrigated with drip irrigation. The growing habit and bearing habit is differed among the rootstocks importantly in the early years of the experiment. Gisel A 5 is seemed to be the earliest fruit bearer rootstock among the tried rootstocks and is followed by Tabel (Edabriz). Fruit size and total soluble solids seems not to be affected by rootstocks importantly.

O - 5

Evaluatin of semi-dwarfing rootstocks for sweet cherry orchards in the Rhine river valley (Germany)

M. Balmer

Dienstleistungszentrum Laendlicher Raum (DLR) - Rheinpfalz, Kompetenzzentrum Gartenbau, Walporzheimer Str. 48, D-53474 Bad Neuenahr-Ahrweiler, Germany

Sweet cherry production in the Western part of Germany (Rhine valley) is characterised by a wine growing climate, comparatively low precipitation (500 – 700 mm p.a.) and sandy soils, often without irrigation. New dwarfing rootstocks such as Gisela 3 or Tabel®Edabriz show a tendency to overcrop from the 4th leaf on, especially without irrigation. In 1997 and 1999 two trials were planted in the fruit growing area of Koblenz to select a rootstock which shows resistance to water stress, overcropping and replanting disease (table 1).

Trial	1	2
Location	Koblenz-Bubenheim	Kettig
Irrigation	no	no
Cultivars	Regina	Sylvia
Rootstocks		
Gisela 5 (S)	x	x
Gisela 6 (S)		x
PHL-A		x
PHL-B		x
Maxma 14	x	x
Maxma 60		x
PiKu 1	x	x
PiKu 3	x	
PiKu 18.167		x
Weiroot 158	x	
Pontaleb®Ferci		x

Table 1: Overview of the rootstock trials

In the area Maxma Delbard®14 has been the most planted rootstock since 1990.

So far, Gisela 5(S) (*P. cerasus x P. canescens*) showed an outstanding productivity in both sites which was unexpectedly combined with good fruit size. Also the aptitude for replanting soils is good.

Maxma Delbard®14 (*P. mahaleb x P. avium*) showed a sub-average productivity and an average fruit size. This rootstock is interesting for its vigour being about 30 percent below *P. mahaleb*. It has a drastic reduction of vigour on replanting soils. In other orchards of the area, it shows other disadvantages: sensitivity to a bark tortrix (*Laspeyresia woeberiana*), root asphyxiation and, not yet proved in Germany, to virus infections especially with *cherry capillovirus A*.

PiKu 1(S) (*P. avium x (P. canescens x P. tomentosa)*) was more vigorous than Maxma Delbard®14 but it had a higher productivity combined with a good vitality, also on replanting soils. With a yield level comparable to Gisela 6 (S) but a better anchorage Piku 1 is actually the favourite in the middle Rhine valley to replace Maxma Delbard® 14 as a semi-dwarfing rootstock.

Gisela 6 (S) (*P. cerasus x P. canescens*) had a high productivity (but lower than Gisela 5 (S)) and exhibited a good fruit-size. Vigour is distinctively stronger than Gisela 5 (S). Nevertheless, a thunderstorm in 2003 selected all Gisela 6 (S) trees and blew them down.

O - 6

The bigger the cherries the better the income?

J. Ladner, T. Schwizer and M. Zürcher

Agroscope FAW Wädenswil, Postfach 185, CH-8820 Wädenswil, Switzerland

In Switzerland, sweet cherries for fresh fruit markets are produced on approximately 450 hectares. Three quality classes are defined: Class I, Extra Class and Premium Class. Economics studies have identified three main factors that influence the producer's profit margin: 1. The producer's price for Extra and Premium Class cherries; 2. The fraction of total production that falls into those two quality classes; 3. The total quantity of cherries produced. Thus, it is important to know which cherry varieties are outstanding performers with regards to these three key criteria. Agroscope FAW Wädenswil mechanically calibrates all cherries in its trials since 2003. This article compares calibration data of promising cherry varieties for the 2003 and 2004 seasons. The impact of these data on the producer's income are discussed by means of an economic model.

O - 7

Variability of pomological properties in Oblacinska sour cherry clones on different rootstocks

M. Milutinovic, D. Nikolic, V. Rakonjac and M. Fotiric

Faculty of Agriculture, Nemanjina 6, 11080 Belgrade-Zemun, Yugoslavia

Oblacinska sour cherry is autochthonous cultivar that is grown the most in the commercial orchards of Serbia. While Oblacinska sour cherry is not homogeneous cultivar, but population of clones with different values, clonal selection has to be done. Besides clonal selection that understands separation of the clones with satisfactory pomological properties, it is necessary to investigate its characteristics on different rootstocks. In this paper, results of 8 pomological properties in 10 selected clones of Oblacinska sour cherry on 2 rootstocks (vegetative propagated Oblacinska sour cherry and Mahaleb seedling) were shown. It was established that examined clones significantly differed considering yield, fruit weight, stone weight, randman and invert sugar content, but showed differences between clones considering soluble solid content, total sugar content and total acid content were not significant. The highest yield had clone D8, but the largest fruit weight and stone weight had clone D4. Used rootstocks significantly influenced on yield, fruit weight, stone weight and randman, and better results were obtained on Mahaleb seedling as rootstock.

O - 8

Evaluation of new rootstocks for a sweet cherry cultivar in Polish climatic conditions

Z.S. Grzyb, M. Sitarek and B. Koziński

Research Institute of Pomology and Floriculture, Pomologiczna 18, 96-100 Skierniewice, Poland

In a field experiment, sweet cherry trees of cv. 'Vanda' grafted on 'GiSelA 5', 'Maxma 14', 'Weiroot 158', 'Tabel Edabriz', 'P-HL A', 'P-HL B ' and 'P-HL C' were compared with trees of the same cultivar grafted on the vigorous rootstock 'F 12/1' (control). One-year-old trees were planted in the spring of 2000 at the Experimental Station in Dabrowice, near Skierniewice (Central Poland). The trees were planted on a gray-brown podzolic soil using two planting densities: 5.0 x 1.5 m and 5.0 x 2.5 m. Tree vigour, yield, fruit weight, soluble solids content in the fruits and the number of suckers per tree were evaluated in the years 2003-2004. The results revealed that all the investigated rootstocks except 'Maxma 14' significantly reduced the growth of sweet cherry trees in comparison to 'F 12/1' regardless of the distance between the trees in a row. Trunk cross-sectional areas of five-year-old trees grafted on 'GiSelA 5' were from 42 % (for the distance of 2.5 m) to 47% (for the distance of 1.5 m) smaller than those on 'F 12/1'. Depending on the planting density, 'Maxma 14' limited tree growth in the range of only 7 to 9%, 'Weiroot 158'– from 35 to 45%, 'Tabel Edabriz' – from 57 to 60%, 'P-HL A' – from 43 to 49%, 'P-HL B' – from 31 to 49% and 'P-HL C'– from 52 to 54%, respectively. Cumulative yield for all the investigated dwarfing rootstocks except 'P-HL B' and 'P-HL C' were significantly higher than those for the control trees. Trees grafted on 'GiSelA 5' were the most productive. The rootstocks also had an influence on fruit weight. The smallest fruit size was recorded for trees grafted on 'Tabel Edabriz', especially those planted at the distance of 1.5 m.

Trees grafted on 'P-HL C' have a tendency to produce suckers. No suckering was observed in the case of trees grafted on 'GiSelA 5', 'Maxma 14' or 'Tabel Edabriz'.

O - 9

Evaluation of some sweet cherry cultivars on Gi.5 and Gi.6 rootstocks in Bayramic, Turkey

A. Kankaya, M. A. Aşkin, B. Balci and F. A. Yildirim

Süleyman Demirel University, Agriculture Faculty, Department of Horticulture, 32260, Isparta, Turkey

The project was established in Bayramiç, Turkey. The performance of the sweet cherry (*Prunus avium* L.) cultivars Lapins, Kordia, Cristalina, Summit and Sunburst were evaluated during 2002-2004. These cultivars were grafted on Gi.5 and Gi.6 rootstocks. Recently, these rootstocks have been used in the new orchards planted in Turkey. In this study, fruit yield and pomological characteristics of these cultivars were determined. Moreover, some phenological characteristics were also observed.

O - 10

Rootstock effect on yield and fruit quality of two sweet cherry cultivars in central Chile

E. Gratacós, M. Kulczewski and A. Cortés

Facultad de Agronomía. Universidad Católica de Valparaíso. Casilla 4 – D. Quillota, Chile

In the years 2003 and 2004, the flowering period, productivity, productive efficiency and fruit quality of Lapins and Bing cultivars were evaluated on Colt, MaxMa 14,Cab 6 P, Gisella 5, Gisella 6 and Pontaleb rootstocks, in a experimental orchard located in Central Chile (33°52' S and 70°41' W at 700 altitude), during its 4th and 5th leaf growing, with a density of 1481 trees/ha. Accumulated production for cv Bing, was in a range between 12,7 and 28,2 T/ha, being higher for Pontaleb and Gisella 6 rootstocks and lower for Colt. In Lapins, the accumulated production fluctuated between 21,6 and 42,1 T/ha, getting equal and higher registers in Pontaleb, Gisella 6 and Cab 6P. Flowering intensity was registered for all combinations. The productive efficiency of cv Lapins was between 82,1 and 435,6 g/cm^2, being higher in G5 and G6 rootstocks, and lower in Colt and Pontaleb ones. After the second year, this relations tend to level to 193 g/cm^2 for Colt and to 246 g/cm^2 for G6. Productive efficiency in cv. Bing moved along 26.3 and 400 g/cm2, getting higher levels in G5 and G6 rootstocks, and level ones in Colt, Cab 6P and Maxima 14. This relations raised for Cab 6P, Pontaleb and Colt after the second year. The quality of the fruit was evaluated for all combinations in terms of fruit weight, firmness, soluble solids and acidity.

O - 11

Phenology, productivity and fruit quality of ten sweet cherry cultivars in a low winter chilling area of central Chile

E. Gratacós and A. Cortés

Facultad de Agronomía, Pontificia Universidad Católica de Valparaíso, P.O.BOX 4-D Quillota, Chile

This research started en 1996 whith *P. cerasus* rootstocks grafted en 1997 with 10 cultivars that were trained in Tatura trellis in La Palma Experimental Station of Valparaíso Catholic University in Quillota, 5th region. The study covered each cultivar's flowering and fruit phenology, vegetative and rizotron root growth, production, productive efficiency, fruit quality and fruit looses due to cracking and birds from 2000 to 2004 seasons.

Winter chilling ranged between 407 and 505 hours bellow 7°C and 497 to 711 PCU (ponderated chilling hours). Bloom and harvest dates were influenced by Hydrogen Cyanamid winter spraying and general production was very much influenced by each winter's chilling accumulation. Vegetative growth reached its peak after fruit set while root growth after bloom and at initial leaf fall. The best productive cultivars were Brooks, Somerset, Lapins, Van, Newstar, Celeste and Rainier, while Bing, Early Burlat, Garnet, Marvin, Ruby, Sunburst, Starkrimson, Summit and Sylvia had a low to very low performance. Fruit quality was satisfactory for export quality standards and fruit losses due to cracking and birds were low in most cultivars.

O - 12

Chilling requirement of ten sweet cherry cultivars in a mild winter location in Chile

E. Gratacós and A. Cortés

Facultad de Agronomía, Pontificia Universidad Católica de Valparaíso, P.O.Box 4-D Quillota, Chile

The introduction of new cultivars with lower chilling requirement migth allow the expansion of sweet cherry growing areas. Due to the lack of enough information, it was developed a study of bud's capacity to overcome dormancy by chilling accumulation in cold chambers and in the field. Tested cultivars were Garnet, Early Burlat, Brooks, Lapins, Bing, Newstar, Ruby, Van, Somerset and Celeste.Seven cultivars were able to overcome dormancy after several continuous 6ºC chilling times in chamber. The same cultivars showed higher bud breaks when they were chilled in the field, with eight of them overcoming dormancy.

O - 13

Performance of Gisela rootstocks in six high density sweet cherry training systems in Northeastern United States.

T. L. Robinson, R. L. Andersen and S. A. Hoying

Department of Hort. Sciences, New York State Agricultural Experiment Station, Cornell University, Geneva, NY 14456, USA

Two large field trials were planted in 1999 and 2002 which compared six cherry training systems [Central leader (336 trees/ha), Spanish bush (673 trees/ha), Slender spindle (897 trees/ha), V-system (997 trees/ha), Marchant inclined tree system (1035 trees/ha), and Vertical axis (1196 trees/ha)] with 3 varieties (Hedelfingen, Lapins, Sweetheart). With Hedelfingen, three rootstocks [Gisela 5, (Gi.5), Gisela 6, (Gi.6) and MxM.2] were compared while with Lapins and Sweetheart only Gi.5 and Gi.6 were compared. After 6 years, tree size was smallest with Gi.5, intermediate with Gi.6 and largest with MXM.2. In the second field trial which also included Gi.7 and Mazzard, the Gi.7 trees were as large as the trees on Mazzard after 3 years while Gi.6 and Gi.5 were significantly smaller. Early yield and cumulative yield were highest for trees on Gi.5 followed by Gi.6 while trees on MXM.2 had the lowest yield. Average fruit size was largest on Gi.6, intermediate on Gi.5 and smallest on MXM.2. A severe winter freeze in 2004 resulted in more flower damage on Gi.6 and Gi.5 than on MXM.2 or Mazzard. Among training systems, the Vertical axis system had the highest cumulative yield per tree followed by the Slender spindle system, Spanish bush system, Central leader system, the V system and the Marchant system which had the lowest cumulative yield per tree. On a hectare basis, the Vertical axis system had the highest cumulative yield followed by the Slender spindle system, V system, the Marchant system, the Spanish bush system and the Central leader system. The cumulative yields largely reflected density; however, the Marchant system had significantly lower yield than expected from its density while the Vertical Axis system had higher yield than expected from its density. Fruit soluble solids was highest with the V system followed by the Central leader and Slender spindle systems. The Spanish bush and the Marchant system had the lowest soluble solids which likely was the result of dense canopies and shade within the canopy. The Slender spindle and the V-systems had the best combination of high yield, fruit size and soluble solids.

O - 14

Evaluation of sweet cherry cultivars and advanced selections adapted to the Pacific Northwest, USA

L. E. Long[1], R. Núñez-Elisea[2] and H. Cahn[2]

[1]OSU Extension Service, The Dalles, OR 97058, USA
[2]OSU Mid-Columbia Agricultural Research and Extension Service, Hood River, OR 97031, USA

The U.S. Pacific Northwest, consisting of the states of Oregon and Washington, is the most important sweet cherry production region in North America, however, as recently as the early 1990's fresh cherry production consisted primarily of one cultivar, 'Bing'. In recent years there has been increased interest in planting new cultivars by Northwest growers.

Cultivars and advanced selections from around the world are currently being tested by Oregon State University at a variety trial located near The Dalles, Oregon. In this report we discuss our observations on harvest timing, fruit size, productivity, firmness and rain crack resistance.

O - 15

Analytical composition and bioactive substances of juices and wines from different sour cherry cultivars

F. Will and H. Dietrich

Department of Wine Analysis and Beverage Research, Research Institute Geisenheim, Rüdesheimer Strasse 28, D-65366 Geisenheim, Germany

Sour cherry juices and wines were produced from 5 different cultivars (cv. Schattenmorelle, cv. Gerema; cv. Ungarische Traubige, cv. Cigány 7 and cv. Stevnsbaer Birgitte) sited in the south-west of Germany. Classic processing technology (steel roller mill, tube heat exchanger followed by hot-extraction, separation, pasteurisation, hot-filling) was used. For the production of fruit wines, the juices were diluted to 8-9 g/L total acid and fortified with sucrose to 8-10 % abv. The wines were racked after complete fermentation, adjusted to 40-60 g/L residual sugar and warm-filled into glass bottles. Regarding primary juice parameters, high amounts of dry mass (13.7-18.8 °Brix), sugar-free extract (57.5-80 g/L), total acidity (15.8-23.7 g/L), sorbitol (12.1-21.6 g/L) and minerals were found. Secondary plant metabolites were present in high amounts as well. In the sum, 651-1693 mg/L of polyphenols were found by means of HPLC/PDA. Neochlorogenic acid, 3-coumaroyl-quinic acid, chlorogenic acid, and epicatechin were the predominant polyphenols. The quercetin glycosides ranged from 31-109 mg/L. Anthocyanins were identified (HPLC/PDA, ESI-MS) as cyanidin-3-(2G-glucosylrutinoside), cyanidin-3-(2G-xylosylrutinoside), cyanidin-3-glucoside, cyanidin-3-rutinoside and peonidin-3-rutinoside. A significant decline of the anthocyanin concentrations could be observed during a 6 months storage, which reduced the red colour of the juices drastically. The high polyphenol concentrations were responsible for the high antioxidative capacities of the products. The fermentation process did not affect the amounts of polyphenols significantly.

O - 16

Effect of consumer size modified atmosphere packaging bags on postharvest storage and shelf-life quality of cherry cv. '0900 Ziraat'

F. Küçükbasmaci, O. Özkaya and T. Ağar

Dept. of Horticulture, Faculty of Agriculture, University of Çukurova, 01330 Adana, Turkey

Effect of consumer size modified atmosphere packaging bags on postharvest quality and physiology of sweet cherry cv 0900 Ziraat were investigated. Cherries were harvested at ideal harvest maturity (18.8% SSC, hue° 63.06) in Ulukisla. Within a few hours after harvest cherries were immediately transported to Narpak Packinghouse in Mersin. Upon arrival cherries were immediately hydrocooled until 2°C pit temperature. Right after they were dumped to a GP Grader packing line to be sorted and sized. Cherries were than packed Xtend CH-48 modified atmosphere packaging bags. In the experiments 3 consumer size MAP bags were used namely; 500g, 700g and 1000g. MAP bags were compared to PE bags of the same sizes. All cherries were stored at 0°C for 7, 10, 14, 21 days to simulate market conditions. After these storage periods at 0° half of the cherries were analyzed immediately and the other half was transferred to 20°C (shelf-life) for 3 d.

Cherries were analyzed for fruit elasticity (shore), SSC (%), titratable acidity, color (hue angle), respiration, weight loss (%), stem chlorophyll content, waste (%) and evaluated for taste.

Cherries from all three types of consumer size MAP bags benefited from modified atmospheres especially in terms of firmness, color and taste. MAP drastically increased the shelf-life and appearance of cherries compared to control. 0900 cherries can be packed in consumer type Xtend MAP bags stored up to 20 days and still maintain their quality even after additional 3 d shelf-life at 20°C.

O - 17

Consumer sensory evaluation of sweet cherry cultivars in Oregon, U.S.A.

J. Turner[1], A. Colonna[2], C. F. Seavert[1] and L. E. Long[3]

[1]Oregon State University, Mid-Columbia Agricultural Research and Extension Center, River, OR, USA
[2]The Oregon State University Food Innovation Center, Portland, OR, USA
[3]Oregon State University Extension, The Dalles, OR, USA

Six commercially grown sweet cherry cultivars were evaluated in a consumer sensory evalu in Portland, Oregon on July 17, 2004. All cultivars were harvested within a three-day wind harvesting cherries at different elevations. Five of the six cultivars were evaluated for ta 'Regina', 'Sweetheart', 'Skeena', 'Lapins', and 'Bing' - while 'Kordia' ('Attika') was include visual evaluation only. One hundred ninety-one participants were asked to visually exa 'Bing', 'Sweetheart', and 'Regina' cherries for their preference in color. Cherry size prefer was evaluated using 'Bing' fruit at 29.76, 25.4, and 21.43 mm, and shape preference evaluated using 'Kordia', 'Skeena' and 'Sweetheart'. In addition, participants tasted five cult and ranked them according to overall preference and purchase intent. The participants in one time evaluation preferred a cherry that was large in size (29.76 mm or larger), dark in ('Regina'), with a distinctive shape ('Kordia'). Sweet tasting cherries were preferred the mos percent) while cherries that lacked flavor or were too tart or too sour were preferred the leas and 27 percent, respectively). The 'Regina' cultivar rated the highest for overall taste prefere 'Regina' also rated the highest for consumer's purchase intent followed by 'Sweethe 'Skeena', 'Lapins', and 'Bing'. Each cultivar had soluble solids between 19.1° brix and 22.7° titratable acidity (percent) between 0.6 and 1.09, with flesh firmness between 291 and 427g/ During the sampling process cherries were kept between 7° C and 10° C in ice filled, insul containers.

O - 18

High antioxidant- and anthocyanine-contents of sour cherry cultivars may benefit the human health: international and hungarian achievements on phytochemicals

Z. Veres, I. Holb, S. Thurzó, T. Szabó, J. Nyéki, Z. Szabó and M. G. Fári

H-4032 DEBRECEN Böszörményi str. 138, Hungary

Evidence suggests that a diet high in fruits and vegetables may decrease the risk of chronic diseases, such as cardiovascular disease and cancer, and phytochemicals including phenolics, flavonoids and carotenoids from fruits and vegetables may play a key role in reducing chronic disease risk. Recent research has proven that sour cherry (Prunus cerasus L.) is a valuable natural source of some bioactive compounds important in the human health preservation. Following bichemical investigations based mainly on two sour cherry varieties, „Montmorency" and „Balaton", just only in the USA 10 patents have been registered about cherry phytochemicals since 1999. The variety „Balaton" is of Hungarian breeding, named „Újfehértói fürtös". Among others, in these researches extremely high anthocyanine, bioflavonoid, melatonin and some other bioactive compounds have been identified as phytochemicals of high anti-inflammation and anti-cancer properties. According to the published data the most important biological effects of sour cherry are connected - directly or indirectly - to their endogenous antioxidant behavior as well as to their specific pattern of anthocyanine components. In the present work we measured the total antioxidal activity of some Hungarian sour cherry varieties in combination with their anthocyanine -, sugar- and acid contents. In 2003 twelve clones were selected and grafted from a local sour cherry population called "Bosnyák meggy" grown in small home gardens and farms of the village Csengöd (South-Hungarian Great-Plain Region). Other Hungarian sour cherry varieties, i.e. cv. „Újfehértói fürtös", cv. „Érdi bötermö", cv. „Debreceni bötermö", cv. „Csengödi" and cv. „Kántorjánosi" served as the control. The fruits were harvested in optimal ripening stage and were lyophilised and stored at -18 °C for the biochemical measurements. The total oxyradical scavanging capacity (TOSC) of the samples were measured with PHOTOCHEMR chemiluminometer (Analytic Jena, Germany). There was a significant difference between the lipid (TOSC-ACL) and the water (TOSC-ACW) soluble TOSC fractions, with ACL being the higher for all varieties. We measured the highest ACL value in clone Bosnyák-6 (24,05 µmol Trolox equivalents per 1 g fresh weight), which was 29.6% and 44.2% higher than that of cv. „Csengödi" and the avarage of control varieties, respectively. The ACW activity of 1 g fresh sour cherry was 17,7 TOSC (µmol vitamin C equivalents) that is, the antioxidant value of 100 g sour cherry is equivalent to 311 mg of vitamin C. Given that the avarage vitamin C content in fresh sour cherry measured by Boehringer-Mannheim UV-test method is 0,197 mg per 100 g and that the total antioxidant activity of 0.00197 mg vitamin C (in 1 g of fresh sour cherry) is only 0,011 TOSC, than almost all of the ACW antioxidant activity in sour cherry must be due to water soluble phytochemicals. The measurements of the anthocyanine content were performed with Ultrospec 2100 pro spectrophotometer (Amersham, USA) according to the MSZ 14881 national standard method. Among the samples analysed the highest anthocyanine content was 1.478 mg/100g fresh weight in Bosnyák-6 clone. This value is 2.4-times higher than that of the variety „Csengödi", and 5.7-times higher than the avarage of control varieties. Our results obtained indicate the immense, and almost unexplored genetic and biological potential of the Hungarian sour cherry germplasm regarding the human health benefit. Our presentation will also review international papers and patents published during the last two decades regarding the sour cherry phytochemicals.

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Summarize physical, physiological and quality parameters of selected sour cherry cultivars (*Prunus cerasus* L) growing in Hungary

E. Kovács

Central Food Research Institute, 1022-Budapest Herman Ottó u. 15. Hungary

Different cultivars (Kántorjánosi, Pándy 279, Érdi Bötermõ) were investigated as a function of ripening, storage and seasons. Samples were harvested in 2000-2004 in the orchard of the Research Institute for Fruitgrowing and Ornamentals, Érd. Samples were stored for 30 days (4-6oC, 90% RP). Quality of sour cherries was characterized by different parameters as size (height, cheek, suture), weight, pH, oBrix, dry matter, total acid content, etc. The color was measured by Hunterlab Colorflex spectrocolorimeter, data were evaluted by a Hunterlab Universal Softver (Hunterlab, USA). The physical parameters were determined by destructive and non-destructive way by SMS (Stable Micro System, TA-XT2). Cell wall hydrolytic enzyme activity during development and storage was determined (Kovács et. al., β1997). Partial purification and characterization of cell wall bound enzymes (-galactosidase and others) was carried out.

Results were evaluated as a function of ripening, storage cultivars and season using different statistical methods.

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Pre-harvest applications of gibberellic acid and calcium for improving post-harvest handling and storage quality of 'Sunburst' sweet cherries

A. B. Pugh

INTA-EEA Chubut. Casilla de Correo 88. (9100) Trelew, Argentina

In the South Patagonian valley of Chubut River (43° 16' S.L.), sweet cherry production succeed depends on the export market. In the last few years technological advances in refrigerated containers and packaging have extended the shelf-life of perishable products and increased the use of ship freight. Sweet cherries are extremely difficult to handle after harvest because they have a short shelf-life. Moreover, not all cultivars are suitable to be shipped to distant markets. In the last two years, poor quality has been detected on fruit arriving to the principal markets. The main limitations were softness, decay, variability in color, bad taste and short shelf-life. These are mainly caused by using wrong varieties or improper post-harvest handling and storage. About 8% of the trees of the valley are 'Sunburst', a variety with good size and color, but usually with a notorious lack of firmness. A pre-harvest application of gibberellic acid (GA), calcium and their combination was performed in 'Sunburst' trees trained as tatura, in the straw-yellow stage of fruit development (3 weeks before commercial harvest). While soluble solids content and fruit size were not significantly affected by any of the treatments, Gibberellic acid, alone and in combination with calcium, resulted in a delay in harvest maturity, increased firmness and extended the shelf-life of the fruits.

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Maintaining cherry quality: supply chain challenges

E. W. Hewett[1], N. Weaver[2] and I. Hofma[2]

[1]Institute of Food, Nutrition and Human Health, Massey University, Private Bag 102 904, Al Campus, Auckland, New Zealand
[2] Le Fresh International (NZ) Ltd., PO Box 101 269, North Shore Mail Centre, Auckland, New Zealand

Most cherries in New Zealand are from Central Otago, more than 1500 km from Auckla domestic market of more than 1 million people that is the destination for nearly 30% of production of 2017 tonnes in 2004. More than 50% of cherries produced are exported t international destinations with the most important being Taiwan receiving 78% of the 1 tonnes exported. The extreme perishability of cherries creates challenges to everyone ir supply chain from grower to retailer. Recommendations exist for optimising postharvest han of cherries, but are not always followed leading to quality problems in domestic and internat markets in some seasons. This can cause income loss to supply chain participants as we harming industry reputation. This paper identifies some specific problems associated attaining consistent market quality in domestic and international markets. It outlines s initiatives being taken to enhance market quality and acceptance of New Zealand cherrie addressing issues such as: preharvest factors affecting quality (including tree training, crop nutrition, water management); postharvest processes (including rapid cooling, method transport, packaging, handling protocols at wholesale and retail level); and supply c management concepts and implementation (including adoption of best production pract communication and cooperation among supply chain partners, uniform quality manage procedures). Facilitated grower workshops, using successful growers as role models, provided a useful forum for gaining acceptance and buy in for changing traditional practises.

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Induction of lateral branching of '0900 Ziraat' sweet cherry cultivar in nursery with 6-Benzyladenine+GA_{4+7}

F. Koyuncu and A. N. Yıldırım

Süleyman Demirel University, Faculty of Agriculture, Department of Horticulture, Isparta, Turkey

Experiments were arranged to stimulate the lateral branching of one-year- old '0900 Ziraat' sweet cherry trees in nursery. Benzyladenine+Gibberellins (6-BA+GA4+7 , formulated as Perlan) at 100, 250, 500, 750 and 1000 ppm was sprayed to '0900 Ziraat' sweet cherry trees budded on 'Prunus mahaleb' rootstock. Treatments were applied in 7 July to the upper 15-20 cm of 70-80 cm high trees. Tree diameter and height, the number and length of laterals were measured and evaluated at the end of October.

All treatments significantly increased the tree diameter compared to the control. 500 and 750 ppm Perlan treatments increased the number of long shoots (all laterals were longer than 30 cm). The widest branch angle was obtained from 750 ppm application.

Application of 6-BA+GA4+7 in water soluble formulation, Perlan, containing %1.88 BA and %1.85 GA4+7 is an efficient treatment to stimulate feathering of '0900 Ziraat' nursery trees. Considering the present study and nursery stock standards, 500 ppm concentration of Perlan seems to be the most successful.

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In vitro propagation of dwarfing sweet cherry rootstocks P-HL

J. Sedlak, F. Paprstein and M. Erbenova

Research and Breeding Institute of Pomology Holovousy, 508 01 Horice, Czech Republic

Dwarfing rootstocks 'P-HL-A', 'P-HL-B' and 'P-HL-C' for sweet cherries were selected in Research and Breeding Institute of Pomology Holovousy. Traditional methods of propagation of these rootstocks did not give positive results. Therefore we used in vitro cultures for multiplication of P-HL rootstocks. Shoot tips were successfully established in vitro and micropropagated on Murashige and Skoog (MS) based media containing different concentration of 6-benzylaminopurine (BAP). Multiplication rates varied depending on the rootstock and concentration of BAP. The highest multiplication rate was obtained for P-HL-A rootstock that produced 10.9 ± 0.5 shoots (longer than 10 mm) on MS medium containing 1.5 mg l-1 BAP. The lowest multiplication rate was obtained for P-HL-B rootstock producing only 2.0 ± 0.3 shoots on MS medium containing 0.2 mg l-1 BAP. Higher concentration of BAP 2 mg l-1 was deleterious to shoot growth and multiplication rate. Antibiotic Cefotaxim was successfully used for elimination of bacterial contamination. Cefotaxim at 200 mg l-1 gave positive results during in vitro cultivation. Rooting was successfully induced with modified MS medium supplemented with indole-3-butyric acid (IBA). Rooted shoots were transferred to the greenhouse for further evaluation.

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The effect of ion exchange substrate and succinic acid on morphophysiological and biochemical parameters of rootstock VSL-2 plants during ex vitro adaptation

T. Krasinskaya[1], N. Koukhartchik[2] and V. Matushevich[3]

[1]Institute for Fruit Growing of National Academy of Sciences of Belarus
[2]Kovaleva Str., Samokhvalovichy, Minsk Region, 223013, Belarus
[3]Institute of Physical Organic Chemistry of National Academy of Sciences of Belarus, 13 Surganov Str., Minsk, 220072, Belarus

Ex vitro adaptation is a stress period for plants after in vitro culture. Our researches found significant influence and after-effect of soil (peat:sand –3:1), BIONA-312, BIONA-312 + 1 mg/l succinic acid (SA), BIONA-312 + 10 mg/l SA, BIONA-312 + 100 mg/l SA on adaptation rate, root length and their number, stem length, chlorophyll (a+b) content, sugar concentration (glucose + fructose +saccharose) and total amount of phenols in the plant leaves on an example of rootstock VSL-2 ((Prunus fruticosa (Pall.)) x (P. Lannesiana Carr.)) after 16-week period of the first adaptation stage, carried out in adaptation substrates and the second adaptation stage, carried out in soil.

The ion exchange substrate (IES) promoted higher adaptation rate and better morphophysiological plant development. We established the positive effect of low SA concentration on plant ex vitro adaptation rate, but high concentration decreased number of received plants. By using IES and SA during adaptation we found the decrease of sugar concentration in plant leaves. Also phenol concentration was increasing both when using IES and IES with SA added in it. The use of IES decreased Chl (a+b) content in rootstock plants, howether addition of SA to IES gave different reactions depending on SA concentration. At the second adaptation stage the plants adaptated in IES and IES+SA had higher stem length, dry weights, Chl content. At this stage the plants adaptated in different substrates did not differ in sugar concentration, but high SA concentration in IES at the first stage stimulated increase in sugar and phenol concentration during further development.

The positive influence of IES and low SA concentration on morphophysiological and biochemical parameters of plants during adaptation was established. This effect remained during further plant cultivation on traditional substrate.

O - 25

Optimizing short term storage of sour cherries

S. Lurie and A. Weksler

Department of Postharvest Storage, Agricultural Research Organization, The Volcani Center, Bet Dagan, Israel

Sour cherries are usually grown for the processing industry. In Israel there is a market for them as fresh fruit for home canning as well. Because the harvest season is very short there is a need to store the fruit for some time in order to stabilize the marketing procedure as fresh fruit. For this reason research was conducted as to the optimum treatment of the fruit for storage of 2 or 3 weeks. Sour cherries are softer than sweet cherries and were damaged by the shower hydrocooling method used to remove field heat from sweet cherry fruit. However, a preharvest gibberellin spray enhanced their firmness and increased their storage potential. The main problem observed was development of decay following storage and shelf life. It was found that fruit stored better in modified atmosphere packaging than in regular air storage at 0°C. CO2 concentrations of 5% or higher inside the packages had a fungistatic effect on the development of decay. A prestorage dip in 30% ethanol was additive to the effect of the modified atmosphere in preventing decay development, and the combined treatment had the lowest levels of decay following storage and 2 days at 20°C. The main decay organisms were Alternaria alternata, Botrytis cinerea, Cladisporium sp., and Penicillium expansum. A protocol was developed to store sour cherries for 3 weeks with minimum levels of decay or damage.

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13C- Photoassimilate partitioning in sweet cherry (*Prunus avium* L) during fruit development

M. Ayala[1] and G. A. Lang[2]

[1]Departamento Fruticultura y Enologia, Pontificia Universidad Católica, Casilla 306 Correo 22, Santiago Chile
[2]Department of Horticulture, Michigan State University, East Lansing, MI 48824, USA

Little is known about the relative importance and temporal relationships of different leaf populations as sources of carbon (C) for sweet cherry fruit and shoot development, particularly on vigor-reducing rootstocks. We hypothesized that the partitioning of C fixed by different leaf types during fruit development is influenced by reproductive and vegetative sink demands. To study these partitioning and growth relationships, an experiment using 2-year-old fruiting branches of 'Ulster' sweet cherry on the semi-dwarfing rootstock, Gisela 6, was established. The three leaf populations on the fruiting branch, i.e., fruiting spur, non-fruiting spur and new terminal shoot leaves, were exposed to 13CO2 labeling at 25, 40, 44, 56, and 75 days after full bloom. Two days after labeling, whole branches were removed and different organs and tissues were prepared for analysis by GC-MS. Spur and shoot leaves were significant sources of C for both fruit and vegetative growth. Fruits were a priority sink vs. new shoot growth during the entire period of fruit development. The highest fruit sink strength was during stages I and III. Current season shoot growth provided a C source for fruit as early as stage I. We propose that resource limitations during fruit development affect final fruit size in sweet cherry on Gisela rootstocks. The source-sink relationships elucidated in this study provide a physiological foundation for developing orchard management strategies that promote a more sustainable balance between vegetative and reproductive growth in high density sweet cherry orchards.

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Season-long deficit irrigation has little effect on sweet cherry gas exchange, growth, yield, and fruit quality

M.D. Whiting[1] and A.Antunez[2]

[1]Irrigated Agriculture Research and Extension Center, Washington State University, Prosser, WA 99350, USA
[2]Biological Systems Engineering Department, Washington State University, Pullman, WA 99164, USA

The effects of three season-long irrigation regimes on gas exchange, leaf and stem water potential, soil water content, growth, and fruit yield and quality of 'Bing' sweet cherry grown on Mazzard, 'Gisela® 6' and 'Gisela® 5' rootstocks were compared over three years. Irrigation treatments included a control (C – 100% replacement of weekly evapotranspiration, Et), deficit (D - 50% replacement of weekly Et), and partial rootzone drying (PRD – 50% replacement of weekly Et to alternating halves of the rootzone). Irrigation water was applied weekly, from bloom to leaf abscission. There was no interaction between rootstock and irrigation treatment. Across rootstock and year, there was no consistent, significant negative effect of either deficit irrigation strategy on fruit growth rate, quality (e.g., soluble solids, diameter, firmness) or yield. Components of gas exchange (i.e., net photosynthesis, transpiration, stomatal conductance) varied seasonally but were unaffected by irrigation treatment. We documented only slight and inconsistent effects of D on tree vigor; however in 2 of 3 years, PRD trees had ca.15% shorter shoots. Throughout the season, midday stem water potential was highest for C and lowest for D, but never varied by more than 0.4 MPa among treatments. D trees exhibited premature leaf senescence compared to C and PRD. The results will be discussed with respect to irrigation scheduling and water stress detection.

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Tree cover and water stress affect microclimate and retard maturation of sweet cherry

D. Khvostov and M. M. Blanke

Klein Altendorf Research Station, Bonn University, Meckenheimer Str. 42, D-53359 Rheinbach, Germany

Moderate water stress was gradually imposed on sweet cherry cv. 'Kordia' trees on dwarfing GiselA 5 rootstock under tree row cover by withholding water during ca. four weeks of fruiting at Klein-Altendorf near Bonn, Germany. Control trees were either irrigated, where under partial i.e. tree row cover, or exposed to the natural rainfall where uncovered, with the following results:

1) Moderate water stress gradually reduced soil moisture from 13.2 % to 10.2 % with concomitant reductions in soil water tension from –200 hPa to –585 kPa during 4 ½ weeks and soil respiration from 0.9-1.0 to 0.4-0.5 g CO2 m-2 h-1.

2) The tree cover reflected ca. 80 % of incident UV and ca. 20% of visible and NIR light and protected the trees from UV for 4 ½ weeks. The crop cover transmitted 68-73% of the incident visible and photosynthetically active radiation (PAR), a light loss which retarded fruit maturity and harvest by ca. one week relative to the open field. White reflective mulch cloth (ExtendayTM) used in the grass alleys to alleviate this loss of incident light, increased vertical light reflection by up to 7fold relative to grass, resulting in reductions of 1.8°C in soil temperature. Air temperature and humidity under the tree row cover exceeded those outside by, respectively, up to 1°C and by up to 10 % on a summer day.

3) Photosynthesis and transpiration rates of ca. 22 µmol CO2 m-2 s-1 and 2 mmol H2O m-2 s-1 of the cherry leaves were both large, but neither was affected by tree row cover, water stress nor the reflective mulch (ExtendayTM).

4) Water stress affected fruit quality. Trees developed the largest cherries at 2 m spacing under tree row cover with reflective mulch cloth irrespective of the planting system (single row or V-shape) or water stress and 15% larger than in the field. Fruit water content appeared unaffected by the treatments. Fruit under tree cover were softer than field-grown ones which was partially reversed by the reflective mulch. Field-grown cherries cracked most frequently, while the crop cover protected the fruits from cracking. Water stress increased their potential for cracking and reduced fruit colour, fruit firmness, sugar : acid ratio.

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Studies on floral biology of *Prunus* in vivo and in vitro conditions

E. Dziedzic, M. Małodobry, W. Lech and M. Bieniasz

Agricultural University, al 29 listopada 54, 31-425 Krakow, Poland

Pollination of *Prunus* ovules was conducted in vitro conditions on White medium (Rangaswam 1961) with addition of 15% sucrose The early stages of embryo development were obtaine After flowering in the orchard the immature embryos were collected from the flowers and th culture of those embryos in vitro conditions was conducted. The different media based c Murashige and Skoog (1962) and Norstog (Stimart and Asher 1974) medium with addition growth hormone were used. The embryos development and the plantlets were obtained. Durir the flowering in the orchard the studies concerning three methods of flower pollination (open, se and cross pollination) were conducted.

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Leaf gas exchange, morpho-histological and chemical characteristics of sweet cherry tree (*Prunus avium* L.) under drip-irrigation

B. Gonçalves, J. Moutinho-Pereira, A. P. Silva, E. Bacelar, A. Santos and C. Correia

University of Trás-os-Montes e Alto Douro, Centre for Technological, Environmental and Life Studies, Department of Biological and Environmental Engineering, Apartado 1013, 5000-911 Vila Real, Portugal

Physiological and morpho-histological characteristics, photosynthetic pigments and metabolites were studied in sweet cherry cultivars 'Burlat' and 'Summit' grafted on Maxma 14. Considerable genotypic differences existed between cultivars. 'Summit' showed higher total lamina thickness (14 %) than 'Burlat', principally due to the thicker spongy parenchyma. However, 'Burlat' presented higher palisade/spongy tissue ratio. 'Summit' showed higher concentrations of total chlorophyll (20 %) and carotenoids (40 %), higher leaf mass per unit area (9 %), and higher stomatal density. Nevertheless, 'Burlat' leaves presented significantly higher concentration of total non-structural carbohydrates (47 %). Despite the differences in leaf morpho-histological characteristics, the values of photosynthetic activity (A), stomatal conductance (gs) transpiration rate (E), mesophyll conductance (gm) intercellular CO2 concentration (Ci) and intrinsic water use efficiency (A/gs) did not varied among cultivars. Values of A, E, gs, Ci and gm determined in the morning were consistently higher than the levels in the afternoon. Higher decreases of A were measured in 'Burlat', with a maximum reduction of 27 %, and it was mainly due to a reduction in gs. Intrinsic water use efficiency increased from morning to afternoon, mainly in 'Summit', which ranged from 20 to 25 µmol mol-1. The present study supplies information about the behaviour, at leaf scale, of the physiological properties of several cherry cultivars in their relation to morpho-anatomical and chemical characteristics. Such information is useful in evaluating the physiology at whole-canopy scale and in studying plant-environment interaction.

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Fruit dry weight and quality of 'Bing' sweet cherries grown without resource limitations

E. D. Cittadini, M. J. Rodriguez, H. van Keulen and P. L. Peri

INTA - EEA Chubut. Casilla de Correo 88. (9100) Trelew, Argentina

Understanding of the seasonal pattern of potential fruit growth is important for identification of necessary operations (e.g. summer pruning or fruit thinning) or as input in crop growth models. 'Bing' sweet cherry trees were heavily thinned at 63 degree-days (8 days) after full bloom, so that weight and quality of the remaining fruits could be analysed under conditions on non-limiting carbohydrate supply. The effect of fruit thinning on mean shoot growth and on the increment of trunk cross sectional area was also analysed to detect possible translocation from reproductive to vegetative growth. Mean Fruit Dry Weight (MFDW) of tagged fruits was estimated weekly from their diameter to identify the moment of the onset of competition between fruits within the trees. At harvest, Fruit Number to Leaf Area Ratio (FNLAR: fruits m-2 LA) and number of fruits per tree were 52 and 61% lower, respectively, in thinned trees than in non-thinned trees. Differences in MFDW between thinned and non-thinned trees were first detected at 578 degree-days (61 days) after full-bloom and persisted until harvest. Soluble solids content of mature fruits was also higher ($P<0.05$) on thinned trees, but no significant effects were observed on titratable acidity, firmness and vegetative growth. The higher MFDW of thinned trees was due to a higher Relative Growth Rate (RGR) of the fruits between 433 and 710 degree-days, with a peak at 550 degree-days. Beyond this stage, fruit RGR decreased more rapidly in thinned than in non-thinned trees probably because in thinned trees MFDW approached its genetic maximum. Keywords: Sweet cherry; Mean fruit dry weight; Soluble solids; Titratable acidity; Firmness, Relative growth rate.

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Archetectural analysis of vegetative growth of 2-year-old 'Bigarreau Van' sweet cherry trees grown on two rootstocks under varied nutrient regimes

D. Andersone[1], I. De Wit[2], H. Wustenberghs[1], J. Keulemans[1] and N. C. Cook[3]

[1]Fruitteeltcentrum, Catholic University of Leuven, Willem de Croylaan 42, 3001 Leuven, Belgium
[2]Better3Fruit, Willem de Croylaan 42, 3001 Leuven, Belgium
[3]Department of Horticultural Science, University of Stellenbosch, South Africa

Sweet cherry cv. 'Bigarreau Van' (*Prunus avium* L.) were grown on Inmil (GM9) and Mazzard (F.12/1) rootstocks under seven different nutrient regimes over two seasons. In the solutions nitrogen and phosphorus were varied to modify tree vigour, in addition to the vigour effects of rootstock. Variables were calculated that describe length and position of branches. These were used to calculate architectural differences between trees using multivariate data analysis. The branched trees were grouped architecturally by cluster analysis and the correlations described using discriminate analysis. In general, trees on F.12/1 were more branched than on GM9. This is particularly true for sylleptic branching in the first year. Similarly, more branching is observed on more vigorous nutrient regimes. The effects of vigour on branching are discussed in relation to the plasticity of tree architecture within a genotype.

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Pruning affects carbohydrate accumulation and fruit bud formation in cherries

A. Küden[1], T. Tamdoğan[1] and B. Imrak[2]

[1]Ç.Ü. Agricultural Faculty, Horticultural Department, 01330 Balcali-Adana, Turkey
[2]Ç.Ü. Pozanti Agricultural Research and Application Center, 01330 Balcali-Adana, Turk

0900-Ziraat, which has a long juvenility period is one of the widely grown cherry cultivar Turkey. Cherries on *Prunus avium* L. or *Prunus mahaleb* L. usually bear in 4 or 5 years.

One of the aims of this study is to determine the CH/N ratio of 3, 4 and 5 years old 0900 Zira cultivar on *Prunus mahaleb* L. rootstock and to find out the effects of carbohydrate and nitroge content and also tree age on fruit bud formation.

On the other hand, Lapins, Sweetheart, 0900-Ziraat and Summit cherry cultivars on *Prun mahaleb* L. rootstock were compared for the effects of carbohydrate content on the yield and fr bud formation.

Also, effects of winter pruning of 1 or 2 years of shoots from 5, 10 and 15 cm length on the fr bud formation and carbohydrate accumulation were investigated.

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Viruses and virus diseases of cherry in the Mediterranean

A. Myrta[1] and V. Savino[2]

[1]Istituto Agronomico Mediterraneo, Valenzano (BA), Italy
[2]Dipartimento di Protezione delle Piante e Microbiologia Applicata, Università degli Studi and Istituto di Virologia Vegetale, Sezione di Bari, Bari, Italy

The Mediterranean region supplies about 38% of the world cherry production. The sanitary status of the Mediterranean cherry industry, concerning virus diseases, is discussed based on the results of surveys carried out in Albania, Bosnia and Herzegovina, Italy (Apulia), Jordan, Lebanon, Morocco, Palestine, Serbia, Syria, Tunisia and Turkey (Eastern Anatolia). The overall incidence of virus infections in cherry was 48%, ranging from 10% of Morocco and Tunisia, to about 60% of Southern Italy. The viruses identified serologically and/or recovered by sap-transmission to herbaceous hosts were in decreasing order of incidence: Prune dwarf virus (PDV), *Prunus* necrotic ringspot virus (PNRSV), Apple chlorotic leaf spot virus (ACLSV) and Apple mosaic virus (ApMV). PDV was by far the prevailing virus being present in 80% of the infected trees. A brief description of the most frequent cherry diseases in the region is given. Finally, the impact of virus diseases on the Mediterranean cherry industry, is discussed.

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Investigations on the biology of cherry fruit fly [*Rhagoletis cerasi* l. (Diptera:Tephritidae)]

A. Ozdem and N. Kilincer

Plant Protection Central Research Institue Bagdat Cad. No:250 06172 Yenimahalle-Ankara, Turkey

The biology of cherry fruit fly [*Rhagoletis cerasi* L. (Diptera: Tephritidae)] was investigated in this study. The experiments were carried out in Cankırı-Eldivan and Ankara-Haymana, Lodumlu and Ayas towns from 1998 to 2000. It was investigated that the first adult emergence dates varied between 10-23 May and 5 or 6 weeks after the first adult emergence, the flight reached its peak. The adult flight duration lasted for 63-87 days. The largest number of adults were caught with the traps on the southern parts of trees, which was followed by east, west and north, successively. The rate of infected fruit was about twice as much on the upper branches as the ones on the lower ones. It was found that all females trapped one week after the first adult was sighted in nature had mature eggs. It was determined that females laid their eggs mostly on yellow, yellowish green, pinky yellow fruit and that there were no eggs on mature and green fruit. It was observed that the duration from the egg to the larvae varied between 9-10 days. It was determined that the development period of larvae ranged between 28-33 days. Though one larvae of cherry fruit fly was generally observed on cherry fruit, two or three larvae were observed densely populated with cherry flies. The first *R. cerasi* pupae was sighted between 18th to 8th June. In Central Anatolia Region the pupae period lasted nearly for 11 months.

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Anthracnose - An emerging disease on sweet cherry

J. Børve[1] and A. Stensvand[2]

[1]Norwegian Crop Research Institute, Ullensvang Research Centre, Norway
[2]Norwegian Crop Research Institute, Plant Protection Centre, Norway

Anthracnose (or bitter rot) is reported on sweet cherry fruits in Switzerland, Hungary and Norway. On sour cherry the disease is reported from several of the eastern European countries and Norway. In the Czech Republic and Norway anthracnose is important also in sour cherries frequently sprayed with synthetic fungicides.

Previously anthracnose in sweet cherry was considered to be caused by Colletotrichum gloeosporioides, but all isolates from sweet and sour cherry in Norway have recently been reclassified as C. acutatum by means of PCR-analysis.

There are few or no investigations on the host-pathogen relationship of C. acutatum in sweet cherry, and more knowledge is needed in order to develop a good management programme for this fungus.

We have found bud shells to be a very important inoculum source in spring in Norwegian sweet cherry orchards. The number of infected buds is normally higher on fruit spurs (mostly generative buds) compared to buds on vegetative shoots. During late spring and summer, the fungus is present (often causing no visible symptoms) on leaves and fruits, both on normally developing and non-abscised aborted fruits. The latter is a likely inoculum source during the green fruit stage. Sweet cherries are susceptible to the pathogen at all development stages during the season, but green fruits seem very important to protect. Based on today's knowledge, the recommended strategy against anthracnose is to spray twice at the green fruit stage with dithianon and to avoid incoulum build-up by removing infested plant material from the orchard.

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The tart cherry integrated orchard management project: Management strategies an perceptions of integrated pest management in the United States

N. Rothwell, A. Coombs, J. Haley, S. Thomsbury and M. Whalon

Northwest Michigan Horticultural Research Station, 6686 S. Center Highway, Traverse City, M 49684, USA

The Tart Cherry Integrated Orchard Management Project was established to deliver reduced-ris orchard management strategies to the tart cherry industry in the United States. A grower surve was implemented to create an industry baseline on management strategies and perceptions o Integrated Pest Management (IPM). These data will help identify the best opportunities fo extension and outreach efforts for tart cherry growers, identify the areas of IPM that pose th greatest challenges for adoption, and provide the project with a baseline against which an change in the overall industry's management practices and attitudes regarding IPM can b measured. A total of 798 valid surveys were mailed to US tart cherry growers in January 2004 The response rate was 51%, and growers from 6 out of 12 states that produce cherrie responded. US tart cherry growers have an overall positive impression of IPM although only 52% of growers responded that they practice IPM on their farms and 13% were not sure if the practice IPM. Growers were also asked to rate various barriers for practicing IPM on their farms The highest rated barriers were zero tolerance for worms at the processor and lack of effectiv alternative control methods for key pests. The expectation is that with follow up surveys, we wil be able to see a statistically significant increase in IPM practices, as well as a statistically significant increase in a positive perception of IPM, thereby increasing the likelihood of greate IPM adoption within the US tart cherry industry.

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The tart cherry integrated orchard management project: Reduced-risk management of disease and insect pests in the United States

A. Coombs, N. Rothwell, M. Whalon, L. Gut, G. Sundin, D. Alston and P. McManus

B18 Food Safety and Toxicology, Michigan State University, East Lansing, MI 48824, USA

Entomologists, plant pathologists, horticulturists, and soil scientists from Michigan State University, University of Wisconsin-Madison, and Utah State University are collaborating on a project to implement reduced-risk orchard management strategies across the US tart cherry industry. Reduced-risk insecticides such as spinosad, indoxacarb, thiamethoxam, and imidacloprid were tested for ability to control tart cherry insect pests compared to grower standard pest control strategies in on farm trials. Reduced-risk insecticides provided control of plum curculio, Conotracheulus nenuphar, and cherry fruit fly, Rhagoletis spp., comparable to the grower standard. In addition, an extensive harvest damage sample assured that blocks sprayed with reduced risk insecticides would meet the stringent quality standard of a zero tolerance for worms in the fruit. A survey of 39 tart and 1 sweet cherry orchard in Michigan revealed resistance to sterol demethylation inhibitor fungicides in the cherry leaf spot pathogen, Blumeriella jaapii, is much more widespread than anticipated. Various fungicide spray programs were evaluated in Michigan and Wisconsin. Reduced-risk fungicides spray programs including copper compounds provided excellent control of cherry leaf spot on both Montmorency and Balaton. Host plant resistance is also being utilized as one aspect for managing cherry leaf spot. Two sources of leaf spot resistance have been identified: GI 148-1 derived from Prunus canescens and Almaz, derived from P. maackii. Eleven selections derived from GI 148-1 have demonstrated resistance in both mist chambers and the field.

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Viral diseases diagnosed by DAS-ELISA and RT-PCR of sour and sweet cherry trees from different provinces of Turkey

C. Ulubas

Mustafa Kemal University, Faculty of Agriculture, Plant Protection Department 31034 Antakya, Turkey

Field inspections and sample collections were carried out in commercial orchards and mother blocks, which are also variety collections belonging to Ministry of Agriculture of Turkey, during early spring in 2000 and 2001. Samples (shoots with leaves) were collected from symptomatic plants in the orchards of Afyon, Ankara, Amasya, Burdur, Çanakkale Isparta, Izmir, Tokat and Yalova provinces. A total of 240 sour and sweet cherry samples were tested for the presence of Apple chlorotic leaf spot virus (ACLSV), Plum pox virus (PPV), and *Prunus* necrotic ring spot virus (PNRSV) by using RT- PCR and tested by DAS-ELISA for Prune dwarf virus (PDV). Tests revealed that 31.66% of total samples were infected with one or more viruses. The most common virus was PDV with the infection rate of 27.5%. It was followed by ACLSV and PNRSV with the infection rate of 6.66% and 3.75%, respectively. Mixed infections of PDV+PNRSV (3 samples) and PDV+ACLSV (6 samples) were also detected. No infection with PPV was determined from the sour and sweet cherry samples collected from all eight provinces except Tokat which was not tested for that virus.

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Linkage maps in sweet cherry (*Prunus avium* L.) and map comparison between sweet cherry and other *Prunus* species

E. Dirlewanger, G. Capdeville, Y. Tauzin, P. Cosson, A. Moing, J. Claverie and F. Laigret*

INRA-Unité de Recherches sur les Espèces Fruitières et la Vigne (UREFV), 71 Av E. Bourleaux, -33883 Villenave d'Ornon, France
*UMR Physiologie et Biotechnologie Végétales 71 Av E. Bourleaux, -33883 Villenave d'Ornon, France

The sweet cherry (*Prunus avium*) is one of the most popular temperate fruit crops. Progresses in breeding have been relatively slow, mainly due to the long generation time and the large plant size of cherry trees. The integration of molecular markers in breeding program should be a powerful tool. Inheritance and linkage studies were conducted with microsatellite markers in a F_1 progeny (133 individuals) of a cross between sweet cherry cultivars 'Regina' and 'Lapins', chosen as parents for their distinct agronomic characters and especially for their differences in sensitivity to fruit cracking. 'Regina' is resistant and 'Lapins' is susceptible. 'Lapins' is a selfcompatible cultivar as opposed to 'Regina'. They differ for several other characters: blooming and maturity dates, peduncle length, and fruit color, weight, firmness, acidity and refractive index. These characters were measured at commercial and physiological maturity stages for 'Regina' and 'Lapins'. For mapping, 308 *Prunus* microsatellites were tested for polymorphism: 224 gave amplification. 89 were heterozygous in 'Regina', 82 in 'Lapins' and 59 in both parents. The selective mapping strategy has been used to choose the markers according to their bin location in the *Prunus* reference almond 'Texas' x peach 'Earlygold' (TxE). The markers located in TxE bins corresponding to region with low density of markers in 'Regina' or 'Lapins' were selected. The comparison with the other *Prunus* maps gives additional evidence for the high level of synteny within *Prunus*. The two sweet cherry maps will be used for detection of QTLs involved in fruit quality

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Cracking of sweet cherries : Past tense ?

J. Vercammen, G. van Daele and T. Vanrykel

Fruittuinweg 1, 3800 Sint-Truiden, Belgium

In Belgium the cracking of sweet cherries poses a very big problem. In practice calcium chloride is usually being sprayed, but its effect varies and is too small, depending on the amount of precipitation. Calcium chloride also has an influence on the taste. Therefore we tested Frutasol, Nutrileader 469 and Platina in our experiments.

Frutasol is a foliar fertilizer and consists of amino acids of vegetable origin. The product has the qualities of a surfactant and has to be sprayed from colour change. When rain is predicted in the cracking-susceptible period (between colour change and picking), a 2 percent solution (2 l per 100 l of water) has to be sprayed before it starts to rain (at least 700 l of water/ha). After application it should stay dry for 1 to 2 hours. If necessary the treatment has to be repeated after 5 days. After a heavy rainfall one has to wait 1 to 2 days before applying another treatment. Frutasol is very effective when the water is absorbed through the skin (2002), but not effective at all when water is absorbed through root pressure (2003 and 2004). Nutrileader 469 is a foliar fertilizer with a base of seaweed that has an effect on stress. The results vary and the maximum result is 10 %. Nutrileader also has an effect on cracking caused by root pressure.

Platina also is a foliar fertilizer with a base of natural amino acids. The dose amounts to 1 l/ha. The treatment has to be applied from the colour change and before the rain. In case of rain one has to spray with an interval of 7 to 10 days (with a lot of water). In our experiments there are 17 % less cracked fruits when Platina is applied. The best effect is obtained when the sprayings applied before the rain, but Platina still has an effect when the sprayings take place after the rain or in case of cracking caused by root pressure.

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Estimation of sweet cherry water status by spectral reflectance

A. Antunez[1], M. Whiting[2], F. Pierce[3] and C. Stockle[1]

[1]Biological Systems Enginering Departament, Washington State University, Pullman, WA 99164, USA
[2]Irrigated Agriculture and Research Extension Center Washington State University Prosser, WA 99350, USA
[3]Center for Precision Agricultural Systems (CPAS), Washington State University, Prosser, WA 99350, USA

This paper reports on the relationships between in situ spectral reflectance of sweet cherry (*Prunus avium* L.) leaves and stem and leaf water potential. Leaf reflectance between 350 and 2500 nm was measured during 2003 and 2004 using a FieldSpec FR spectrophotometer ASD assembled to a leaf clip probe (Analytical Spectral Devices, Inc., Boulder, CO, USA). Tree water status was determined by measuring midday stem (ψstem) and leaf (ψleaf) water potentials using a pressure chamber (Model 610, PMS, Corvallis, OR). Raw reflectance data was smoothed using the Savitzky-Golas algorithm and manipulated to obtain the first and second derivatives. Pearson's correlation coefficient (r) and partial least squares (PLS) with cross validation (cv) were used to determine the combination of reflectance wavebands (10 nm resolution) that best explains variation in stem water potential. Our results show that 1) data smoothing and first and second derivations did not significantly improve the performance of the model; 2) wavelengths most significantly correlated with tree water status were in the visible range (400-700 nm); 3) the best PLS model developed predicting sweet cherry ψstem incorporates six wavelengths (between 550 and 710 nm) with a regression coefficient (r2) of 0.75 and a squared error of prediction (SEP) equivalent to 0.14. 4) leaf reflectance shows good potential as a tool for screening sweet cherry water status. Possibilities for scaling to the orchard level and utilizing remote sensing technologies will be discussed.

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Nitrogen uptake efficiency and partitioning in sweet cherry is influenced by time of application

A. N. Azarenko and A. Chozinski

Oregon State University, Department of Horticulture, 4017 Ag Life Science, Corvallis, OR, 97331, USA

Ammonium sulfate, labeled with the stable 15-N isotope, was applied to the soil at the rate of 45 kg/ha of actual nitrogen to 7 year-old 'Royal Ann' trees on Mazzard rootstock. The fertilizer was applied at four timings; rapid shoot growth/spring (10 May), pre-harvest (15 June), post-harvest (3 Aug), and pre-leaf fall (3 Oct) to eight replicate trees. Four trees were excavated at the end of the growing season, prior to leaf fall, and another set of four after a second growing season. Fruit were harvested in mid-June of both years. Trees were excavated and partitioned into fruit, current season's growth, numerous wood components, spurs, roots, and leaves. Components were sub-sampled, dried, and analyzed for total N and 15-Ncontent. In October, whole tree total N was 2.4, 2.4, 1.9 and 2.0kg per tree for spring, pre-harvest, post-harvest and pre-leaf fall applications, respectively. The respective amounts of fertilizer N was 0.30, 0.16, 0.09, and 0.06 kg/tree. N derived from the fertilizer (NDFF) was 13%, 7%, 5%, and 3% and uptake efficiency also declined 21%, 11%, 6%, and 4% for the different timings. After the second growing season, NDFF and uptake efficiency were not different between the timings and had a mean of 14% and 26%, respectively. Implications of our data with respect to fertilizer N management will be discussed.

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Diurnal variation of some indices on young sweet cherry trees in subhumid climate conditions

S. Yazgan[1], E. S. Koksal[2] and B. N. Candogan[1]

[1]University of Uludag, Agricultural Faculty, Agricultural Engineering Department, 16059, Bursa, Turkey
[2]Department of Water Management, Research Institute of Rural Services Ankara, 06583, Ankara, Turkey

Remotely sensed spectral vegetation indices are widely used for crop management purposes. Spectral reflectance could be vary either according to nutrition status, pigment and water content of crop or the soil background, moisture condition and atmospheric conditions. The successful use of these indices requires knowledge of the units of the input variables used to form the indices, and an understanding of the manner in which the external environment and the architectural aspects of a vegetation canopy influence and alter the computed index values. In this study, two different irrigation treatment were applied to on two years old cherry trees and spectral reflectance, canopy temperature and leaf water potential were measured at different times of the day in subhumid conditions on June 20-21 and August 21-22, 2004 using a nadir-oriented hand-held spectroradiometer, an infrared thermometer and a pressure chamber. With the use of spectral reflectance values, normalized difference vegetation index, soil adjusted vegetation index and ratio vegetation index were calculated as spectral vegetation indexes. Different sun altitude angle, azimuth angle, air temperature and vapor pressure deficit of air caused significant diurnal changes in spectral reflectance, crop minus air temperature and leaf water potential. Analyses of this data indicated that it is possible to use remotely sensed data to determine the water stress and vegetation density of cherry trees.

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Investigations on fertility of sour cherries (*Prunus cerasus* L.)

M. Schuster

Federal Centre for Breeding Research on Cultivated Plants, Institute for Fruit Breeding, D-01326 Dresden, Germany

In sour cherry breeding, self-compatibility is one of the main breeding goals. Sour cherries are frequently considered to be self compatible, although self-incompatible and partially self-compatible cultivars do exist. Self-compatible cultivars are necessary for a stable fruit set in the cherry production.

To study the reasons of self-incompatibility in sour cherries the fruit set and the pollen tube growth were investigated in a sour cherry populations 'Köröser Gierstädt' (SI) x 'Vowi' (SC) after self pollination and open pollinations in tree years. Additional meiotic investigations of pollen mother cells were made in self-compatible and self-incompatible sour cherry cultivars and clones.

In result, a relationship was detected between self-incompatibility and a low fruit set and between self fertility and a high fruit set after open pollination. The pollen tube growth investigations showed different results. 72 hours after pollination pollen tubes of the self-incompatible genotypes did not arrive the ovary, but after 96 hours about 50% of the pollen tubes were grown into the ovary. Also a high amount of dead ovules could be observed in self-incompatible genotypes. In meiotic investigations a relationship was detected between a low fruit set and an instable pairing frequency of the chromosomes in the metaphase I. n this context introgression of different cherry species must be discussed as a reason of low fertility or self incompatibility in sour cherry.

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Loss of pollen function in self-compatible 'Cristobalina' sweet cherry

A. Wünsch[1], J .I. Hormaza[2] and R. Tao[3]

[1]CITA de Aragón, 50059 Zaragoza, Spain
[2]Estación Experimental La Mayora, CSIC, 29750 Málaga, Spain
[3]Lab. Pomology, Grad. Sch. Agric., Kyoto Univ., Kyoto 606-8502, Japan

Sweet cherry shows S-RNase based gametophytic self-incompatibily, which prevents fertilization between genetically related individuals. The specificity of the self-incompatible reaction is shown to be controlled by two S locus genes. These encode, a pistil-expressed ribonuclease (S-RNase) that inhibits the pollen tube growth of self pollen, and a pollen-expressed F-box protein (SFB) that is believed to be involved in the degradation of S-RNases. Initial genetic and pollination studies on a Spanish local sweet cherry cultivar 'Cristobalina' (S3S6) showed that its self-compatibility is caused by the loss of pollen function of both of S3 and S6 haplotypes. In this work, we investigated the possible causes of the breakdown of pollen function in this genotype. DNA blot analysis using the S-RNase and SFB probes indicated that there is no structural changes of the S locus genes. Furthermore, RT- and real time RT-PCR revealed the normal level of transcription of the SFB in pollen of 'Cristobalina'. The previously-conducted genetic analysis and the results obtained in this study strongly suggest that a mutation in an additional or general factor may be involved in the self-compatibility observed in 'Cristobalina'.

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Assessment of genetic diversity and relationship among some sweet cherry cultivar using AFLP™ markers

H.Gulen[1], A. Ipek[1], M. Burak[2] and A. Eris[1]

[1]Uludag University, Agricultural Faculty, Horticulture Department, Bursa, Turkey
[2]Atatürk Central Horticultural Research Institute, Yalova, Turkey

Sweet cherry is an economically important crop in Turkey but the relationship among Turkish an foreign cherry cultivars has not been properly determined yet. In this study, amplified fragmer length polymorphisms (AFLP) has been utilized to analyze genetic diversity among 22 swee cherry cultivars including some Turkish and foreign cultivars using total genomic DNA. Fou EcoRI and MseI primer combinations with three base selective nucleotides extension generate 20 polymorphic AFLP fragments. A UPGMA dendrogram was constructed to asses the geneti distance and relationship among these cherry cultivars. Utility of AFLP in the geneti characterization of cherry will be discussed.

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On the origin of *Prunus cerasus* (sour cherry) genomes

A. Horvath, A. Zanetto, M.Tavaud, H. Christmann and F. Laigret

INRA-Unité de Recherches sur les Espèces Fruitières et la Vigne (UREFV), 71 Av E. Bourleaux, 33883 Villenave d'Ornon, Cedex, France

Prunus cerasus L. belongs to the section Eucerasus of the Prunus genus and is a tetraploid species. It is thought to be the result of a natural cross between wild Prunus avium L. and Prunus fruticosa Pall. (steppe cherry). Since P. avium has a diploid genome and P. fruticosa a tetraploid genome, P. cerasus should have arisen from a fecundation event between non reduced P. avium gametes and P. fruticosa gametes. In order to verify this hypothesis, using cpDNA and genomic (SSR) markers, we studied P. avium, P. cerasus and P. fructicosa samples from different European countries.

Interestingly enough, we showed that some P. cerasus haplotypes were identical to some P. fructicosa haplotypes (mainly in Hungarian samples). This suggests that P. fructicosa has participated as mother to P. cerasus genome. Concerning genomic markers, some P.cerasus alleles were shared by either P. avium and P. fructicosa samples, indicating that the two later species participated to P. cerasus genome.

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Determination of the chill units of cherry cultivars suitable to subtropical conditions

A. B. Küden[1], B. İmrak[2], M. Tanır[1], S. Bayazit[1], S. Comlekcioglu[1]and A. Küden[1]

[1]Ç.Ü. Agricultural Faculty, Horticultural Department, 01330 Balcali-Adana, Turkey
[2]Ç.Ü. Pozanti Agricultural Research and Application Center, 01330 Balcali-Adana, Tur

Recently, cherry is grown under subtropical conditions with low chilling cultivars. Also sc preventations should be taken to break dormancy of buds under mild climatic conditions, such artificial chilling, preventing induction of dormancy by defoliation of the leaves, evapora cooling or chemical applications. Using low chilling cultivars is the most important thing ur subtropical or tropical conditions, so the chill unit calculation of the cherry cultivars is importan

In this study we calculated the chilling requirements of Bing Spur, Cristobalina, Early Compact, Kordia, Na 1, Sunburst, Summit, and 0900 Ziraat since 2001-2002 for about 4 ye The results were evaluated by using Richardson's chill units and Asymcur Model developec Anderson et al. (1986; 1987). The computer program of this model was prepared by Miller Küden in 1989 in Fortran programme and compiled to Windows by Efe et al (1996).

Besides the chill units of the cherry cultivars, total growing degree hours (GDH) of them w also calculated according to Anderson et al. (1986) and Anderson and Richardson (1987) the same computer programme.

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Where will cherries be grown?

G. Ing †

1217 Eastside Road, Hood River, Oregon, USA

Cherry production is dictated by climate, land base, varieties, costs of production including labor and adoption of technology including marketing infrastructure.

China, with low labor costs and a large land base, now produces about 50% of the world's pears and almost 40% of world apples. Will sweet cherry production in China increase correspondingly? Chinese production has been quite minimal and local. However, area planted has increased four fold since 1996 from 1,000 nectares to 4,000 hectares. Production has moved from 3800 metric tonnes in 1996 to 15,000 tonnes in 2004.

While Western European countries with higher labor costs and less tendency to change varieties have declined in production, there are increases in Turkey, Spain, South America and United States. Former USSR countries may become major cherry producers. South Africa has a budding industry with ideal growing conditions and low labor rates.

In Turkey, with ideal growing conditions, acreage is increasing dramatically. Turkey's low per acre production can be rapidly increased with technology.

New plantings favor warmer areas such as Spain, California, Chile, Argentina and Australia. Marketing advantage relates to larger and firmer cherries and handling technology. The paper intends to summarize the changing profile of world production and examine reasons for such.

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The effect of irrigation, gibberellic acid and nitrogen on the occurrence of double fruit in 'Van' sweet cherry

H. Engin and A. Ünal

Çanakkale Onsekiz Mart Univ. Faculty of Agriculture, Department of Horticulture, Çanakkale, Turkey

In this study carried out between 2001 and 2003. Double fruit formation frequently seen in 'Van' sweet cherry was studied. The effect of irrigation in summer and the effect of gibberelic acid and nitrogen treatments in transition stage from sepal to petal differentiation, on the occurrence of double fruits were determined. The effect of irrigation, gibberelic acid and nitrogen treatments on the occurrence doubling on buds, flowers and fruits were investigated. The results suggest that

1. The frequency of occurrence of flowers with two pistils and double fruits in 2002 was higher than 2003 because of high temperature during flower bud differentiation.

2. Under field conditions, the percentage of double fruits was not increased by drought stress.

3. Gibberellic acid and combination of gibberellic acid and nitrogen application decreased double ovaries during anthesis and the percentage of double fruits.

4. In all the experiments, the frequency of double pistils at full bloom was lower than observed in the buds in autumn.

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On the advancement of bud breaking and fruit ripening induced by Hydrogen Cyanamide (Dormex®) in sweet cherry: a three-year study

A. Godini, M. Palasciano, G. Ferrara, S. Camposeo and A. Pacifico

Dipartimento di Scienze delle Produzioni Vegetali, Università di Bari, Italy

A research aiming at ascertaining the capability of Hydrogen Cyanamide (Dormex®) to advance blooming and fruit ripening of sweet cherry cvs. Burlat and Ferrovia has been carried out in Apulia (Southern Italy) during 2002 (964 chilling hours), 2003 (592 chilling hours) and 2004 (834 chilling hours). The effect of 4 concentrations of Dormex® (0,0%, 2,0%, 3,5% and 5,0%) and three times of application was tested. In 2002 the best results were obtained by early treatments (Burlat -57 and Ferrovia -51 days before the beginning of blooming) whatever the concentration. The maximum blooming advancement was 11 to 13 days in Burlat, 7 to 9 days in Ferrovia. The maximum ripening advancement was 7 to 8 days in Burlat, 6 to 8 days in Ferrovia. The unusually mild 2002/2003 winter influenced negatively the research, greatly reducing the advancement of the above phenological stages of the two cultivars. In 2004 early treatments (Burlat -81 and Ferrovia -68 days before the beginning of blooming) replicated the best results. The maximum blooming advancement was 17 days in Burlat, 15 days in Ferrovia. The maximum ripening advancement was 7 days in Burlat, 8 days in Ferrovia.

On the whole, early treatments (between 55 and 80 days before the beginning of blooming) and low concentrations (between 2,0% and 3,5%) after a normal winter resulted the most suitable, in terms of cost and respect of the environment. The effectiveness of Dormex® exhausted after bud breaking and environmental factors influenced the fruit growth processes from blooming onward, generally reducing the duration of the initial advancement.

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Forced cultivation of sweet cherry under overall cover from rain

M. M. Blamer and M. M. Blanke

OVA Klein-Altendorf, Bonn University, Meckenheimer Str. 42, D-53359 Rheinbach, Germany

Sweet cherry cvs. 'Burlat', 'Earlise', 'Samba', 'Souvenir' and clone M, all with early ripening, lar and dark red-black fruit were planted in 2002 at a spacing of 3.8 x 1.75 m, under a compl cover from rain, of the whole orchard, in Klein-Altendorf Research Station near Bonn, Germa with the following results:

1) Sweet cherry trees under such cover flowered 6-13 days earlier and their fruits ripened 12- days earlier in 2004 than those from uncovered control trees, indicating a shorter or enhanc fruit development and maturation of up to one week.

2) The cover proved insufficient for frost-protection at night despite increased daytime air and s temperatures (by up to 15° and 5°C, respectively). Trickle irrigation was used to overcome loss soil moisture under cover from rain.

3) Cherry leaves grown under this cover were thinner and softer and contained less chloroph a, chlorophyll b and total chlorophyll in case of cv. 'Burlat' than leaves of uncovered control tre but without limiting photosynthesis. In contrast, chlorophyll contents of cherry clone M leav grown under cover equalled that of uncovered control.

4) Three of the five cvs employed developed fruit mass of 9-15 g (25-33 mm fruit diamete Three-year-old sweet cherry trees on dwarfing GiSelA 5 rootstock were more vigorous th those without cover and produced 3-4.5 kg fruit per tree.

5) The cover had no adverse effect on fruit colouration. Cherry fruit grown under cover we slightly smaller with attractive colouration and softer and tasted better, due to increases in bo sugar and acidity with sugar:acid ratios of 25-30:1 as well as reduced firmness.

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Plastic covering against sweet cherry fruit cracking also affects fungal fruit decay

J. Børve[1], A. Stensvand[2], M. Meland[1] and L. Sekse[1]

[1]Norwegian Crop Research Institute, Ullensvang Research Centre, Norway
[2]Norwegian Crop Research Institute, Plant Protection Centre, Norway

The most common covering system in Norwegian cherry orchards is a flat roof. The covers do not restrict natural air movements, and the effect on microclimate is minor. The covering system can therefore be used to avoid wetness-related fruit decay without lowering fruit quality. Fruit cracking due to wetness on the outer surface of the fruit occurs during a three weeks period prior to harvest. Covering the trees during this period reduced cracking significantly in 4 out of 5 experiments.

The most important diseases on sweet cherries in Norway, brown rot, gray mold, anthracnose and Mucor rot, are all caused by fungal pathogens dependant of wetness. The fruits are susceptible to fungal pathogens during all the fruit developmental period, most during bloom time and also increasingly towards harvest. Covering prior to harvest reduced fruit decay significantly in 3 out of 5 experiments. By prolonging the covering period with 2 weeks the same reduction in fruit decay was found even if 1 or 2 fungicide applications were omitted. All fungicide applications could be omitted (3-6) without any increase in fruit decay by covering the whole period from flowering to harvest. Separate covering periods only during flowering and then for 5-6 weeks prior to harvest reduced fruit decay from 9 % to 6% when no fungicide applications were applied between the covering periods. The amount was further reduced to 1.5% by fungicide applications at green fruit stage. Thus, plastic covering is both an alternative and a supplement to fungicide applications.

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The current situation and future of sweet cherry production in the eastern mediterrenean region (Hatay/Turkey)

A. A. Polat, C. Durgaç and S. Serçe

Mustafa Kemal University, Agricultural Faculty, Department of Horticulture, Antakya-Hatay, Turkey

The production areas in the world permitting economical sweet cherry production are limited. Sweet cherry production is made in restricted areas in few countries. There are large areas in our country which are suitable for sweet cherry production. In Hatay, which is located in the east part of Mediterranean region, sweet cherry production is centered in Belen and İskenderun. According to 2004 data, 530 ton sweet cherry was produced in Hatay. Of this production, 59% were in Belen and 36% in İskenderun. We have been carrying out studies to determine sweet cherry production potential as well as its problems and to extend new cultivars in Hatay. Our studies revealed that the origins of the sweet cherries grown in the region are unknown. An important cultivar mixture was observed as well. Moreover, significant problems were determined in orchard establishment, cultivar selection, irrigation, fertilization, pruning, cultivation techniques, harvesting and postharvest applications.

The future studies aiming the solutions of these problems may increase sweet cherry production and by this way important development might occur for both domestic consumption as well as export.

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Sweet cherry trees decay and managements on replanted cherry land

M. Meland, M. E. Moe and O. Frøynes

The Norwegian Crop Research Institute, Norway

Some high density sweet cherry orchards in Norway suffer from decay of trees resulting in death or reduced vigour of trees. A survey has been conducted monitoring healthy and infected trees from several orchards. The nutritional statuses of the soil and in the trees were in general in accordance with general accommodation. Different species of root nematodes were identified with levels above the damage of thresholds. Neither insects, diseases, bacterials nor virus were registered as the main reason for this dieback. However, differences between cultivars and rootstocks sensitivity were observed. In order to investigate this cherry tree decay further, new field trials were established in 2001 with trees of the cultivars Van and Kristin grafted on the two rootstocks *Prunus avium* seedling and Colt and trained as a central leader trees. Two parallel trials were planted; one in the soil of on old cherry orchard and the other in the soil from agricultural land where no fruit production has been conducted in advance. During the first years significant larger annual vegetative growth measured as trunk cross sectional area and annual shoot growth were registered from the trees growing in the agricultural soil. In the replanted cherry soil, trees grafted on the rootstock Colt grew more vigorously than the seedling rootstock based on leaf areas and shoot growth measurements. The first significant crop is expected in 2005. Results will be presented from the cherry orchards survey and the replant trials.

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Mechanical harvest of fresh market quality sweet cherries: economics and key orchard system components

M. Whiting[1], D. Peterson[2], D. Elfving[3], E. Kupferman[3], J. McFerson[4] and C. Seavert[5]

[1]Washington State University, Irrigated Agriculture Research and Extension Center, Prosser, USA
[2]USDA-ARS, Appalachian Fruit Research Station, Kearneysville, USA
[3]Washington State University, Tree Fruit Research and Extension Center, Wenatchee
[4]Washington Tree Fruit Research Commission, Wenatchee, USA
[5]Oregon State University, Mid-Columbia Agricultural Research and Extension Center, Hood River, USA

In the United States, labor costs account for 40 – 50% of all expenses in a typical sweet cherry (*Prunus avium* L.) grower's operating budget. Skilled labor is becoming increasingly expensive and scarce as sweet cherry production in the Pacific Northwest has almost doubled over the past 10 years. Our research programs have investigated the potential for improving labor efficiency and reducing harvest costs through mechanization. During the past three years, we have studied components critical to a mechanically harvested orchard system including harvester design, efficiency, and effects on fruit quality, effects of canopy architecture, rootstock and cultivar, Ethrel® effects on pedicel-fruit retention force (FRF) and fruit quality, and consumer perceptions of stemless sweet cherries. Economic analyses show reductions in the cost of harvest from ca. $0.48-0.35 per kg for hand-harvested fruit, to $0.04-0.08 per kg for mechanically harvested fruit. The mechanical harvester improved labor efficiency (kg fruit.person-1.min-1) more than 12-fold compared to hand harvesting. Compatible orchard systems will need to be Y-shaped with a single fruiting plane per side. We showed that FRF must be below ca. 350 g.mm-1 for removal. 'Bing' FRF was linearly reduced in proportion to Ethrel® concentration from 0 to 3.6 L/ha of product, regardless of application volume. Each of 7 cultivars tested showed significant reductions in FRF (28% - 50%) in response to Ethrel®. Independent fruit quality analyses found no significant differences comparing hand-harvested fruit and machine-harvested fruit at harvest or following 2 weeks in cold storage.

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Self and cross compatibility studies on commercial sweet cherry (*Prunus avium* L.) cultivars in Iran

K. Arzani[1] and S. Goharkhay[2]

[1]Department of Horticultural Science, Tarbiat Modarres University (TMU), PO Box 14115 – 336, Tehran, Iran
[2]Seed and Plant Improvement Institute (SPII), Karaj, Iran

Sweet cherry (*Prunus avium* L.) is one of the most important temperate fruits in Iran. According to the recent statistics there is more than 25000 hectares sweet cherry orchards in Iran with 218584 tones annual production. Most sweet cherry orchards are located in Tehran, Karaj, Khorasan, Ardabyl and Isfahan province. Due to the existence of self- and cross-incompatibility in most of sweet cherry cultivars, determination of suitable pollinizer is an important task for new established sweet cherry orchards as well as sweet cherry breeding programs. In order to achieve these aims and with the objective of completing the list of suitable self and cross compatibility of Iranian sweet cherry cultivars the national sweet cherry project was started in 1999 growing season in the Tarbiat Modarres University (TMU) and Seed and Plant Improvement Institute (SPII) of Iran. Self and cross compatibility of various sweet cherry cultivars were examined during 1999 to 2005 growing seasons in the Kamal-Abad Fruit Trees Collection Orchard, SPII, Karaj Iran. Some of sweet cherry cultivars were studied for self and cross compatibility were such as cultivars 'Siah Mashad', 'Haj-Yosefy', 'Zarde daneshkadeh', 'Soraty-lavasan', 'Meshkin-shahr', 'Ghazvin', 'Hybrid no. 28', 'Ghermez- baghnoe' and 'Red Rezaeieh'. The branches of mentioned cultivars were collected at balloon stage and placed in water at room temperature in the laboratory. Pre-season pollen collection was carried out using opened flowers in the Department of Horticultural Science laboratory at TMU and stored in small glass vials and placed in refrigerator at 4°C until time of pollination. Hand pollination was applied two days after full bloom (DAFB) on flowers of selected branches in the orchard. All selected branches were protected against insects using cotton tissue bag before anthesis. Note that hand pollination was carried out using pre-collected and fresh pollen from selected cultivars. Also samples were collected from pollinated flowers at 24, 48, 72, 96 and 120 hours after pollination and fixed in FAA solution for further microscopic examination of pollen tube growth. Results from in-vivo and in-vitro examinations showed a wide range of compatibility and incompatibility (0 to 65.2 % fruit set) from studied cultivars.

O - 62

Rootstock and plant spacing influence sweet cherry growth in four locations of Portugal

A. Santos[1], V. Cordeiro[2], P. Parente[3], R. Santos-Ribeiro[1] and J.L. Lousada[4]

[1]Departamento de Fitotecnia, CECEA, Universidade de Trás-os-Montes e Alto Douro, Ap. 1013, 5001–911 Vila Real, Portugal
[2]CETQ – Quinta do Valongo, Direcção Regional de Agricultura de Trás-os-Montes, 5370–087 CarvalhaiO - MDL
[3]Sociedade Agrícola Quinta dos Lamaçais, Ld[a], Apartado Ap. 7, Teixoso – Estr. Nacional, 6250–998 Caria, Belmonte, francisco
[4]CEGE, Departamento de Florestal, Universidade de Trás-os-Montes e Alto Douro, Ap. 1013, 5001–911 Vila Real, Portugal

Four trials were set up at the main Portuguese producing areas, to monitor sweet cherry growth on three rootstocks under four in-row spacings. Cultivars are Sweetheart and Skeena, and the rootstocks are Edabriz, Gisela 5 and Maxma 14. Between-row distance is 5.5 m, in-row is 0.70, 1.40, 2.10 and 2.80 metres. Tree training is vertical axis, with two moments of pruning. The experimental design is a double split plot, in randomised blocks, with two replications: moment of pruning is assigned to the main plots, cultivar/rootstock interaction to the sub-plots, and plant spacing to the sub-sub-plots. There are 4, 5, 7 and 13 experimental units (plants) in each sub-plot, in direct proportion to plant density. The experimental design is unbalanced for the interaction Sweetheart/Edabriz, which has only one replication per location, the others being occupied by Regina/Edabriz. Trunk diameter was taken at plantation and after leaf fall on the subsequent campaigns, and the ANOVAs were carried on the enlargements of the trunk cross sectional area (*delta* TCSA). At the second leaf fall, significant differences were detected on rootstock and plant spacing *delta* TCSA, the replications being a bit heterogeneous too; the rootstock was the factor that influenced plant growth the most at all locations, ranking from 12.7 to 37.9% of the total expected variance. Plant spacing effect started this early to be responsible for 2.5 to 11.1%, somewhat different results being noticed on the four locations. Residual variance ranked from 40 to 50%. Overall *delta* TCSA consistently decreased with in-row tree spacing; the decrease attaining 23.5, 20.8 and 15.5%, on Maxma 14, Gisela 5 and Edabriz, respectively. The TCSA differences at plantation maintained throughout the 2 years, but cultivar Sweetheart tended to thicken more, particularly during the second vegetative cycle. Notwithstanding, this cultivar was the one that suffered a greater growth reduction at the highest density. As expected, density affected growth reduction the most in trees planted at 70 due to the greater competition, and subsequent earlier growth reduction. This reduction impacted equally upon the most fragile and the most vigorous rootstocks.

O - 63

Plant Breeder Rights – essential for progress in breeding of new varieties

M. Röhrig

DSG Berlin – International Royalty Office –Parrisiusstr. 33 D-12555 Berlin, Germany

"Plant Breeders Rights" (PBR) relate to intellectual property rights for plant varieties. This kind of protection guarantee the holder exclusive rights for a specific period of time so as to provide an incentive to pursue innovative activities.

New varieties of plants giving a higher harvesting yield, providing resistance to plant diseases etc. or offering other desirable, superior traits as an essential factor in increasing productivity and product development.

Breeding new varieties of plants requires a substantial investment. Granting to the breeder of a new variety the exclusive right to exploit his variety encourages the breeder to invest in plant breeding.

PBR protection is possible in the signatory countries of the Convention of the International Union for the Protection of new Varieties (UPOV) in 58 countries worldwide.

The conditions for the granting of PBR to a variety are that it is new, distinct, uniform, stable and designated by a variety denomination.

Developments in the nineties of the last century are strengthening the rights of a plant breeder for varieties which are essentially derived form the variety in respect of which the PBR has been granted.

O - 64

The epidermal characteristics of fruit skin of some sweet cherry cultivars

L. Demirsoy and H. Demirsoy

Ondokuz Mayis University, Agric. Fac. Horticulture Department, 55139 Kurupelit, Samsun, Turkey

Fruit cracking caused by rainfalls before harvest is a major problem in sweet cherry growing in many parts of the world. It is known that fruit cuticle is an important factor in terms of resistant to cracking. For this reason, this study aimed to determine epidermal characteristics of the fruit skin of some sweet cherry cultivars.

This study was carried out in 2001 by using 8 local and one standard sweet cherry cultivars, namely 'Hüsenba', 'Tabanıyarık', 'Kargayüreği', 'Hafızahmet', 'Eraşlama', 'Karakirtik-1', 'Geçaşlama', 'Karakirtik-2' and 'Van'. A piece of skin, including the epidermal cells and parenchyma, from fruits harvested at full ripeness and fixed in FAA was sampled from the equatorial region at the opposite side of the suture of each fruit. The material was embedded within paraffin and the sections of fruit skin with 8-9 µm were prepared by a rotary microtome. Thickness of cuticle, epidermis and subepidermis, and number of subepidermal cell layers were measured under a light microscope. In all the cultivars, thickness of cuticle varied from 2.63 to 3.60 µm. 'Tabanıyarık' produced the fruits having thicker cuticle than 'Van'. The rest produced the fruits having thickness of cuticle similar to 'Van'.

O - 65

Carbon partitioning in sweet cherry (*Prunus avium* L.) on dwarfing precocious rootstocks

M. Ayala[1] and G. A. Lang[2]

[1]Departamento Fruticulturay Enologia Pontificia Universidad Católica, Casilla 306 Correo 22, Santiago, Chile
[2]Department of Horticulture Michigan State University East Lansing, MI 48824, USA.

To study the relative importance or temporal relationships of the primary leaf populations (i.e. fruiting spur, non-fruiting spur and current season shoot leaves) as sources of C for sweet cherry fruit and shoot development, a series of partitioning experiments using girdling, defoliation, fruit thinning and ^{13}C-isotopic labeling was established with sweet cherry trees on dwarfing/semidwarfing Gisela (GI) rootstocks. A preliminary a girdling and defoliation experiment isolated fruit of 'Hedelfinger'/GI5 and 'Ulster'/GI6 from different leaf sources and indicated that leaf populations on both fruiting and non-fruiting branch segments were required for optimum fruit development. A second experiment used $^{13}CO_2$ to label non-fruiting spur leaves on 'Sam'/GI5 limbs with three different leaf areas to fruit ratios indicated that fruit were a stronger sinks than current season shoots during stage III of fruit development. A third experiment on 'Ulster'/GI6 quantified the relative ^{13}C contribution of each leaf population to fruit and shoot development during key points throughout fruit development. Spur and shoot leaves were significant sources of C for fruit and vegetative growth. Fruits were a priority sink vs. new shoot growth, in terms of C allocation, during the entire period of fruit development. Finally, a fourth experiment on 'Regina'/GI6 labeled with $^{13}CO_2$ after terminal bud set determined the extent of storage reserves use for spring growth. In fall, the major storage organs were roots, older wood in the trunk and branches and buds. During spring, ^{13}C-reserves were remobilized and partitioned to flowers, fruits and young leaves from before budbreak until 14 days after full bloom. Overall, these results provide a physiological foundation for canopy relationships that may help to develop specific orchard management strategies to promote a more sustainable balance between vegetative and reproductive growth in high density sweet cherry orchards on vigor-limiting rootstocks.

5th International Cherry Symposium

June 06-10, 2005, Bursa-Turkey

Poster Presentations

P – 1

Investigation of morphological variability in different population of mahaleb (*mahaleb* L.) for cherry rootstock breeding in Iran

E.G. Moghadam and A.Tallaie

Khorasan Agric.Res.Center, Mashad, Iran

The best cherry rootstock for Iranian cherry orchards is *P.mahaleb* L. In the seed populations, we observed many dwarf plants and decided to select some of them as dwar rootstocks. The main purpose of our studying is to investigation of genetic variation classification of mahaleb genotypes based on vigor. So, seeds from mature ecotypes mahaleb have been collected from different parts of Iran. Morphological variability in th populations was analyzed. In order to analyze the differences between the collec genotypes from various regions, region referred as the treatment and genotypes within ea region were taken as the replications of that region. A one-side analysis of variance v performed for different regions genetic diversity detection, which indicated a signific difference between all regions for most traits. Results showed that Correlation coefficie among most characteristics are mostly high. Cluster analysis revealed five cluste Regression equation showed that the most important factors for prediction vigor tree we crown volume, height, tree width, size index and trunk circumference.

P - 2

Sweet cherry rootstock testing in Slovenia

V. Usenik[1], N. Fajt[2] and F. Štampar[1]

[1]University of Ljubljana, Biotechnical Faculty, Agronomy Department, Chair for Fruit Growing, Ljubljana, Slovenia
[2]Agricultural and Forestry Chamber of Slovenia, Agricultural and Forestry Institute of Nova Gorica, Fruit Growing Centre of Bilje, Slovenia

In the paper the results of two sweet cherry rootstocks testing in Slovenia will be evaluated. The first experiment was planted in the spring of 1997. It tested the cherry rootstocks: Weiroot 72, Weiroot 158, Weiroot 13, Gisela 4, Gisela 5, Gisela 195/20, Edabriz, Pi-ku 4.20, MaxMa 14 and F12/1 with sweet cherry cultivar 'Lapins' at Fruit Growing Centre Bilje. Each graft combination includes 5 plants. The training system applied was a spindle bush. All scion / rootstock combinations were planted on the same distance 5 x 4 m. After 6 years all trees of Gisela 4 died. Root suckering occurred with Weiroot 13, Gisela 4 and F 12/1. The tree volume was the highest on the rootstock F12/1 and the lowest on the Edabriz. The highest cumulative yield were measured with Pi-Ku 4.20 but the yield efficiency was the highest on Gisela 5. On F 12/1 very low yield efficiency was observed. In 7 and 8 year after planting fruit size of cv. 'Lapins' were the best on the rootstock Gisela 5. The second experiment started in the winter 2000/2001 on 3 different locations in Slovenia. Tested rootstocks were: Gisela 5, Weiroot 158 and Ma x Ma 14 with cultivars Lapins, Nordwunder, Kordia and Regina (10 trees per scion/rootstock combination). Trees were maintained in two training systems: solaxe and spindle. Trees were planted on the distance 4 x 2.5 m (Gisela 5 and Weiroot 158) and on 4 x 4 m (Ma x Ma 14). Ma x Ma 14 proved as vigorous rootstock, but Gisela 5 and Weiroot 158 proved as semi vigorous. The yield and yield efficiency were the highest on Gisela 5 on all sites.

P - 3

Growth and yield of some sweet cherry cultivars grafted on Gisel-A 5 rootstock

M.E. Akçay and M. Burak

Atatürk Central Horticultural Research Institute-Yalova, Turkey

This study was carried out at Yalova Atatürk Central Horticultural Research Istitute between 2002–2005. In the study the yield and growth of 18 foreign and local sweet cherry cultivars grafted on Gisel-A 5 clonal rootstock were determined. The evaluation of growth data showed that Venüs has the largest trunk diameter with 7.85 cm, where as Sweetheart found to be the weakest cultivar in growth development with 3.72 cm trunk diameter. With Regina to shoot length and tree height, Regina is in the first rank with 54.0 cm shoot length and 313 cm tree height, Sweetheart was again the weakest with 20.4 cm shoot length and 148 cm tree height. The cultivar showed different crown development and tree habit; Lapins and Cordia had very few lateral shoots, and showed up right growth, whereas Veysel many lateral shoots Sweetheart showed the smallest crown developement. The phenological parameters were recorded.and the yield were obtained from Sweetheart, Lapins, Celeste, summit and Veysel cultivars that these cultivars showed early bearing characteristics on Gisel- A 5.

P - 4

Pomological characteristics and biochemical composition of fruits of some Canadian sweet cherry cultivars

S. Radicevic, R. Cerovic, O. Mitrovic and I. Glisic

ARI SERBIA, Fruit and Grape Research Centre Cacak, Yugoslavia

The demand for the sweet cherry fruits in the region of Serbia and Montenegro has been gradually increasing over the last few years so that there are real conditions that in the future its growing should be more extended there and its importance for the economy greater. Fruit and Grape Research Institute in Čačak has a long tradition of introduction, research, and introducing into the production those cultivars which proved to be the best in our agroecological conditions. Such a systematic work on the introduction, as well as on creating the new domestic cultivars has a very significant influence on gradual change in the sweet cherry sortiment in this region. Exceptionally good results in our conditions showed cultivars created in Canadian Research Fruit Stations of Summerland, British Columbia, and Vineland, Ontario.

The paper presents a two-year study results on the time of ripening, pomological properties, and biochemical composition of fruits (content of soluble solids, total and invert sugars, sucrose and total acid content) in nine sweet cherry cultivars originating from Canada: Lapins, Early Van Compact, Summit, Compact Lambert, Compact Stella, Sunburst, New Star, Vega and Vista.

The largest fruits have been recorded in cultivar Sunburst (11,20 g). The highest content of soluble solids was observed in cultivar Vega (18,16%), and the lowest in cultivar New Star (13,50%). All examined cultivars have high content of total sugars; with Sunburst (12,58%), Vega (12,20%) and Early Van Compact (12,18%) especially singled out in this respect, what is in direct relation with their excellent quality.

P - 5

Prunus cerasus and *Prunus fruticosa* as interstock for sweet cherry trees

K. Hrotko

Corvinus University Budapest H-1118, Budapest Villányi út 35-43, Hungary

In suboptimal soil conditions vigorous seedling rootstocks intergrafted with dwarfing stempiece may provide an appropriate rootstock solution. As *Prunus cerasus* cultivars were reported as dwarfing interstems, a trial was established in 1990 in order to examine the effect of sour cherry cultivars compared to some *Prunus fruticosa* selections on growth and productivity of sweet cherry trees.

Trees of the varieties 'Van' and 'Germersdorfi óriás' were planted on mahaleb rootstock intergrafted with 'Erdi botermo', 'Pándy meggy' and *P. fruticosa* hybrid 'Prob'; on sour cherry seedling intergrafted with 'Meteor korai' and 'Debreceni botermo' to compare interstock trees to trees on mahaleb seedling and Mazzard. The trees were planted at spacing 5x3 m, trained to central leader type (modified Brunner-spindle). Five cm of the rootstock was exposed above soil line and the whole interstock part (30 cm) was above soil line.

Intergrafted sour cherries on both mahaleb and sour cherry rootstock reduced the tree vigour, but the reduction was significant only on *P. cerasus* seedling. *Prunus fruticosa* 'Selektion 1' and 'Prob' (*P. fruticosa* x mahaleb hybrid) drastically reduced the tree size but the longevity of these combinations is not satisfying, only few trees were living in the 15th leaf.

The cumulative yield efficiency of 'Van' after fourteen years was highest on 'Meteor korai'/cerasus followed by 'Pándy meggy'/mahaleb seedling interstock. The highest yield efficiency of 'Germersdorfi óriás' trees was achieved on 'Oppenheimer Selektion 1' (*Prunus fruticosa*) as interstock on mahaleb root, followed by 'Meteor korai'/cerasus seedling root. Fruit size on *Prunus cerasus* interstem was generally larger.

P - 6

Rootstock effect on growth, yield and fruit quality of two sweet cherry cultivars in Western Poland

R. Kurlus

Department of Pomology, August Cieszkowski Agriculture University of Poznan, Dabrowskiego 159, 60-594 Poznan, Poland

From 1997 to 2004, a trial of 'Burlat' and 'Duroni 3' sweet cherry cultivars grafted on 'Tabel Edabriz', 'Maxma 14', 'SL 64' and '*Prunus avium*' as a control rootstock, was carried out in Western Poland, at the Poznan Agricultural University Research Station in Przybroda. Rootstocks effect on trees vigor, yield, productivity and fruit quality was evaluated.

After 7 years of evaluation, trunk cross sectional area of 'Burlat' and 'Duroni 3' trees, when grafted on 'Tabel Edabriz' rootstock, was respectively 46% and 65% of the trees grafted on '*Prunus avium*'. There were no significant differences in vigor of both cultivars on 'Maxma 14', 'SL 64' and '*Prunus avium*' rootstocks, by far. All trees started bearing in the fourth season. Five year cumulative yields of Burlat grafted on 'Maxma 14', 'Tabel Edabriz' and 'SL 64' were significantly higher than on *Prunus avium* seedling. Among all rootstocks, only 'Tabel Edabriz' effected in higher cumulative yields of 'Duroni 3'. The productivity indices of both cultivars on 'Tabel Edabriz' were higher than on other rootstocks. Rootstocks effected fruit quality. 'Burlat' had the lowest mean fruit weight when grafted on 'Tabel Edabriz'. 'Duroni 3' grafted on 'Tabel Edabriz' and 'SL 64' had significantly smaller fruits, than grafted on '*Prunus avium*' and 'Maxma 14'. Fruit total soluble solids depended on both: cultivar and rootstock. 'Duroni 3' on '*Prunus avium*' had the highest TSS, whereas 'Burlat' on 'Maxma 14' the lowest.

P - 7

Dwarfing rootstocks P-HL for sweet cherries

F. Paprstein, J. Kloutvor and J. Sedlak

Research and Breeding Institute of Pomology Holovousy, 508 01 Horice, Czech Republic

Three dwarfing rootstocks for sweet cherries were selected from a hybrid material of 'Rtynska Ptacnice'. All selected rootstocks show resistance to winter frost. Sensitivity to fungal disease Blumeriella jaapii is comparable to *Prunus avium* rootstocks. Traditional methods of propagation do not give satisfactory results. It is possible to propagate these rootstocks using *in vitro* culture. P-HL rootstocks have good affinity with most sweet cherry varieties.

P-HL-A – Trees on this rootstock require good orchard management. Tree size is reduced by 70 % compared to F12/1 rootstock. P-HL-A rootstock induces very early fruiting of scions of sweet cherries and high yield. This rootstock is suitable for higher density orchards and slender spindle systems. Anchorage is poor so tree must be supported. Adult tree height is 3.5 meters. Life cycle of the plantation is 20-25 years.

P-HL-B - Tree size is reduced by 50 % compared to F12/1 rootstock. P-HL-B rootstock induces very early fruiting of scions of sweet cherries and high yield. Anchorage is very good. Trees on this rootstock require good orchard management. Life cycle of the plantation is 25-30 years.

P-HL-C - Tree size is reduced by 80 % compared to F12/1 rootstock. Trees on this rootstock require very good orchard management. P-HL-C rootstock induces very early fruiting of scions of sweet cherries and high yield. This rootstock is suitable for slender spindle systems. Anchorage is poor so tree must be supported. Adult tree height is less than 3 meters. Life cycle of the plantation is 15 years.

P - 8

Literature review: Reactions of Gisela rootstocks to pathogens

S. Franken-Bembenek

Forsthausweg 33, 35394 Giessen, Germany

This review presents results concerning Gisela rootstocks and their reaction to diseases. It includes investigations and field observations of ungrafted plants in the nursery and of young or mature trees on Gisela rootstock. The results are discussed with respect to the aspects that complicate interpretation and drawing of conclusions: Complications arising by the condition, that trees are composed of rootstock and scion; impact of age and state of health of the tree, strong environmental influence, different pathogen strains, and difficulties to conclude from in-vitro-tests or inoculation studies to field conditions.

Information found for Gisela 3, Gisela 5, Gisela 6, and Gisela 12 are presented in comparison to results for conventional standard rootstocks mazzard, F12/1, Colt, mahaleb. Included are reactions to bacteria (Pseudomonas and Agrobakterium), funghi (Phytophthora, Thielaviopsis, Fusarium, Armillaria, Blumeriella), viruses (PDV, PNRSV, RRV, CRV, L-ChV), phytoplasmae (X disease, ESFY), and nematodes (Meloidogyne, Pratylenchus).

Sensitivity to pathogens does not seem to be a limiting factor for the use of Gisela rootstocks. Choice of appropriate sites and application of adapted cultural practices are often more important for the incidence of several diseases than the inherent susceptibility or tolerance of the Gisela rootstock.

P - 9

Performance of Lapins cherry on several rootstocks in Italy

F.R. De Salvador[1], A. Pititto[1], M. Giorgioni[1], G.Bassi[2], L. Folini[3], L. Longo[4] and C. Piccioni[5]

[1]Istituto Sperimentale per la Frutticoltura-Rome, Italy
[2]Istituto Sperimentale di Frutticoltura-Verona, Italy
[3]Fondazione Fojanini-Sondrio, Italy
[4]A.R.S.S.A.- Regione Calabria, Italy
[5]A.R.S.I.A.L.- Regione Lazio, Italy

In the framework of a national programme supported by the Italian Ministry for Agricultural and Forestry Policy and the European working group "Alpe Adria", four experimental plots were established in spring 1996 to study the performance of the cultivar 'Lapins' grafted onto several rootstocks. Trial A, located in the north (Trento), centre (Rome) and south (Cosenza) of Italy, included Mazzard F12/1, Mazzard seedling (*P. avium*); SL64, Argot (*P. mahaleb*), CAB 6P, CAB 11E, Edabriz, Weiroot 158, (selections of *P. cerasus*); Colt, MaxMa 14 and MaxMa 97 (*P. avium x P. mahaleb*); GM 61/1; GM 79; Gisela 5. Trial B, located in the north of Italy (Verona and Sondrio), included Mazzard F12/1 (*P. avium*); W13, W72, W158, Edabriz, (selection of *P. cerasus*); MAXMA 14 (*P. avium* x *P. mahaleb*; Gisela 4 (*P. avium* x *P. fruticosa*); Gisela 5 (*P. cerasus x P. canescens*); Gisela 12 (*P. canescens x P. cerasus*) Pi-ku 4,20 (*P. avium* x (*P. canescens x P. tomentosa*).

Trial A. – Rootstock vigour depends on the sites of cultivation, but the highest trunk growth was induced by Colt and Argot, followed by *P.avium* seedling and MA 97. Very dwarfing rootstocks were Gisela 5, GM61/1 and Edabriz, which sometimes induced inadequate tree growth, especially in the hot climatic conditions of southern Italy.

Argot, SL64, Colt, MaxMa97, MaxMa14 and W158 showed the highest cumulated crop per tree, but only W158 also combined very high yield efficiency. A large number of suckers was observed for Argot, CAB 6P, CAB 11E and SL64, while fewer suckers were seen with MaxMA97, MaxMa14 and W158. The highest fruit weight was generally obtained with vigorous rootstocks (*P. mahaleb* and *P. avium* selections), whereas Gisela 5, Edabriz and GM 61/1 reduced it significantly.

Trial B. - The most vigorous rootstocks were Mazzard F12/1 followed by MA14, W13 and W158; intermediate vigour was induced by Gisela 12, Piku 4,20. W72, Gisela 4 and Edabriz greatly reduced tree growth, which was very poor in Gisela 5.

Piku 4,20, Gisela 20, W72 and W158 showed marked yield precocity, which allowed a higher cumulated yield. Gisela 5 also produced well in the first years, but subsequently the annual yield decreased and the cumulated value was similar to that of MA14 and Mazzard F12/1.

Gisela 5 and Edabriz had very high yield efficiency, but growth was stunted and fruit size clearly reduced compared to those of Mazzard F12/1 and Gisela 12

P - 10

Performance of the NC-140 regional sweet cherry rootstock trial (1998) in North America

F. Kappel, G. Lang, R. Andersen, A. Azarenko, R. Godin, R. Nunez-Elisea, J. Cline and M. Whiting

Pacific Agri-food Research Centre, Agriculture and Agri-Food Canada, 4200 Hwy 97, Summerland BC, Canada

The most recent regional trial testing rootstocks for sweet cherries in North America was planted in the spring of 1998. The scion cultivars used were 'Hedelfingen', in eastern North America and 'Bing' in western North America. The rootstocks being tested include: mazzard seedling, *Prunus mahaleb* seedling, Gisela® (G) 5, G6, G7, Giessen (GI) 195/20, GI 209/1, GI 318/17, GI 473/10, Tabel® Edabriz, Weiroot (W) 10, W 13, W 72, W 154, and W158. This report will present the performance of scion cultivars on various rootstocks within each location because of the complexity of multiple scion evaluations at numerous sites. A summary of general performance in the overall trial will also be given. Not surprisingly, rootstock influenced yield, vigour and fruit quality. Additionally, differences in stem pull force, maturity, and disease tolerance were also observed. There were interactions for tree size between location and rootstock however the rootstocks can be divided into different vigour groups. Yield was also affected by both location and rootstock as was fruit size.

P - 11

Testing sweet cherry varieties in Hungary after accession to EU

K. Neszmélyi, P. Klincsek and J. Harsányi

H-1024 Budapest, Keleti K. u. 24., Hungary

After accessing to EU Hungary and namely our Institute besides France has been the examination office of cherry varieties for Community Plant Variety Office. When testing new varieties we have to verify if the candidate variety is distinct from any other variety whose existence is a matter of common knowledge and a new variety must be uniform and stable (DUS-test).

There is a national listing system in Hungary for fruits and only the varieties in this list can be marketed as certified propagating material. The DUS-tests are conducted at two different sites in Hungary. Naturally we evaluate the varieties if they have value from angle of cultivation, consumption and processing. Mainly sweet cherry varieties of Hungarian origin are in our National List because the Research Institute for Fruit Growing at Érd has a successful breeding program. Naturally foreign varieties are grown also in Hungary such as KORDIA and SUNBURST.

The first results of the Hungarian breeding are KATALIN, LINDA and KAVICS registered in the 90-s of the last century. Mainly LINDA and KATALIN are spreading in different countries of Europe. These varieties have excellent fruit quality, large fruits as well as shiny deep red skin colour, firm flesh and good taste. KATALIN matures about with the famous HEDELFINGEN and KATALIN's performance was better both in productivity and fruit quality than that of HEDELFINGEN.

RITA is a brand new registered variety ripening very early, giving excellent quality for its season in protected orchard against rains. The very late ripening ALEX is self-fertile, and very productive. Promising new varieties are tested, too.

P - 12

New cherry rootstock for intensive plantings

S. Sansavini and S. Lugli

Dipartimento di Colture Arboree, Università di Bologna, viale Fanin 46, 40127 Bologna, Italy

An ongoing field trial currently at year 6 of the sweet cherry cvs Lapins and Regina on six dwarfing at a planting density of 1,096 trees/ha and six semi-dwarfing or vigorous rootstocks at 667 trees/ha in the typical cherry district of Vignola (Modena Province, Italy) has so far produced a range of notable data in terms of early bearing, yield and fruit quality. Gisela 7 has induced the earliest bearing in both varieties, with a year-5 yield around 15 tonnes/ha; good results have also been recorded for Gisela 6, followed by Weiroot 158 and PHL A. Apparently less efficient has been Gisela 5, while the very dwarfing stocks Gisela 4, Edabriz, Weiroot 158 and the vigorous MaxMa 14 and, especially, MaxMa60, Colt and Colt 6x have proved unsatisfactory. The best cherry size and quality have confirmed the top rankings of Gisela 7 and 6.

P - 13

Sweet cherry cultivar and advanced selection evaluation in Norway

O. Frøynes and M. Meland

Norwegian Crop Research Institute Ullensvang Research Centre N-5781 Lofthus, Norway

Due to a late harvesting season compared to that found in other European countries, the sweet cherry industry in Norway is now expanding, aiming for export 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 sought. In addition, early ripening cultivars are sought for local marketing in early and middle July. Testing cultivars and advanced selections has been carried out at Ullensvang Research Centre since 1959. During the last 6 years, approximately 130 cultivars and advanced selections have been included in the testing program. Important parameters like fruit size, fruit firmness, low fruit cracking, high and precocious yield, fresh appearance and good flavour are evaluated. Based on the results from this testing program, the following cultivars are currently recommended: a) for early season: 'Burlat', 'Moreau' and 'Merchant', b) for mid-season: 'Giorgia', 'Chelan', 'Samba', 'Techlovan' and 'Van', c) for late season: 'Lapins', 'Kordia', 'Regina' and 'Sweetheart'.

P - 14

Flowering, production and fruit quality of twelve sweet cherry cultivars in an experimental orchard at Central Chile

E. Gratacós , M. Kulczewski and A. Cortés

Facultad de Agronomía. Universidad Católica de Valparaíso. P.O.Box 4 – D. Quillota, Chile

During 2003 and 2004 it was registered flowering dates, crop load, productive efficiency and fruit quality on Brooks, Lapins, Bing, Sweetheart, Stella, Cristalina, Santina, Garnet, Newstar, Summit, Celeste and Sylvia cultivars on Pontaleb (*Prunus mahaleb*) rootstock, in a 4th and 5th leaf growing's orchard, located at Central Chile (33°52' S and 70°41 W at 700 m altitude) with a density of 1481 trees/ha. Flowering periods, floral density and intensity were determined for all combinations. Accumulated production fluctuated between 1.6 and 61,7 T/ha, being higher for Lapins, Sweetheart and Stella selffertiles varieties. Production efficiency moved within a range of 3.5 and 200 g/cm2, getting higher levels in Sweetheart, Lapins, Santina and Stella cultivars. By the second year, range fluctuated between 8.2 g/cm2 for Summit and 243 g/cm2 for Lapins. The fruit quality was evaluated for all combinations in terms of fruit weight, firmness, soluble solids and acidity. Brooks, Stella, Santina and Cristalina varieties raised the higher fruit weight with a high crop load. In 2004 early varieties diminished their firmness in relation with the year before.

P - 15

Validation of sweet cherry production in different winter chilling areas, with several cultivars, rootstocks and training systems for the Chilean industry

E. Gratacós , A. Cortés and M. Kulczewski

Facultad de Agronomía, Pontificia Universidad Católica de Valparaíso, P.O.Box 4-D Quillota, Chile

This project studies the behavior of sweet cherries in low winter chilling areas and the potential to increase productivity and fruit quality in traditional areas, by means of new cultivars and rootstocks plus modern production systems. This research project started in 1996 and the following are the places - sequenced from lower to higher winter chilling - with the respective aspects being evaluated in each: Quillota (5th Region): 10 cultivars on a local *P. cerasus* rootstock started in 1996. Los Andes (5th Region): 16 cultivars on *P. mahaleb* SL 64 rootstock, 7 rootstocks whith two cultivars and 3 Training Systems, started in 2001. Rancagua (6th Region): 12 cultivars on P mahaleb SL 64 rootstock, 6 Rootstocks whith 3 cultivars and Crop regulation trials, started in 2003. Curicó (7th region): 7 rootstocks on Lapins cultivar and 3 Training Systems, started in 2003. Talca (7th region): 6 cultivars on Maxma 14 rootstock started in 2004. The actual results and conclusions gathered in this research up to 2004 will be presented.

P - 16

Histological investigation on cherry rootstocks

G. Vegvari, K. Hrotko, L. Magyar and A. Hajagos

Department of Pomology, Corvinus University of Budapest, Hungary,
H-1518 Budapest, Pf. 53, Hungary

In some rootstock trials in Hungary cherry trees on 'Gisela 5' show water deficiency symptoms in hot summer. There are some indications that the histological structure of the stem may influence the transport in xylem and phloem. Considering these possible relationships the histological structure of stems of different cherry rootstocks, such as 'Gisela 5', *P. fruticosa* 'Prob', *P. mahaleb* 'SL 64', 'Magyar', 'Bogdány', 'Brokforest' (MxM 14), *P. cerasus* 'CAB 11 E' and Mazzard was investigated. During the winter dormancy the cross section of one year old shoots were studied by scanning electron microscope. In the *P. mahaleb*, *P. avium* and *P. cerasus* rootstocks the xylem surface in the stem cross section was double compared to the phloem, while in 'Gisela 5' we found an opposite ratio with considerable smaller xylem surface. Also the average trachea diameter in stems of Gisela 5 was found considerable smaller compared to other rootstocks. The calculated trachea lumen ratio for xylem surface was 19.9% in 'Gisela 5' stems and 24.1% for 'Prob', both are dwarfing rootstocks. In *P. mahaleb* stems the ratio ranged from 38.7-43.5%, while 'CAB 11E' showed 57.5% and Mazzard seedling 67.3% trachea lumen, three times larger than in 'Gisela 5'. If the xylem morphology and trachea lumen ratio in the young xylem of rootstock part in sweet cherry trees grafted on 'Gisela 5' remains the same, this large difference in stem structure may influence the xylem transport and storage capacity of the trees, which may lead to water deficiency in hot summer days.

P - 17

Performance of sweet cherry trees on Weiroot 158 rootstock

Z. Cmelik

Faculty of Agriculture University of Zagreb, Croatia

An investigation on the growth of sweet cherry trees, which were cultivated on heavy soil, was conducted for eight years after planting (1997-2004). The experiment included cultivars: Burlat, Hudson, Karina, Kordia, Lapins, Margit, Oktavia, Regina, Sam, Schneiders and Sunburst. The trees were grafted on rootstock Weiroot 158, planted at a spacing 5 x 3 m, and trained to the free-spindle. After 8 seasons, growth of the trees, as indicated by trunk cross-sectional area (TCSA), canopy height and volume was different depending on the cultivars. Cumulative yields and yield efficiencies were also different depending on the cultivars. Tree mortality was highest for 'Sunburst', medium for 'Burlat', 'Kordia' and 'Schneiders', and low for 'Oktavia'.

P - 18

Performance of cherry rootstocks in heavy, limy soils

R. Gella

CITA-DGA. Apdo 727 50080 Zaragoza, Spain

Santa Lucia cherry rootstock (*Prunus mahaleb*), with a good performance in limy soils, presents serious mortality problems in the heavy, scarcely permeable soils of the Ebro Valley (Spain).

The efficiency of five cherry rootstocks grafted with the variety Compact Stella were studied in a 12 year trial, statistically arranged into randomized blocks with 12 repetitions per rootstock-graft combination. The plot was heavy, limy, equipped with flood irrigation and uncultured soil vegetal cover. The following rootstocks were used: MM Pilarico and MM Villamayor (both *Prunus cerasus*), F-12/1 (*P. avium*), SL-64 (*P. mahaleb*), and Colt (*P. avium x P. seudocerasus*).

Yearly data were recorded on vigour, yield, productivity, chlorosis symptoms and trees survival. Significant differences were found on vigour, being SL-64 the most outstanding followed by F-12/1 and the two *P. cerasus*. Colt showed adaptation to the soil and 60% tree survival at the end of the 12 year study versus 100% in *P. cerasus* and intermediate in the case of SL-64 and F-12/1. Accumulated fruit production was higher for SL-64, while productivity in Kg/cm2 trunk section was not statistical different from both *P.cerasus*.

P - 19

Promising sweet cherry cultivars in Slovenia

N. Fajt[1], V. Usenik[2] and E. Komel[1]

[1]Agricultural and Forestry Chamber of Slovenia
[2]Agricultural and Forestry Institute of Nova Gorica, Fruit Growing Centre of Bilje, Slovenia

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. The cherry trees in other regions are grown near bigger towns or for local purposes. Prior to the First World War the assortment consisted of only early-maturing cherry cultivars like: 'Najzgodnejša iz Klosterneuburga', 'Zgodnja iz Rifenberga', 'Zgodnja iz Dornberka', 'Črna mehkužnica', 'Pisana hrustavka' or 'Vipavka', 'Črna hrustavka' or 'Ivanjščica'.

Systematic research on sweet cherry cultivars started after 1959 when a collection orchard was planted in Šempeter near Gorica. The orchard comprised 50 different cherry cultivars of local and foreign origin. Since then, the collection orchard has been regularly enlarged, the cultivars have been tested for their phenological and pomological characteristics, and 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 cherry cultivars and rootstocks has been one of the most important activities in the Centre. During this period we have tested 63 varieties planted in two collection orchards on two locations. The research has encompassed from early to late – maturing cherry cultivars. After a several-year-long investigation into recent cherry cultivars of foreign origin the following cultivars with local importance have been proposed for the cultivation in Slovenia: 'Early Lory', 'Burlat C1', 'Biggareau Moreau', 'Isabella', 'Prime Giant', 'Garnet', 'Brooks', 'New Star', 'Big Lory', 'Canada Giant', 'Summit', 'Kordia', 'Regina' and 'Sweet Heart'. Among local cultivars the most promising are medium-early-maturing 'Vigred' and late-maturing 'Petrovka' and 'Pavliška'. The most important cultivars for general growing are 'Burlat', 'Celeste', 'Giorgia', 'Van', 'Sunburst', 'Germersdorfska' and 'Lapins'.

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.

P - 20

Mid-trial report of the NC-140 regional sour cherry rootstock trial (1998) in North America

G. Lang, F. Kappel, R. Andersen, J. Cline, G. Greene, K. Kosola, R. Perry, T. Robinson and S. Seeley

Dept. of Horticulture, Michigan State University, East Lansing, MI 48824, USA

The 1998 North American regional trial (NC-140) to evaluate rootstocks for sour cherry (*Prunus cerasus* L.) production was planted in Michigan, New York, Utah, Wisconsin, Pennsylvania, and Ontario with 'Montmorency' as the scion. The 13 rootstocks under evaluation include: mahaleb (*P. mahaleb*) seedling as the industry standard; the *P. cerasus*-based interspecific hybrid clones Gisela® (Gi) 5, Gi6, Gi7, and Giessen (GI) 195/20 and GI 209/1 (now Gi 3); the *P. cerasus* clones Tabel® Edabriz and Weiroot (W) 10, W13, W53, W72, and W158; and the *P. pseudocerasus* clone P50. Significant differences in tree vigor and mortality have been evident, though highly variable by location. Rootstocks consistently in the higher vigor categories include mahaleb, W10, W13, W158, and P50; the most consistently dwarfing included Edabriz, W53, and GI 209/1. Poor weather during late winter and early spring significantly impacted yields at many locations during the early years of fruiting. In some years at some sites, yields have been equal to, or greater than, trees on mahaleb (e.g., trees on W13), including some rootstocks that make smaller trees (e.g., W72), indicating a significant potential for improved yield efficiency that was not found during the previous (1987) NC-140 rootstock evaluation. Yields generally were lowest on the weakest rootstocks (e.g., GI 209/1, W53, and Edabriz). Tree and cropping performance through the 7th year of the trial will be reported for each site, as well as summarized generally across sites.

P - 21

Rootstock and management practices evaluation to avoid cherry replant disease in Chile

G. Reginato, C. Córdova and C. Mauro

Universidad de Chile, Facultad de Ciencias Agronómicas. Casilla 11315, Chile

Since spring 2002, several trials to determine detrimental effects on replanted cherry trees have been conducted in cherry production area of Chile. Comparison of tree growth achieved on methyl bromide treated soil (Non replanting condition) in relation to non treated soil were performed. Tree growth as trunk cross sectional area (TCSA) was evaluated, considering the high relationship of it with total leaf area.

In Rancagua (34°10' S, 70°45' W), 10 rootstocks under a replant condition of an orchard growing on *P. mahaleb* were evaluated. All the 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. Similar response showing less affected trees were detected in Curicó (34°55' S, 74°12' W). Less affected vigorous rootstock, growing in a replanting soil, showed similar tree growth to less vigorous rootstock on a fumigated soil.

Planting right after, or 1 or 2 year after orchard removal were evaluated. 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. Methyl Bromide and 1,3-dichloropropene (1,3-D) were better soil fumigants for cherry replant disease than chloropicrin (C) or 1,3-D plus C which was intermediate between C alone and 1,3-D alone.

P - 22

Adaptation and selction of cherry studies in Taurus mountains

A. Küden[1], A. B. Küden[1], B. İmrak[2] and A. Tümer[1]

[1]Ç.Ü. Agricultural Faculty, Horticultural Department, 01330 Balcali-Adana, Turkey
[2]Ç.Ü. Pozanti Agricultural Research and Application Center, 01330 Balcali-Adana, Turkey

Local cherry cultivar 0900-Ziraat gives 8-12 g of fruit size in different cherry growing areas. Alhough fruit size is good in 0900-Ziraat fruit yield is very low. So, the growers need new cherry cultivars which have good quality, big size, good flesh firmness and high yielding. Lapins (7, 8 g), Summit (8-11 g), Sunburst (10-13 g) Canadian cultivars, Durano-3 (10-13 g) Italian cultivar, Fercer-Arciana (12-13 g) French cultivar are good sized

In this study, we experimented Artvin, Aksehir Napoleaon, Bing Spur, Cristobalina, Durano-3, Early Rivers, Early Van Compact, Garnet, Hedelfinger, Karabodur, Karagevrek, Katalin, Kordia, Lamida, Lapins, Larian, Malatya Dalbastı, Meckenheimer, Nadino, Nalina, Namosa, Na-1, Na-478, New Star, Octavia, Omerli, Precoce de Bernard, Regina, Satonishi, Summit, Sunburst, Tardif de Vignola, Tardif de Vignola, Telegal, Tokosogo, Toros-4, Toros-5, Toros-7, Van and Venüs cherry cultivars for the flowering periods, fruit quality characteristics and ripening times.

P - 23

Herbicide influence on the growth of young cherry trees in a high-density orchard

Z. Rankova, K. Kolev and V. Dzhuvinov

Fruit Growing Institute, 4004 Plovdiv, Bulgaria

During 2002 – 2004 the influence of herbicides on the vegetative and reproductive behaviour of three cherry cultivars - Burlat, Kordia and Lapins - grafted on Gisela 5 rootstocks was investigated. The trees were planted in 2001 with a spacing of 3m within and 5m between the rows.

The herbicide Pendimethalin (Stomp 33EC) was applied in early March, before the onset of vegetation, in 2 trial doses – 4 l/ha and 6 l/ha. The control was a non-treated tree row.

The results of the investigation show that Pendimethalin in both trial doses controlled effectively all annual weed species.

After the effect of Pendimethalin against secondary weed growth wore off, two treatments with Glyphosphate (Roundup) at 8 l/ha during vegetation were applied.
The two trials with herbicide treatment showed better vegetative growth and higher reproductive behaviour of the cultivar/rootstock combinations. This can be explained with the effective elimination of weed competitors and the lack of inhibiting side effects by the herbicide on the young plants.

P – 24

Cancelled

P – 25

Investigation on the effects of several precooling applications on the crop and quality losses in 0900 Ziraat cherry cultivar

M. Akbulut[1] and M. Özcan[2]

[1]Ministry of Agriculture and Rural Affairs Black-Sea Agricultural Research Institute Department of Horticulture Samsun, Turkey
[2]Ondokuz Mayis University Faculty of Agriculture Department of Horticulture Samsun, Turkey

On the investigation, cherry fruits (0900 Ziraat cherry cultivar) was storaged, after precooling treatments (no precooling, precooling with air, precooling with water) by packaging them in different package materials. Packaged cherry fruits storaged in 0-1 °C and 90-95 % RH.

According to the results of the research plastic material reduced the weight losses, during cold storage period. Total solible solid (TTS) and the titratable (TA) acidity of cherry fruits generally reduced end of the cold storage period. Particularly, precooling aplications effected by reduce of physiological disorders and fungal rots. Precooling with water on cherry fruits took less time compared with precooling with air and provided cooling 13 times faster. Rots and disorders were observed in high rates during researches with no precooling compared with precooling with water (12,60 %) and precooling with air (11,46 %) researches.

Precooling applications reduced the crop and quality losses and it was determined that precooling with water was more successfully application than the others. The color of fruit shell and stem darkened in the end of storage period. 0900 Ziraat cherry cultivar could be storage performance for 3 or 4 weeks.

P - 26

The research on the effects of postharvest treatments on the physiological disorders and fungal rots in 0900 Ziraat cherry cultivar

M. Akbulut[1], M. Özcan[2] and M. A. Sökmen[2]

[1]Ministry of Agriculture and Rural Affairs Black-Sea Agricultural Research Institute Department of Horticulture Samsun, Turkey
[2]Ondokuz Mayis University Faculty of Agriculture Department of Horticulture Samsun, Turkey

The aim of the study, which was carried out in 2001 and 2002, was to lengthen the storage life and keeping the quality of intensively grown 0900 Ziraat cherry cultivar, after precooling treatments by packaging them. Packaged cherry fruits storaged in 0-1 °C and 90-95 % RH.

It is observed that physiological disorders and fungal rots went further during the storage period, and especially, increases happened after the third week. The fungal rots increased fruits stored in plastic material. While rot and disorder rate was 4,10 % in first week, it became 14,54 % in the third and 27,53 % in yhe fourth week. In the research performed, it's observed that pitting is the main reason for physiological disorder and it's determined that Alternaria spp. and Cladiosporium spp. Are the basic reason for fungal rots. Although flavour and quality of fruit have started to reduce from 3rd weeks, but they had acceptable quality for sale on 4th week.

P – 27

Cancelled

P - 28

The quality changes of cherry fruits cv. 0900 Ziraat stored in different packages

M. A. Koyuncu, Ö. Çağatay, E. Savran and T. Dilmaçünal

University of Süleyman Demirel, Faculty of Agriculture, Department of Horticulture, Isparta, Turkey

In this research, cherry fruits cv. 0900 Ziraat packaged with three different packages were stored at 0°C temperature and 90 ± 5 % relative humidity for 35 days. The quality evaluations were performed at the postharvest physiology laboratory of Faculty of Agriculture at the Suleyman Demirel University. One of the packages made of plastic material was locally produced in Isparta and named as Package 1. The others were imported packages and named as Package 2 and Package 3. The fruits in all three packages were in good quality at the 28th day of storage. On the other hand, based on external appearance, stored fruits were marketable after 35 days. At the end of the storage period, the weight losses changed between 0.16 % (Package 3) and 0.23 % (Package 1). The firmness of fruits increased until 28th day and then decreased. All fruits had more redness after 35 days than initial. The fruits in all three packages had similar green colour of stems at the end of 35 days. The soluble solid contents of cherries fluctuated during the storage period in three packages. While titretable acidity decreased a little, pH increased. In conclusion, the locally produced package provided a good result for cherry quality during the storage period of 28 days as good as the other packages did.

P - 29

Shelf life quality of Bing sweet cherry following preharvest treatment with gibberellic acid

M. A. Koyuncu, T. Dilmaçünal, E. Savran and A. Yıldırım

University of Süleyman Demirel, Faculty of Agriculture, Department of Horticulture, Isparta, Turkey

This research was conducted with Bing sweet cherry fruits grown in Isparta to determine the quality changes at room conditions. Fruits were treated with different GA3 doses (0, 5, 10, 15, 20 and 25 ppm) at preharvest period. Harvested fruits transported to the Postharvest Physiology Laboratory of Agriculture Faculty of Süleyman Demirel University in 2004. Sweet cherry fruits put in plastic boxes, covered with stretch film and placed at 20°C temperature and 60-65 % RH conditions for the evaluation of shelf-life quality during 10 days. Weight loss, fruit flesh firmness, colour change (fruit and fruit stem), soluble solid content and titretable acidity of fruit samples were determined at 2., 4., 7. and 10th days of shelf-life period. Gibberellic acid dosess effected postharvest quality of fruits, especially firmness. All fruit samples found at marketable quality at the end of the storage period. The samples treated with 20 ppm GA3 gave the best (6,83 points) result.

P - 30

Effects of different precooling treatments with ozonated water on the quality of the sweet cherry fruit cv. 0900 Ziraat

M. A. Koyuncu, A. C. Seydim, T. Dilmaçünal, E. Savran and T. Taş

University of Süleyman Demirel, Faculty of Agriculture, Department of Horticulture, Isparta and University of Süleyman Demirel, Faculty of Agriculture,Department of Food Engineering, Isparta, Turkey

The sweet cherry fruits cv. 0900 Ziraat was precooled immediately after harvest at the postharvest physiology laboratory of Agriculture Faculty in Suleyman Demirel University. The precooling was performed using four different methods of ozone treatment to water: (1) saturation of water with ozone for 8 minutes + additional ozone treatment to water for 8 minutes after fruit was put in this saturated water, (2) treatment of ozone to water for 16 minutes after fruit was put in water, (3) saturation of water with ozone for 8 minutes + putting the fruit into water for 8 minutes without treatment, (4) putting the fruit in the water without ozone treatment for 16 minutes as control group. The fruit coated with the plastic film after putting into plastic cases was placed in the room with the temperature of 10°C and humidity of 60-65 %. The shelf life quality was evaluated during one week. The fruits removed at the 3th, 5th and 7th days of the storage were evaluated for weight loss, flesh firmness, soluble solid content, titretable acidity, pH, fruit colour, stem colour and external appeareance. All of the fruits precooled with ozonated water were found marketable at the end of the storage. The weight losses changed between 0.565 % (control) and 0.721 % (first treatment). While the flesh firmness did not change in the control fruits, ozone treated fruits showed an increasing during the storage period. Titretable acidity increased in the applied fruits in excess of control samples. The red colour of cherry decreased in the applied fruits more than controls. First application samples had minimal darkness and maximal yellowness in the fruit stem.

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Fruit quality of sweet cherry 'Lovranska'

I. Ljubicic, B. Duralija, T. Jemric, T. Safner and M. Brajan

Department of Agricultural Botany, Faculty of Agriculture, University of Zagreb, Svetosimunska 25, 10000 Zagreb, Croatia

Sweet cherry 'Lovranska' is a local cultivar with very good quality and perspective. The aim of this research was to examine the relation between different quality parameters of sweet cherry fruits, from four locations in its typical growing area (Lovran). Total soluble solids (TSS), colour (CIE Lab method), weight, width, thickness and height of the fruits, and stalk length were measured. Average concentrations of samples for total soluble solids varied depending on location in range from 13,5 to 15,2 ° Brix. On three locations, fruits with the higher amount of TSS had the lower value of fruit skin luminescence (L). Fruit weight was not directly correlated with the colour, but it was related to the fruit size.

P - 32

Sweet cherry (*Prunus avium* L.) postharvest quality of nine cultivars in South Patagonia

F.A. Manavella, L. San Martino, G. Salato and D. Arribillaga García

INTA Los Antiguos Av. 11 de Julio 973 (9041) Los Antiguos- Santa Cruz, Argentina
INIA Tamel Aike. Las Lengas 1450, Coyhaique, Chile

Sweet cherry production in south Patagonia (46° 19' SL) has been developed since the earliest '70 in Los Antiguos (Argentina) while in Chile Chico (Chile) began in the latest '90. During the last years, new cultivars have been introduced in the region, but there are no records about their postharvest quality. The aim of this study was to characterized nine sweet cherry cultivars growing in the area by phenological aspects and by measuring weight, caliber, soluble solids content (SSC), firmness, titrable acidity (TA) and color (L*, C* and h). The cultivars under study were Bing, Van, Kordia, Lapins, Sunburst, Napolitana, Rainier, Newstar and Sweetheart. Phenology was determined from bud burst to harvest. For postharvest quality measures, three samples of 100 fruits from all of the cultivars were collected at harvest stage from each grower's orchard (2 to 6 orchards for cultivar) and measured in the same day of collection. Means were statistically analyzed and significance differences were found in all the characteristics. The most promising cultivars for the region, due to their late ripening and postharvest quality, were Sweetheart, Lapins, Kordia and Bing. The first three were harvested in middle January, while Bing was harvested in late December. Among other results, firmness was 87.3 for Sweetheart, 75.4 for Lapins, 72.5 for Kordia and 70 for Bing; TA (% malic acid) for Bing was 0.66, for Kordia 0.58, for Sweetheart 0.48 and 0.44 for Lapins; SSC (°Brix) was 21 for Sweetheart, 20 for Kordia, 16.8 for Lapins and 15.5 for Bing.

P - 33

Changes of anthocyanin content in sour cherries during ripening and storage

G. Muskovics, E. Kovács and H. Daood

Budapest University of Technology and Economics, 1111-Budapest Mûegyetem rkp. 3-9. and Central Food Research Institute, 1022-Budapest Herman Ottó u. 15., Hungary

The quality of the Hungarian sour cherry cultivars is unique in Europe, therefore they are called hungaricums. The anthocyanin content of the Hungarian cultivars has not been measured before. The object of our experiments was to determine the anthocyanin content, to identify it in two different cultivars (Pándy 279, Kántorjánosi) and to show the effects of ripening and storage through the changes in the skin colour.

The identification and quantification of the anthocyanins was performed by HPLC, by 0,46; WATERS 2695 Separation×m 25μgradient elution (TRACER Nucleosil 100 C18 5 Module; WATERS 2996 Detector) after acidic–methanolic extraction. The electronic control was carried out by Empower Software 2001 (Hong, Wrolstad, 1990;Tsao, Yang, 2003; Versari et al., 1997). The skin colour of the sour cherries was measured by CIELAB colour measuring system (Hunterlab, Colorflex 45/0, USA).

As a result of our experiments it was found that in the mature fruits of both cultivars the same anthocyanins, cyanidin-3-glucosil-rutinoside and cyanidin-3-rutinoside were present in largest quantities. The total anthocyanin content of the two sour cherry cultivars was between 29 and 35 mg in 100g of fresh mature fruit. During the storage this amount decreased for the first two weeks and then took a permanent value, which was 68-78% of the anthocyanin content in fresh mature fruit.

The anthocyanin content was highly correlative with the skin colour. In the course of the colour measurement a difference was found between the two cultivars. While the colour of cv. Kántorjánosi changed from yellow to red, the other cv. Pándy 279 preserved its red colour, which became darker and deeper during maturation.

The research was financed by National Scientific Research Foundation (Budapest), (OTKA T034401/2000-2004).

P - 34

Loss of firmness and change of skin color of sweet cherry (*Prunus avium* L.)

E. Kovács

Central Food Research Institute, 1022-Budapest Herman Ottó u. 15., Hungary

Different cultivars (Carmen, Krupnoplodnaja, Linda and Vera) were investigated as a function of ripening. Samples were harvested in 2004 in the orchard of the Research Institute for Fruitgrowing and Ornamentals, Érd – after anthesis, than they were stored for 30 days (4-6oC,). Quality of cherries was characterized by different parameters as size (height, cheek, suture), weight, pH, oBrix, dry matter etc. The color was measured by Hunterlab Colorflex spectrocolorimeter, data were evaluted by a Hunterlab Universal Softver (Hunterlab, USA). The physical parameters were determined by destructive and non-destructive way by SMS (Stable Micro System, TA-XT2). Data were evaluated by different statistical methods (multiple regression model, correlation coefficients).

Great differences were found as a function of development (early green) and ripening of sweet cherries in the data of physical measurements. These values were greatly influenced by the structure of seeds in fruits. Less difference was found among cultivars during storage.

Research was financed by Széchenyi project (NKFP-4/0028/2002 CT) and the FVM (Ministry of Agriculture and Rural Development, Budapest) (38.195/2003).

P - 35

Observation on the occurrence of twin sweet cherries in Italy and Slovenia

A. Roversi, N. Fajt, A. Monteforte, L. Folini, D. Panelli and S. Giosuè

Istituto di Fruttiviticoltura, Facoltà Agraria,Università Cattolica S.C.-29100 Piacenza, Italia

During the past cherry season, that is spring-summer 2004, the frequency of double (twin) sweet cherries was registered for 53 varieties grown in 3 sites in Italy and 1 in Slovenia. In particular, the frequency of double cherries per 4-5 fruiting branches chosen out of 5-10 representative trees for each variety was registered.

Since experimental data by Beppu had evidenced the influence of over 30 °C temperature during flowering bud differentiation on the occurrence of double cherries, for each site of investigations the daily maximum temperature in May-July period was considered for the previous year (2003) and then summarized for the further comparisons of sites. Data elaboration has also taken into consideration fruiting branch age and exposure, tree age and rootstock, and harvest precocity of each variety.

First results have evidenced a significant influence of genotype as, in the same place of cultivation both varieties with a high percentage of double cherries and others with no double fruits were found. On the contrary, the influence of fruiting branch age and exposure are not significant on the occurrence of double fruits. Nevertheless, in every site the phenomenon intensity is higher for the earl harvested varieties than for those harvested later. Moreover, the occurrence of twin cherries recorded, generally speaking, is higher for the sites where the total amount of maximum daily temperatures in previous spring-summer seasons were higher, i.e. the hottest sites.

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Effect of postharvest storage on quality and antioxidant activity of sweet cherry (*Prunus avium* L.)

B. Gonçalves[1], A. P. Silva[2], J. Moutinho-Pereira[1], E. Bacelar[1], C. Correia[1], A. Santos[2], E. Rosa[2] and A. S. Meyer[3]

[1]CETAV - Centre for Technological, Environmental and Life Studies, Department of Biological and Environmental Engineering
[2]CECEA - Research Centre for Agricultural Sciences and Engineering, Department of Plant Science and Agricultural Engineering. University of Trás-os-Montes e Alto Douro, Apartado 1013, 5000-911 Vila Real, Portugal
[3]Food Biotechnology and Engineering Group, BioCentrum-DTU, Building 221, Technical University of Denmark, 2800 Lyngby, Denmark

Physicochemical characteristics (weight, colour, firmness, titratable acidity - TA, pH, soluble sugars – SS and phenolic composition) and antioxidant activities of cherries on human LDL were studied in cultivars 'Burlat', 'Summit' and 'Van', at harvest and after storage at 0°C for 30 days. On average, 'Summit' showed higher fruit weight and 'Van' higher SS and TA. 'Summit' also presented higher values of L*, chroma and hue angle. During storage, 'Van' had a higher reduction of fruit weight (35%). Storage induced a reduction of chromatic parameters when compared to the values observed at harvest. In general, 'Summit' had a better suitability for the fresh market. Hydroxycinnamates, anthocyanins, flavonols and flavan-3-ols concentrations varied among cultivars and during storage. Neochlorogenic and p-coumaroylquinic acids were the main hydroxycinnamic acid derivatives. The 3-glucoside and 3-rutinoside of cyanidin were the major anthocyanins. Epicatechin was the main monomeric flavan-3-ol with catechin present in smaller amounts in all cultivars. The flavonol rutin was also detected. 'Summit' contained highest concentrations of phenolics (158 mg/100 g fw) and Burlat lowest (140 mg/100 g fw). Storage decreased total phenols levels in 'Summit', but levels increased in 'Burlat' and 'Van'. Phenolic cherry extracts inhibited low-density lipoprotein oxidation *in vitro* in a dose-dependent manner. Freshly cherries exhibited significantly higher antioxidant activities than extracts of stored samples. 'Summit' had highest antioxidant activity. This study may be useful in the selection of suitable cultivars and in the design of optimal storage for production of cherries with high levels of potentially health protective phytochemicals.

P - 37

Effect of preharvest gibberellic acid treatments on postharvest quality of sweet cherry in Cukurova

O. Özkaya, Ö. Dündar, A. Bahar and A. Küden

Cukurova University, Agricultural Faculty, Horticulture Department, 01330 Balcalı, Adana, Turkey

Effect of preharvest gibberellic acid treatments, 10 , 20 and 30 ppm on Aksehir Napolyon sweet cherry were compared with control during four weeks storage. The most important problem of sweet cherry is discoloration of stem after storage. Different preharvest treatments can be effective to stop or slow down discoloration. In this research fruit firmness, titrable acidity, total soluble solids, stem color (1-3 scale), weight losses and fruit decay were evaluated depend on different concentrations of GA3 . Application of GA3 decreased the loss of fruit firmness, delayed stem discoloration and maintain the brightness during storage compared with control and the other application rates.

P - 38

Determination of controlled atmosphere storage conditions of sweet cherry cv. '0900 Ziraat'

B. Akbudak[1], H. Tezcan[2] and A. Eris[1]

[1]Department of Horticulture, Faculty of Agriculture, University of Uludag, 16059 Bursa, Turkey
[2]Department of Plant Protection, Faculty of Agriculture, University of Uludag, 16059 Bursa, Turkey

This research was carried out with the aim of determining the effects of low O_2 and high CO_2 combinations on the fruit quality during the storage of sweet cherry cv. '0900 Ziraat'. For this purpose, fruits of the cultivar used in the study were stored in cold stores with 0±0.5°C and 90±5% RH and 5 different atmosphere combinations such as 0:21 (CO_2%:O_2%) (control), 5:5, 10:5, 15:5, 20:5, 25:5 were applied to the fruits along the storage period. Some physical and chemical analysis [weight loss (%), respiration rate (mgCO_2/kgh), total soluble solids (TSS) (%), titratable acidity (TA) (%), pH, ascorbic acid (mg/100 g), skin colour (L, a, b) and percentage of rotted fruit (%)] were realized on fruit samples taken at certain intervals during storage and after 2 day shelf life at the end of the storage. At the end of the study, it was determined that cv. '0900 Ziraat' could be stored successfully with a storage potential of 60 days in controlled atmosphere conditions (20:5 and 25:5 atmosphere combinations) at 0±0.5°C and 90±5% RH. The results show that fruits of cv. '0900 Ziraat' were stored more successfully in 20:5 and 25:5 atmosphere combinations, compared with other treatments.

P – 39

In vitro techniques to study the shoot-tip grafting of cherry

M. E. Amiri

Department of Horticulture, University of Zanjan, Zanjan, Iran

The feasibility study of an *in vitro* cherry (*Prunus avium* Var. Seeyahe Mashad) micrograft method was studied. Sour cherry (*Prunus cerasus* Var. Albaloo Telkheh) was used using as rootstocks (using *in vitro* germinated sour cherry seedling *in vitro*) and axenic shoot cultures (shoot-tip and nodal cultures) established from cherry mature tree as micro scions. *In vitro* germinated seedlings, which emerged 12-18 days after inoculation on gelled medium, were decapitated and used as rootstock. Mature tree explants initiated on hormone-free Murashige and Skoog (1962) MS modified medium were made into scion of 5-14 mm length of grafting. Micrografts could be easily cultured on hormone-free liquid half-MS medium and were potted out after 10_12 weeks of culture growth. A complete graft union of the *in vitro* cherry micrograft was achieved in three weeks, and vigorous plants were established after 60 days of *in vitro* culture followed by 10 days of hardening. Grafting success was dependent on the method of grafting and size of the scion. Shoot-tip grafting and side grafting were equally successful (60 to 75%). Length of scion shoot had significant effect on micrografting success. Graft success was high (75) when the scion length was ≥ 5 mm and it was less (0.5) when size of scion was small (3-5mm). Grafting survival after 60 days *in vitro* was 68%, which then dropped slightly to 40% after hardening. The *in vitro* cherry micrograft is suggested as an effective and useful method for disease-free and germplasm multiplication.

P - 40

Derermination of *in vitro* propagation techniques of some clonal sweet and sour cherry rootstocks

A. Fidancı, M. Burak and B. Erenoğlu

Atatürk Central Horticultural Research Institute-Yalova, Turkey

In this study, *in vitro* rapid propagation techniques of some cherry clonal rootstocks namely Gisela 5,MaxMa 14 and Tabel /Edabriz.

The most appropriate time for taking explant is from the end of April to the beginning of June. Taking explant earlier caused high level of contamination in later time browning increased and growing and multiplication rates were reduced. As explant source ,shoot tip and axillary buds were used .The best media and conditions were examined for sterilization ,culture establishment ,multiplication ,rooting and acclimatization.

In the culture establishment stages only contamination created problems, where as the most important problem in multiplication stage was vitrification. In the rooting stage MS and added 1 mg / l IBA gave %95-100 rooting in three weeks.

The rooted plantlets were transferred to small trays or plastic pots containing peat most + perlit : 1/1 medium showed high rate of survivability in the acclimatization stage.

P - 41

Micropropagation of some *Prunus* and *Pyrus* genotypes *in vitro* as affected by different carbon sources

D. Ruzic, T. Lazic and R. Cerovic

ARI SERBIA, Fruit and Grape Research Centre, Kralja Petra I 9 32000 Cacak, Yugoslavia

This paper aimed at assessing specific requirements of three different genotypes in terms of type and concentration of carbohydrates, essential for growth and development, which can substantially improve their *in vitro* propagation.

Sweet cherry cv Lapins, sweet cherry rootstock Tabel Edabriz and pear rootstock Pyrodwarf were used as model plants. In multiplication stage the shoots were grown on Murashige and Skoog (MS) (1962) medium with in mg l-1: BAP, 1.0; IBA, 0.1 and GA3, 0.1. Sucrose, D-fructose, D-glucose, D-sorbit and mannitol were used as carbon sources in the concentration of 58.5 and 115 mM, and sucrose only in the concentration of 30 mM as well. As a control, the medium of the identical hormonic content, but without carbohydrates, was used. In rooting stage, shoots were placed on media with mineral content of MS reduced at ½, IBA 1.0 and GA3 0.1 mg l-1, with 115 mM of sorbitol and fructose and 58.5 mM of sucrose.

In all three studied genotypes, sorbitol, fructose and glucose, proved to be much more efficient sources of carbon as compared to sucrose. Sorbitol used in the concentration of 115 mM had the greatest effect on multiplication of shoots of cv Lapins and pear rootstock Pyrodwarf, and fructose (115 mM) had the greatest effect on rootstock Tabel Edabriz.

The percentage of rooting ranged from 85-100% in all studied genotypes. However, the best plant quality was obtained on medium with 58.5 mM sucrose for cv Lapins and with 115 mM fructose for Tabel Edabriz and Pyrodwarf rootstocks.

P - 42

The effects of medium ingredients on shoot propagation and rooting of cherry rootstocks *in vitro*

H. Buyukdemirci

Young Plant and Seedling Test Center, 16700 Karacabey, Bursa, Turkey

Shoot apex of gisela5 grown *in vitro* were transferred onto Murashige and Skoog (MS) medium containing different concentrations of cytokinin, auxin, and agar. It was found that MS medium supplemented with 0.5 mg 6-benzylaminopurine (BAP)/l, 0.01 mg indole-3-butyric acid (IBA)/l, and 0.1 mg gibberellic acid (GA3)/l, and containing 6 mg agar/l was the best concentrations of medium for propagation of gisela5 *in vitro*. For rooting of the cherry rootstock, decreasing the MS macronutrients, especially nitrates, improved the number of rooted cuttings *in vitro*. On the other hand, for MaxMa 14 shoot multiplication was the best on MS medium supplemented with 0.5 mg BAP/l, 0.1 mg IBA/l, and 0.1 mg GA3/l; also, this rootstock rooted well on hormone free MS medium.

P - 43

Investigation of isozyme polymorphism in open–pollinated sweet cherry (*Prunus avi* L.) and mahaleb (*Prunus mahaleb* L.) seedlings

M. Şeker

University of Canakkale Onsekiz Mart, Faculty of Agriculture, Department of Horticultu Canakkale, Turkey

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

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Micropropagation of two cherry rootstocks and their behaviour in the nursery and in the orchard

C. Xilogiannis, A. Xilogiannis and E. Mpalas

Filothei, Arta, Greece

The experiments were carried out in Greece in a commercial tissue culture laboratory. Two cherry rootstocks, C.A.B. 6P (*P. cerasus*) and S.L. 64 (*P. mahaleb*), were propagated *in vitro*. Their behaviour in the nursery and in the orchard was tested after grafting with four sweet cherry varieties (B. Burlat, Ferrovia, Tragana, Van e Ziraat). Micrografting and dormant bud techniques were used.

Explants from actively growing shoots were collected from controlled virus-free mother plants and sterilized with a solution of sodium hypochlorite at 2% for 20 min. The culture medium used for the first stage was WPM, while for shoot proliferation the MS modified culture medium was used. The shoot elongation culture medium was the MS modified diversely for each rootstock. The rooting culture medium was half strength of MS containing 1mg /l of IBA for C.A.B. 6P and 2mg/l IBA for S.L. 64.

Rooted shoots were successfully acclimated and well grown in greenhouses. In nursery they reached the right sizes (8-10 mm) for grafting with dormant buds in about 3 months.

Both micrografted and dormant-bud-grafted plants presented successful results and perfect compatibility. Plants micrografted in March reached a height of 1,5-2,0 m at the end of the growing season (November). The performance of the grafted plants, in both rootstocks, was observed for the first years after planting in cherry orchards located in Northern Greece.

P - 45

Comparative assessment of growth and cropping of the sour cherry trees grafted on *Prunus mahaleb* L. seedlings and originated from *in vitro* propagation in the young orchard

L. Klaas, H. Jänes and K. Kahu

Kreutzwaldi 64, 51014 Tartu, Estonia

Growth and bearing pontential of cherry trees originated *in vitro* (TC trees) and grafted on *Prunus mahaleb* L. seedlings were compared. Three cultivars: 'Läti Madalkirss', 'Nõmme Liivakirss' and 'Kampesur' were used in the trial. The orchard was established in the spring 1998 at the Polli Horticultural Institute in South Estonia. The plant material for propagation *in vitro* and for grafting was taken from one and same mother-tree. The following characters were compared: trunk cross-section area (TCSA), yield, mass of 100 fruits, winter damage. The trees started to in fruit in 2000, all cultivars flowered abundantly, but late spring frosts killed the flowers. The first yield was obtained in 2001. It was observed that growth of TC trees was greater than the grafted trees. In the first year of cropping the higher yield was also obtained in the TC trees. Tree damages in winter 2001/2002 were more serious on grafted trees than on TC trees.

P - 46

Pomological traits variability of sweet cherry trees (*Prunus avium* L.) expanded collection of Gemer region land races.

I. Kvetko, J. Brindza, B. Stehlíková, D. Tóth and P. Brindza

In 1796 a group of Jelšava town fruitgrowers established a Sweet Cherry Association. Their main activity was focused on an intensive collecting and planting of local sweet cherry races available in the Gemer region. It resulted in monitoring and evaluation of sweet cherry trees collection comprising 159 local genotypes. The pomology analyses of fruits showed the weight values for fruit/stone in ranges of 1.5 – 8.9/02. – 0.5 g, length values in ranges of 12.0 – 23.8/8.2 – 13.2 mm and width values in ranges of 12.3 – 25.9/5.7 – 8.2 mm. From the stones study there were learned marked distinctions among the varieties. Using statistical and mathematical medthods it was confirmed, that the evaluation of stones morphological traits enables genotypes identification.

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Determination of local sweet cherry cultivars suitable for storage in alcohol for processing industry

Z. Göksel, S. Erdoğan and M. Burak

Atatürk Bahçe Kültürleri Merkez Araştırma Enstitüsü-Yalova, Turkey

Sweet cherries are grown world-wide, but the most important producer countries are; USA, Turkey, France and Italy. Turkey is in the second rank after USA in relation to world sweet cherry production.

Due to the short production period and the fragile structure of sweet cherries, especially, the industrial cultivars have to be suitably stored and be ready for marketing as well as be ready for industrial use. There are some conservation methods that enable the sweet cherry producer to conserve their product and marketing them at appropriate time.

Conserving sweet cherries in alcohol is one of the most important method for the processing cultivars. The cultivars are bleached in alcohol is one of the most important method for the processing cultivars. The cultivars are bleached in alcohol and used chocolate industry.

In this study 18 sweet cherry cultivars (Sarı, Bella di Pistoia, Karabodur, 0895 Kaman Çayırı, 0847 Geç Kara Kirtik, 0890 Aydın Kirazı, Bigarreau Napolyon, Cemal, Acı Kara, Corum, Abdullah, Bigarreau jobulay, Tabanlı, Bademli, Merton Late, Noir de Guben, Elifli, Starks Gold) which are grown at Atatürk Central Horticultural Research Institute collection orchard, were studied. Sweet cherries were stored in alcohol with % 94 and % 96 purity. Sweet cherries were put in glass jars and kept in dark room at ambient air temperature.

During the experimental period, quality changes, stone losses, total acidity, reducing sugar, pH, soluble solids and the amount of alcohol were measured periodically at the 1.5^{th}, 6^{th} and 12^{th} month of storage.

As a result of the study "Kaman Çayırı, Noir De Guben, Tabanlı, Cemal, Karabodur, Sarı, Stark's Gold, Merton Late and Geç Karakırtik" cultivars were found to be the most suitable for storing in alcohol.

P - 48

Dried fruit quality judging on different sour cherry varieties in Hungary

J. Apostol[1], P. Klincsek[2], G.Král[2] and G.Simon[3]

[1]Res. Inst. for Fruitgrowing &Ornamentals to Érd, Budapest, Park u., Hungary
[2]H-1223:/2: OMMI, Budapest, Keleti K.u.24, H-1024, Hungary
[3]"Corvinus" Univ, Hort. Faculty, Dept.Fruitgrowing Budapest, Villányi u.39-43; H-1118., Hungary

The modern consumer's habit needs new material to enrich biological complete human foods. The mueslis contain more and more art of dried fruit. The organic nutrition prefer fruit, grown in that area, where they will be consumed. Therefore we thought on cherries, because earlier, almost all kind of fruit, incl. cherries, were used to dry. First we collect all varieties of sour cherry growing in Hungary (by the National List), than they were dried similar to the dried plum. After a short storage the samples were judged, by different consumers. The aim was to know, which variety gives the best result, i.e. which variety is the most suitable to gather for dried fruit. At the judging we used the methods, worked out by the National Institute for Agricultural Quality Control in Hungary. Our work shows orders, which varieties were the best, from different point of view. (e.g. colour, size; firmness of flesh, flavour, and total score). The best varieties by total score will be shown and short characterised. The 7 best varieties from 19 were Hungarian ones. The first one is a brand new protected variety: PIRAMIS, bred in Hungary. This gives a very good size, pleasant firmness of fruit and an excellent taste.

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Double fruit formation and the occurrence of two pistils examination by scanning electron microscopy in sweet cherry

H. Engin and A. Ünal

Çanakkale Onsekiz Mart Univ. Faculty of Agriculture, Deparment of Horticulture, Çanakkale, Turkey

Pistil and two pistils (abnormal pistil) formations were examined using scanning electron microscopy. Bud samples were taken every 10 days from July to October and stored in FAA (Formalin, ethanol and glacial acetic acid). Carpel differentiation had formed by August 23. Flower primordias have single pistil (normal pistil formation), two pistils (abnormal pistil formation) and rarely three pistils. Flower primordia with abnormal pistil formation had formed three type based upon length of the two pistils. In first type, one of the pistils formed much shorter than the other. In second type, one of the pistils occurred nearly half the other. In third type, two pistils formed approximately equal. This study showed that most of the flowers with two pistils in the buds have flower primordia with equally developed pistils. In 'Van' sweet cherry in this study, the rate of flower primordia with equal length pistils was 78,4 % and the total rate of flower primordia with different length pistils was 21,5 %.

P - 50

Differentiation of flower germs in some sour cherry varieties in the region of Skopje

M. Popovska[1] and B. Popovski[2]

[1]Institute of Agriculture, bul. Aleksandar Makedonski b.b., 1000 Skopje, Macadonia
[2]Faculty of Agriculture Science and Food, bul. Aleksandar Makedonski b.b., 1000 Skopje, Macadonia

The paper presents the research results related to flower germs differentiation in sour cherry varieties Oblachinska, Shumadinka, Haiman's and Keleris 14 and the influence of some climatic factors (temperature and precipitation), as well as to the influence of the flowering period and the ripening of fruits on its beginning, duration and dynamics in the agroecological conditions in Skopje.

The differentiation dynamics is given to graphical presentation of microphenophases in differentiation of plum flower germs (A-O) made by Micic (1944).

The process begins at the end of June and continue in the period of winter rest in the second half of October or at the first decade of November in dependence of the year. It started at average daily temperature of 23.9 oC – 26.3 oC in the decade preceding the beginning of this process and developed further at temperature of 18.1 oC – 21.5 oC . The duration is from 101 day (Shumadinka) to 134 days (Haiman's). The dry period quickened the beginning but made slower the dynamics of differentiation, while the humidity period made slower the beginning but accelerated the dynamics. The germs of periants and stamens differentiate almost in the same time. The precipitations quicken the formation of carpels (middle of September).

The beginning of differentiation depends upon the time of flowering but it doesn't depend on the time of fruits ripenning. In this period varieties satisfy their needs with the necessary active temperature sum and precipitations (from 1932.5 oC and 163.3mm in Oblachinska to 2904.2 oC and 112.4 mm in Shumadinka).

P - 51

Total water content in leaves of sour and sweet cherry cultivars in eastern Serbia

R. Miletic, M. Zikic, N. Mitic and R. Nikolic

Center for Agric and Tech Research, Grljanski put b.b., 19000 Zajecar, Yugoslavia

Region of eastern Serbia is characterized with low precipitations and high air temperat during summer. The investigations of water dynamics in the leaves of sour and sweet ch cultivars grown in collection plantation in eastern Serbia were carried out in the five-year- period of time. Four standard cultivars of sour cherry and nine of sweet cherry were chose the investigation. At the end of every month during vegetation, the leaves were sampled a was determined the content of total water by drying samples at 105 0 C to their cons weight. In five years period, the monthly average content of total water in the leave different cultivars of sour and sweet cherry varied from 58.6 to 70.7 % and from 57.7 to %, respectively. The average content of total water determined in five years period in leaves of sweet cherry cultivars was higher (64.2 %) than in sour cherry cultivars (62.8 Considering fertility, greater content of total water was determined in the fruitful tha fruitless years and in cultivars with later time of mature.

P - 52

The relationship of flesh cellular morphology to fruit size in sweet cherry

J.W. Olmstead[1], A.F. Iezzoni[1] and M.D. Whiting[2]

[1]Department of Horticulture, Michigan State University, East Lansing, MI 48824, USA
[2]Irrigated Agriculture Research and Extension Center, Washington State University, Prosser, WA 99350, USA

Maximizing fruit size is critical for profitable sweet cherry (*Prunus avium* L.) production, yet little is known about cellular differences among and within cultivars that contribute to fruit size differences. Fruit size varies widely between sweet cherry cultivars, and significant variation exists among genetically identical fruit due to cultural and environmental differences. The relative contributions of flesh cell number and cell size to final fruit size in sweet cherry were determined by analyzing equatorial sections of several sweet cherry cultivars at maturity. Cells intersecting a transverse line were counted and the average cell length was calculated. The average cell numbers of 'New York 54' (1.4 g/fruit), 'Emperor Francis' (6.1 g/fruit) and 'Selah' (12.8 g/fruit) were significantly different ($P<0.05$) (27, 47, and 83, respectively). Therefore, flesh cell number is the major contributor to differences in fruit size among cultivars. To determine the components of cellular morphology that account for differences in fruit size within a cultivar, fruit from 'Bing' and 'Regina' trees exhibiting a range of fruit size (i.e., due to cultural and environmental differences) were measured. For both cultivars, average cell number was not significantly different ($P=0.9$, $P=0.3$, respectively), while average cell size was ($P<0.05$). Therefore, fruit flesh cell number is genetically controlled and potential exists to improve final fruit size, within a cultivar, by utilizing cultural practices that increase cell size.

P - 53

Influence of rootstock on branching and flowering habit on two-year-old 'Bing' sweet cherry branches in two warm climates in South Africa

A. G. Sheard[1], K. Maguylo and N. C. Cook

[1]Kwazulu-Natal Department of Agriculture & Environmental Affairs, Horticulture Section, Private Bag X9059, Pietermaritzburg, 3200, South Africa

Four-year-old sweet cherry trees were selected from commercial 'Bing' orchards in the Himeville, Kwazulu-Natal (29°44' S, 1687m, 1047 Positive Chill Units) and Fouriesburg, Eastern Free State (28°38' S, 1699m, 1180 Positive Chill units) regions of South Africa to assess the influence of rootstock on floral and vegetative growth. Two uniform, 2-year-old branches were randomly selected from each of ten trees on vigorous Mahaleb and dwarfing Gisela 5 (G5) rootstocks. Each branch was assessed for number and length of lateral shoots, number of spurs, flowers and fruit set. The results indicate that rootstock and climate influence sweet cherry flowering, spur and lateral branch development. 'Bing' on G5 developed significantly more flower buds and reproductive spurs than on Mahaleb. More flower buds developed at the base of 1-year-old shoots on G5. Only trees on G5 set a harvestable crop. Climatic differences between regions had an influence on branch architecture with the colder Fouriesburg region having a significantly more and longer shoots as well as final fruit set.

P - 54

Relationship between mean fruit weight and the ratio of fruit number to leaf area, at spur and whole-tree level, for three sweet cherry varieties

E.D. Cittadini, P. L. Peri, N. de Ridder and H. van Keulen

Casilla de Correo 88, (9100) Trelew, Argentina

Fruit weight is the main quality parameter of sweet cherries and the leaf area per fruit is the most important factor influencing fruit weight. The objective of this study was to determine the relationship between Mean Fruit Weight (MFW) and the ratio of Fruit Numbers per Leaf Area (FNLAR) for the cultivars 'Bing', 'Van' and 'Lapins', growing under tatura-trellis and vase training systems, at both spur and whole-tree level. The research was performed through regression analysis with FNLAR (fruits m-2 LA) as independent variable and MFW (g fruit-1) as dependent variable. There were no significant interactions between training system and cultivar for the effect of FNLAR on MFW at spur and whole-tree level. Also, there were no significant differences between vase and tatura-trellis training systems, probably due to the low LAI of the experimental trees (2.5 in both training systems). Coefficients of determination for the relationships per cultivar were higher at whole-tree level than at spur level. At both spur and whole-tree level, 'Lapins' had the highest Y-intercept and 'Van' had the lowest value. At spur level, no differences between cultivars were detected in their sensitivity to increments in FNLAR, but at whole-tree level 'Van' showed less sensitivity than 'Lapins' and 'Bing'. The better fit at whole-tree level suggested that fruits of a spur are not only supplied by the leaves on that spur, but also from other less fruit-loaded spurs, from non-fruiting shoots and from reserves. Different varieties required specific FNLAR to attain a target MFW. They may have different potential weight and can have different sensitivity to increments in FNLAR.

P - 55

Some fruit bearing shoots characteristics of nine sweet cherry cultivars in Hungary

S. Thurzó[1], Z. Szabó[1], J. Nyéki[1], M. Soltész[6], J. Nagy[2], J. Racskó[1], G. Drén[1], Zs. Veres[3], T. Szabó[4] and I.J. Holb[5]

[1]University of Debrecen, Centre of Agricultural Sciences, Institute for Extension and Development, H-4032 Debrecen, 138 Böszörményi Street, Hungary
[2]University of Debrecen, Centre of Agricultural Sciences, Faculty of Agriculture, Department of Land Use and Rural Development, H-4032 Debrecen, 138 Böszörményi Street, Hungary
[3]University of Debrecen, Centre of Agricultural Sciences, Faculty of Agriculture, Department of Vegetable Crops, H-4032 Debrecen, 138 Böszörményi Street, Hungary
[4]Fruit Research Station Újfehértó, H-4244 Újfehértó, 2 Vadastag, Hungary
[5]University of Debrecen, Centre of Agricultural Sciences, Faculty of Agriculture, Department of Plant Protection, H-4032 Debrecen, 138 Böszörményi Street, Hungary
[6]Collage of Kescskemét, Faculty of Horticulture, Department of Fructiculture, H-6000, Kescskemét, 1 – 3 Erdei Ferenc Square, Hungary

High crop yield, crop yield stability, and big fruit size are essential factors for the sweet cherry cultivars. Tree flower buds play an important role in the obtaining quick fruit setting and regurarly high yields.Our study was made in Siófok and in Nagykutas on nine cultivars in February 2005. Fruiting laterals were classified into four groups (0-10 cm, 10-20 cm, 20-40 cm and >40 cm) and then the density and setting of flower buds were evaluated and expressed as bud/cm.

There were large differences among cultivars in the data of density and setting of flower buds In the four-group mean of fruit bearing shoots, cv. Bigarreau Burlat (1,10 bud/cm) and cv Germersdorfi 45 (0,61 bud/cm) had the largest and the least flower bud density, respectively Among the fruit bearing shoots, the largest flower bud density was in the group of 0-10 cm fruiting laterals. Among cultivars, cv. Bigarreau Burlat had the largest bud density. In the group of 0-10 cm, 10-20 cm, 20-30 cm and 30-40 cm fruiting laterals, the least flower bud density was for cv. Linda, cv. Germersdorfi 45, cv. Ferrovia and cv. Sunburst, respectively. On cvs Van and Bigarreau Burlat, large numbers of double-set flower buds were observed on the fruit bearing shoots longer than 20 cm. On our poster, additional results on date of blooming flower-density and fruit-attachement of the different fruit bearing shoots will be presented.

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Effect of fruit number to leaf area ratio on fruit quality and vegetative growth of 'Bing' sweet cherry trees at optimal LAI

E. D. Cittadini, M. B. Vallés, J. Rodríguez, H. van Keulen and P. L. Peri

INTA - EEA Chubut. Casilla de Correo 88. (9100) Trelew, Argentina

Fruit yield and quality define the grower's income from commercial sweet cherry orchards. The objective of this study was to determine the effect of Fruit Number to Leaf Area Ratio (FNLAR, fruits m-2 LA) on Mean Fruit Weight (MFW), Firmness (F), Soluble Solids content (SS) and Titratable Acidity (TA) of 'Bing' sweet cherries growing on trees of near-optimal LAI (Mean: 3.6; CV: 20%) under a vase training system in Patagonia (Argentina). The effect of FNLAR on Mean Shoot Growth (MSG) and Trunk Cross Sectional Area Increment (TCSAI) was also analysed to determine possible competition between reproductive and vegetative growth. In the study, regression analysis was used, with FNLAR as independent variable. While MSG and TCSAI were not significantly correlated to FNLAR (P=0.369 and P=0.092, respectively), MFW, TA and SS decreased linearly with increasing FNLAR (P<0.05), at a rate of 0.02881 g, 0.0277 ml NaOH and 0.0642% per FNLAR unit, respectively. Firmness showed the same tendency, but the correlation was not significant (P=0.083). Knowledge of the relationship between fruit quality and FNLAR on trees at near-optimal LAI allows definition of target tree structures that combine high yield with favourable quality to maximise gross income of the orchard.

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Physiological response of sweet cherry to chemical blossom thinners

O. Lenahan and M. D. Whiting

Washington State University, Irrigated Agriculture Research and Extension Center, 24106 N Bunn Road, Prosser, WA 99350, USA

Previous research in our lab has shown great potential for reducing crop load and improvin fruit quality in productive sweet cherry (*Prunus avium* L.) orchard systems by chemicall thinning blossoms. Although the mode of action of chemical thinning agents is unclear, on likely mechanism is the reduction in net carbon balance and supply of growth resources t developing fruit. Our work has investigated the physiological response of sweet cherry t various chemical thinning agents to better understand thinner efficacy and develop successful thinning program. In 2004, we applied 4% vegetable oil emulsion (VOE), 1% tergitol, 2% ammonium thiosulphate (ATS), and 2% fish oil + 2.5% lime sulphur (FOLS) by ai blast sprayer to 9-yr-old 'Bing'/ 'Gisela ®5' sweet cherry trees at ca. 20% and 80% full bloom Leaf gas exchange, leaf SPAD meter readings (related to chlorophyll content), and fruit qualit were evaluated. Tergitol, VOE, and FOLS suppressed photosynthesis by ~26%, 21%, an 19%, respectively ten days after application. Similarly, all treatments reduced SPAD mete readings 14 days after application, with tergitol and VOE showing the greatest reductio (~18% and 10%). However, in 2004 there was no relationship between phytotoxicity an thinner efficacy.

This paper will also report on detailed physiological analyses to be conducted in 2005 for 14-day post-bloom thinning treatment in addition to applications during bloom. Specificall leaf gas exchange and chlorophyll fluorescence will be measured prior to, and followin thinner application; leaf area expansion and chlorophyll content will also be reported.

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Cherry tree response to Hydrogen Cyanamid treatment under low chilling conditions

G. Lemus

INIA, La Platina, Chile

During three seasons Hydrogen Cyanamid (H C) on cherry trees was evaluate, in different locations, at Elqui, Limarí, and Choapa valleys in Chile. Winter whether conditions in those areas are warm and, although chilling accumulations varies from 150 to 800 chilling hours, depending the altitude along the valley. High temperatures during daytime induce a negation in the real accumulation of chilling hours. Brooks and Newstar cherry trees were treated with 1.25% H C plus 2% mineral oil, along the winter time, in order to compare bloom advance,- flowering development, and fruit set. In all the seasons under trials, control trees showed late flowering and a long period of bloom, so fruit development was accompanied of developing flowers. CH treatments advanced up to 60 days full bloom and shortened flowering period in the half of the time required by control treatments. Fruit set was not dependant of flowering time or CH treatment. The most important factor for fruit set was air relative humidity level. Where RH was more than 40% during bloom fruit set was higher than areas whith lowere RH. Our results showed that CH is a proper tool for advance and concentrate cherry bloom. A minimum level of chilling accumulation is required for a cherry tree bloom adequate response.

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Hydraulic conductance determination and its components in field grown mature sweet cherry trees

R. Oyarzun[1,2], M. Whiting[3] and C. Stockle[1]

[1]Biological Systems Engineering Department, Washington State University, Pullman, WA 99164, USA
[2]Centro de Estudios Avanzados en Zonas Aridas, Benavente 980, Casilla 599, La Serena, Chile
[3]Irrigated Agriculture Research and Extension Center, Washington State University, Prosser, WA 99350, USA

As a fundamental step towards modeling soil water extraction, canopy hydraulic relationships, orchard water use, and designing efficient irrigation strategies, we evaluated the components of hydraulic conductance (K) of mature sweet cherry (*Prunus avium* L.) trees in situ. In June, 2004, K of 10-year-old 'Bing'/'Gisela® 5' trees was determined, from concomitant measurements of whole canopy gas exchange and leaf (sunlit and shaded) and stem water potentials (y). Measurements were taken prior to, and following fruit harvest. Leaf water potential of sunlit leaves was lower (0.4 MPa) than shaded leaves, reaching minimum values around -2.3 MPa. Total daily tree transpiration was similar on each sample date, about 50 l/tree/day (ca. 80 mol/m2 leaf area/day). Mean tree conductance was 60 ± 6 mmol s-1 MPa-1. The soil-root component was estimated to be 100 ± 20 mmol s-1 MPa-1, while the stem-leaf component was higher at 150 ± 50 mmol s-1 MPa-1. These results are comparable to those reported for other tree fruit species and confirm previous reports that soil-root interface and leaf-stomatal conductance are the limiting factors controlling water transport. We observed a slight trend of decreasing conductance as season progressed, and a weak pattern of hysteresis in the daily relationship between whole-canopy E vs. y, suggesting that water storage within the tree is not a significant component compared with transpiration and tree water balance.

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Growth performance of sweet cherry cultivars on five rootstocks in three locations

V. Cordeiro[1], A. Santos[2], A. Bento[3], R. Ribeiro[1] and J. L. Lousada[4]

[1]CETQ, Quinta do Valongo, Direcção Regional de Agricultura de Trás-os-Montes, 5370–087 Carvalhais-MDL, Portugal
[2]CECEA, Departamento de Fitotecnia, Universidade de Trás-os-Montes e Alto Douro, Ap. 1013, 5001–911 Vila Real, Portugal
[3]CIMO, Departamento de Fitotecnia, Escola Superior Agrária de Bragança, Quinta de Stª Apolónia, Apartado 172, 5300-855 Bragança, Portugal
[4]CEGE, Departamento de Florestal, Universidade de Trás-os-Montes e Alto Douro, Ap. 1013, 5001–911 Vila Real, Portugal

The effects of several rootstocks upon the growth of the sweet cherry cultivars 'Burlat', 'Summit' and 'Van' were investigated during the first six years at three locations of Northern inland Portugal: Bragança, Mirandela and Vila Real. The aim of the work was to test and select appropriate rootstocks for the local conditions, and to study the influence of budding height on tree growth. The trials were set up in 1999, the rootstocks being Edabriz, Gisela 5, Maxma 14, Cab 11E and *P. avium* (Mazzard). The experimental design is a double split plot, in randomised blocks, with two replications: rootstocks are assigned to the main plots, cultivars to the sub-plots, and budding heights to the sub-sub-plots; there are two plants per experimental unit in each replication. Tree trunk diameter was annually recorded from scion formation (raising) in the nursery to the end of the 6th leaf in the orchard. In all locations, the rootstock was the factor that influenced most plant growth, ranking from 18 – 28 (Gisela 5), 32 – 47 (Edabriz), 54 – 70 % (Cab 11E) to 78 – 90 (Maxma 14) of the trunk cross sectional area (TCSA) of the Mazzard. At the 6th leaf stage, more than 70% of the expected variance was attributable to rootstock, and only 5% to budding height, similar results being noticed on the three locations. No suckering was observed on Maxma 14, and very little on Gisela 5 and Edabriz, which contrasted with the excessive number of suckers on Cab 11E. Cultivars 'Van', 'Summit' and 'Burlat' had similar growth. Rootstock * cultivar interactions resulted in a wide range of vigours: the trees of the cultivar 'Van' on *P. avium* roots attained the maximum TCSA. Concerning total shooting, *P. avium* showed the strongest main stem and branch shooting, but tree shooting suffered a dramatic reduction on Edabriz and Gisela 5. Some tree deaths occurred under the hardiest conditions of Bragança. As expected, cultivar 'Van' attained the highest productivities on all the rootstocks, mainly on Gisela 5 and Edabriz, where fruit size can decrease too much and become unsuitable for trading.

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Incidence of brown rot blossom blight and fruit rot of sour cherry cultivars in organ sour cherry production in Hungary

I.J. Holb[1], S. Thurzó[2], T. Szabó[3], M. Soltész[5], J. Nyéki[2], G. Drén[2], J. Racskó[2], Zs. Veres[4] a Z. Szabó[2]

[1]University of Debrecen, Centre of Agricultural Sciences, Faculty of Agriculture, Department Plant Protection, H-4032 Debrecen, 138 Böszörményi Street, Hungary
[2]University of Debrecen, Centre of Agricultural Sciences, Institute for Extension a Development, H-4032 Debrecen, 138 Böszörményi Street, Hungary
[3]Fruit Research Station Ujfeherta, H-4244 Ujfeherta, 2 Vadastag, Hungary
[4]University of Debrecen, Centre of Agricultural Sciences, Faculty of Agriculture, Department Vegetable Crops, H-4032 Debrecen, 138 Böszörményi Street, Hungary
[5]College of Kecskemét, Faculty of Horticulture, Department of Fructiculture, H-60(Kecskemét, 1-3 Erdei Ferenc Square, Hungary

Brown rot blossom blight and fruit rot incidence were evaluated on three sour cherry cultiva (Kántorjánosi, Újfehértói fürtös, Érdi bőtermő) in an organic sour cherry orchard in Hungary 2003 and 2004. Trees were grown according to the organic fruit production guidelines a small untreated plots were set up for each cultivar in both years. Blossom blight and fruit was the highest on cv. Érdi bőtermő in both years. In 2003 both blossom blight and fruit incidences were low even in the untreated plots (less than 15 % and 5 % respectively). 2004 brown rot incidence reached 55 % for blossom blight and 25 % for fruit rot in t untreated plots. Blossom blight incidence was 1.5-2 times higher on cv. Érdi bőter compared to cv. Kántorjánosi or cv. Újfehértói fürtös. During 80 % of the blooming period cv. Érdi bőtermő, weather was rainy and cold, therefore, it resulted in severe blossom a serious twig blights in the untreated plots (up to 55 %). The damage was half in the pl which were treated with three fungicide applications during the blooming period. Fruit incidence was highly related to rainfall during the fruit maturity time in 2004. Right before t harvest of Érdi bőtermő, due to an intensive rainy period, about 35 % of fruits were cracke which resulted in up to 25 % infection of Monilinia laxa on the harvested fruit. Fruit incidence was only up to 5 % on cvs. Kántorjánosi and Újfehértói fürtös.

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Virus and virus-like problems of cherries in East Mediterranean region of Turkey

K. Caglayan, M. Gazel and C. Ulubas

Mustafa Kemal University, Agriculture Faculty, Plant Protection Department 31034 Antakya, Turkey

A survey has been conducted in sweet and sour cherry plantations during early spring and autumn between the years of 2000-2003 in the East Mediterranean province of Turkey. A total of 240 sweet and 73 sour cherry samples having virus like symptoms were collected from both commercial orchards and varietal collections. All samples were tested for the presence of *Prunus* necrotic ring spot virus (PNRSV), Prune dwarf virus (PDV), Plum pox virus (PPV) and phytoplasmas. ELISA tests showed that PDV was very common with the infection rate of 10.83 % on sweet cherry trees but no infection was found on sour cherries. PNRSV was not detected on both sweet and sour cherries. Only one sweet cherry plant was found infected by PPV according to ELISA tests but PCR analyses didn't react positively. Phytoplasma–like symptoms were observed but no infection was detected by PCR.

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The impact of integrated pest management (IPM) on sweet cherry orchards in Marmar region

G. Çetin, C. Hantaş, M. Burak and S. Soyergin

Atatürk Central Horticultural Research Institute Yalova, Turkey

The study was conducted in order to minimize the use of pesticides and their undesirable sid effects while keeping pest populations at low levels .

The study was carried out on 13 sweet cherry orchards selected from Bilecik, Bursa, Kırklare Kocaeli and Yalova provinces in 2001-2004.

Cherry fruit fly (CFF) (R. cerasi) was found as the main pest. S. laxa was most importa disease. On the other hand occasionally occurrence of minor pests were: A .rosanus, viennensis, M. cerasi, H.nubiferana, R. nanella, P. oleae. Whereas, Chrysopha sp. / bipunctata, C. semtempunctata, P. quatuordecimpunctata, A. fasciatopunctata, Scymnus sp and Syrphus sp. were found as beneficial insects.

Due to the IPM application; while the rate of wormy fruit produced by CFF on IPM orchard was on an average, 0,2% , 0,1% , 0,091 % 0,14% in 2001 to 2004, but this rate was 13,9% 8%, 3,22%, 12,2% on control orchards respectively. The population of harmful species ar spraying number were reduced. Population and species of natural enemy increased. F minor pest such as; Leaf roller, (A. rosanus L.), Black cherry aphid (M. cerasi F.) E. hir (Poda) any special chemical was not used. Cultural measures were applied or we integrated along with control of CFF. Product obtained from IPM orchards brought incon more than orchards which were directed conventionally.Physiological disorders we determined by leaf and soil analysis. In this way farmers applied proper fertilisers. Wee control was made mechanically. The questionnaires were obtained from 18 farmers and da were evaluated . During study 84 technical personnel and 62 farmer were trained.

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Cherry pests, diseases and its control in Italy and Bulgaria

P. Cravedi[1], F. Molinari[1], M. Borovinova[2] and I. Sredkov[2]

[1]Instituto di Entomologia e Patologia Vegetale – Universita Cattolica del S.Cuore, Piacenza, Italy
[2]Institute of Agriculture, 2500 Kyustendil, Bulgaria

Cherry production in Italy can have a particularly relevant economic importance in some areas, where it is a typical crop. The pests that require to be controlled are cherry fruit fly (Rhagoletis cerasi), Myzus cerasi, Caliroa cerasi and some species of Lepidoptera.The cherry fruit fly (Rhagoletis cerasi), is the key pest and its control is difficult, especially in organic farming and in hilly areas. Control measures include etofenprox, trichlorfon, formothion and dimethoate applied spraying the whole canopy; the latter product can be applied also in baits; a new control method, based on covering the trees with a net, proved to be completely effective. One bacteria and 7 fungi species infect sweet cherry and cause damages in Kyustendil region, Bulgaria.The key disease is cherry leaf spot (Blumeriella jaapii). Cherry leaf spot is controlled by postinfection treatments at integrated plant protection and by protective treatments at conventional plant protection with ergosterol biosynthesis inhibitors and dodin. Twenty pests are permanent species which use cherry tree for host in Kyustendil region and in some situations its developed causing real infestations. The key pest is cherry fruit fly (Rhagoletis cerasi). Cherry fruit fly is controlled by treatments independently of density in orchards with conventional plant protection and on based on biological threshold in orchards with integrated plant protection.The number of treatments for controlling key disease cherry leaf spot (Blumeriella jaapii) and key pest cherry fruit fly (Rhagoletis cerasi) can be reduced by postinfection treatments and on based on biological threshold.

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Preliminary studies on the detection of phytoplasmas in cherry by microscop techniques

G. Sertkaya

Mustafa Kemal University, Antakya, Turkey

Some symptoms consisting of growth reduction, leaf chlorosis, thin shoots with wilted leave die-back and decline have been observed on sweet cherry (*Prunus avium* L.) trees in Easte Mediterranean Region of Turkey in many years. Symptomatic plants were inspected in th field conditions. Shoot and leaf samples were collected from affected trees in sweet cher (*Prunus avium* L.) orchards in Adana in early spring and late summer in 2004 for detection phytoplasma infections by fluorescence and electron microscopy techniques. Small bits stems taken from symptomatic plants were stained with DAPI and examined with a epifluorescence microscope. Ultra-thin sections of midribs were examined under transmission electron microscope (TEM). Total 11 samples collected in late summer perio tested with both techniques, 3 samples reacted positive by DAPI test. Only, 1 DAPI-positi sample was detected positively by TEM analyses. Demonstration of the presence phytoplasmas-like bodies in sieve tubes was not easy, because the many of them collapse No typical fluorescence was detected in the sieve tubes of the shoot samples taken from t same trees in early spring. Although, the number of the positive samples was not in a hi level among the detected trees, according to symptoms observed and to fluorescen microscopy results, it is suggested that the causal agent of the disease in cherry samples is phytoplasma. The results obtained from TEM analyses confirmed the presence phytoplasma-like bodies in sieve tubes of the samples. This is the first report of phytoplasr in cherry trees in Turkey based on microscopy techniques. The studies on the detection of t pytoplasmas by molecular techniques are in progress. Further investigations are a necessary to have more knowledge of the distribution and natural transmission of the relat agent/s in sour and sweet cherry varieties in Turkey.

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Serological detection of some viruses in cherry rootstocks in the Eastern Mediterranean Region of Turkey

G. Sertkaya

Mustafa Kemal University, Antakya, Turkey

The seedlings of cherry rootstocks were inspected in the field conditions, and shoots and leaves samples were collected from susceptible seedlings in the rootstock blocks of two nurseries in the Eastern Mediterranean Region of Turkey in autumn in 2004 and in early spring in 2005. Total of 52 samples collected from seedlings obtained by seed germination and 43 samples taken from the rootstocks propagated by cuttings were investigated for apple chlorotic leaf spot trichovirus (ACLSV), apple mosaic ilarvirus (ApMV), cherry leaf roll nepovirus (CLRV), prune dwarf ilarvirus (PDV), prunus necrotic ringspot ilarvirus (PNRSV) and plum pox potyvirus (PPV) by using DAS-ELISA. Although the seedling samples were tested negative for all the detected virus infections, six out of 43 cutting samples were found to be infected with ACLSV (1 sample), CLRV (1 sample), PDV (3 samples), PNRSV (2 samples). No PPV or mix-infected sample detected from the samples collected from cherry rootstock blocks in the nurseries. The samples tested positively for different viruses were also investigated by biological indexing by using herbaceous indicators. Different symptoms as chlorotic leaf spot, yellow mosaic and leaf deformation were observed on the inoculated Cucumis sativus and Chenopodium quinoa test plants. However, the using of the cuttings as rootstock is uncommon in the region, because of the rooting of hardwood cuttings is very difficult. The results suggest that rootstocks produced by cuttings could be main reservoirs for the most important viruses of stone fruits, if the using of cuttings derived from uncertified mother plants is become widespread for obtaining genetically uniform etc.rootstocks of stone fruits in the future.

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A preliminary survey for viruses and viroids in cherry (West Anatolia)

M. Gümüş[1], A. Myrta[2] and İ. C. Paylan[1]

[1]Ege University, Faculty of Agriculture, Department of Plant Protection, İzmir, Turkey
[2]Mediterranean Agronomiques Institute Via Ceglie 9 70100 Valenzano, Bari, Italy

Field surveys were carried out in the main cherry growing areas of West Anatolia (Turkiye) to evaluate the presence of viruses and viroids. During the surveys many trees were found with leaves showing virus-like symptoms: i.e. mosaic, deformation, vein banding, vein curling and shot holes. Even that less frequently, trees showing stunting and dieback were encountered also. Viruses checked by ELISA and sap transmission to herbaceous plants were Plum pox virus (PPV), Prune dwarf virus (PDV), Prunus necrotic ringspot virus (PNRSV), Apple chlorotic leaf spot virus (ACLSV), Apple mosaic virus (ApMV) and Cherry leaf virus (CLRV), whereas the presence of Peach latent mosaic viroid (PLMVd) and Hop stunt viroid (HSVd) was tested by tissue-printing molecular hybridization. 44 (29,7 %) of cherry samples were found infected from at least one virus out of 148 tested in ELISA (106 from Kemalpasa-İzmir; 32 from Sultandag-Afyon; 10 from Saphane-Kütahya). The identified viruses were: PDV, PNRSV, ACLSV, ApMV, CLRV and, among which PDV was the predominant one. 40 samples were tested for viroids, but none of them was detected.

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Cicadellidae (*homoptera*) fauna of ecologically managed cherry orchards of Western Turkey

S. Tezcan[1], U. Zeybekoglu[2] and B. Simsek[1]

[1]Department of Plant Protection, Faculty of Agriculture, University of Ege, 35100 Bornova, Izmir, Turkey
[2]Department of Biology, Faculty of Science, University of Ondokuz Mayıs, Samsun, Turkey

The most important cherry production areas of western Turkey is in the provinces of Izmir and Manisa. Among the many other insect species, leaf-hoppers (Homoptera: Cicadellidae) retain great importance because of sucking the plants, laying their eggs and as being a vector of some plant diseases.. Although detailed studies have been carried out extensively in other fruit trees or field crops, there is not any detailed study carried out related to leaf-hoppers in cherry orchards in Turkey. This study has aimed at drawing the attention to leaf-hopper fauna in the cherry orchards. This study has been conducted in three ecologically managed cherry orchards in the provinces of Izmir and Manisa during the years of 1998 and 1999. At the end of these studies 28 species belonging to 21 genera have been determined. Their population fluctuations have been given for each orchard and their importance for cherry orchards have also been discussed in this presentation.

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Detection of Hop Stunt viroid in sweet and sour cherry trees in Turkey

M. Gazel, C. Ulubas and K. Caglayan

Mustafa Kemal University, Agriculture Faculty, Plant Protection Department, Antakya-Hatay, Turkey

During a survey for the evaluation of the sanitary status of sweet and sour cherry trees in Turkey, 127 samples were collected from 36 varietal collections of mother blocks and commercial orchards except from The East Anatolia Region of the country. All samples were tested for the presence of Hop stunt viroid (HSVd) by RT and PCR. Total nucleic acids were extracted from about 500 mg leaf tissue of each sample according to Astruc et al. (1996). As a result of PCR tests, HSVd infection was detected in 21 samples. Among the 21 HSVd infected trees, 5 plants were sour cherry (45.45% infection rate) and 16 plants were sweet cherry (13.79% infection rate).

Presence of HSVd represents a serious threat to the stone fruit tree industry of the country. Considering the economic impact of this pathogen on the industry in many countries, it is desirable to extend our surveys to evaluate impact on fruit production.

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A general evaluation on the fauna of cherry orchards of Turkey

S. Tezcan and N. Gulpercin

Department of Plant Protection, Faculty of Agriculture, University of Ege, 35100 Bornova, Izmir, Turkey

Cherry is an important fruit in Turkish economy and some sort of research have been conducted particularly on the role of some pests, natural enemies and other organisms in neutral character in cherry orchards. The objective of this study is to enlighten the fauna of cherry orchards in the light of previous research carried out. The results of studies conducted in Turkish cherry orchards and also further studies needed in this field will be discussed in this presentation.

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Traditional cherry growing in Amasya in Turkey - A brief overview

H. Demirsoy and L. Demirsoy

OMU., Agricultural Faculty, Horticulture Department, 55139-Kurupelit, Samsun, Turkey

The sweet cherry is apparently native in some parts of Northern Turkey. Cherry is grown in some passageway regions between the Central Anatolia and the Black Sea region such as Amasya and Tokat. Amasya, between 39 and 40° N latitude, is one of the major cherry production centers in Turkey. The altitudes of Amasya is 412 and 755 m. These areas have terrestrial climate.

In Amasya, cherry growing is traditionally made. Sweet cherry orchards have a cultivar diversity, the cultivars have scattered in different orchards. Cherries are generally grown on mahaleb seedlings. Cherry trees are of high height. They can not be pruned generally. In the region, dwarf cherry rootstock has not been used, yet. Irrigation is made by furrow irrigation system.

In the region, there are about 40 cherry cultivars. All of them, ripening is between third week of April and second week of July. The earliest ripening is 'Turkoğlu' (about April 25) followed by 'Karakiraz', 'Köroğlu' and 'Tabanıyarık' while the latest ripening is 'Geçkiraz' (about July 10). Although their fruits are small, the earlier cultivars such as 'Türkoğlu', 'Karakiraz', 'Köroğlu' and 'Tabanıyarık' are economically important because of early ripening.

The average fruit weight varied from 8.9 to 2,7 g. Local cultivars in Amasya are preferred by some cherry processing companies to use in chocolate and confectionary industry due to the small fruits of them.

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Cherry situation in Albania

D. Baki

Ministria e Bujqesis dhe ushqimit. Tiran, Albania

Actually, in Albania the area under the cultivation of cherry (Cerasus avium. L) is restricted. The land and climatic conditions of Albania are suitable for the cultivation of it. The largest districts, with good possibility, are around Tirana, Gjirokastra, Korça, Dibra and Shkodra. Actually, in our country, there are about 450 000 cherry's trees, by these 240 000 cherry trees are cultivated in blocks. In the production are about 370 000 trees, with average yield is about 16.7 kg per tree. Total production is about 6260 ton, by this 2840-ton per fresh consumption and 3420 ton per industrial processing. Production starts in the first decade of May and continues until August, with a concentration between Jun and July. The use of cherry grafted saplings to propagate plants is the traditional method of growing in Albania. Planting distance of cherry three is 6-8 m between rows and 4-6 within the row (300-500 threes/ha). The last years some farmers are using the low volume trees and drip irrigation and drip fertigation to achieve high yields of marketable cherries per hectare. Mainly are distributed the following autochthons cultivars: "Black Belica", "Red Belica", "Black Cualle", Red Cualle", "Bukje", and "Dollmas", etc. and imported cultivars that can be originated from Italy: "Precoche di Mercato", "Bigareau Moreau", "Celeste", "Van", "Durano Nero il di Vignola", "Ferrovia", Bella Di Pistoja", "Bigare", "Napoleon", etc. Some varieties or ecotypes have limited distribution and often take their name from the area where they are cultivated, such as "Zhitom". In some cases, the same variety can be called with different names in different regions. To enlarge and improve the cherry market, researches are needed to:

- improve the variety structure , according to cultivation zone ;
- develop suitable field technologies for the production of quality cherries ;
- improve the propagate material and the techniques of sapling production;
- characterize cultivars for the content of their biochemical substances in order to assess their suitability for fresh consumption and processing industries;
- to work together with regional partners for increasing level of using Albanian genetic resources.

This poster paper gives an overview of the current status and some problems of production of cherry in Albania

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The role of extension in production of cherry in Lavasan Township, Iran

M. Chizari

P.O.Box 14155-4838, Iran

Cherry production has a long history in Iran. Lavasan because of its climate is a centeral producers of cherries. Obviously, Extension-Education provided to cherry producers regarding latest technology available can have a significant value both in terms of quality and quantatity of cherries. This study will explain the important of cherry production in the Township of Lavasan, its history, as well as examining the most effective and efficient Extension-Education agent can develop and deliver educational programs.

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Sour cherry research and production in Serbia and Montenegro

R. Cerovic and S. Radicevic

Agricultural Research Institute Serbia, Fruit and Grape Research Centre Cacak, Yugoslavia

In the structure of fruit growing of Serbia and Montenegro the sour cherry ranks third with 8,8 million trees of productive age and fruit harvest of 86.932 t, according to statistical data for 2003. About half of production, mostly in deep-frozen state, is being exported, the rest is for human consumption, while the little part is used in industry. Four our country, sour cherry represents, following raspberry, the most important fruit species intended for export. The production is largely extensive, with the assortment in which cv. Oblačinska and spontaneously spread cv. Cigančica are prevailing cultivars with more than 85%, while the rest make large fruits cvs sour cherries. Untill now in Serbia and Montenegro three kinds of large fruits cultivars sour cherries have been created: Čačanski rubin, Šumadinka and Lara.

The paper presents the most important results on breeding and introduction of sour cherry as well as bio-pomological characteristics of more recent cultivars which are being grown in Serbia and Montenegro. Also, a detailed sour cherry production balance in our country for the period from 1999-2003 is included herein.

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Improvement of intensity of cherry production using phytotechnical methods

K. Király

Department of Fruit Production, Centre of Agricultural Sciences, University of Debrecen, Hungary

Quality-centered and environmentally-friendly fruit production requires the establishment smaller sized trees and high density plantations for almost every fruit species.

By applying smaller crown sizes and intensive growing techniques, many advantages can identified compared to extensive type orchards.
For example:

- nursing/pruning and harvest work can be performed more effectively
- improvement in the outer and inner quality parameters of the fruit
- effectiveness of plant protection is improved,
- the smaller size make the application of technologies (e.g. crop safety: hail, rain, bird netting) possible, resulting finally in
- an increase in productivity

The introduction of smaller trees poses a particularly great challenge to cherry production.

Trials of dwarfing rootstocks have not yet been successful, therefore we must use the Mahaleb rootstock, which is excellently adaptable to the Hungarian environment, but ha stronger growth.

Then again, for the necessary regeneration of the productive parts of cherry cultivars, ther a need for rootstocks with such strong growth.
At the research garden of the University of Debrecen in Pallag, we planted 21 cherry culti on cv. Mahaleb rootstock in a 4 m x 1 m spacing pattern in the spring of 2000.

In our study, we demonstrated the possibilities, in terms of growth, bud and fruit formatio developing and maintaining the string spindle (super spindle) through pruning (repe summer pruning).
Based on these parameters, we determined which cultivars should be recommended for, which were obtainable for the application of, intensive technology.

P – 77

Mineral composition of sweet cherry orchards in Çanakkale and applying GIS (Geographical Information System) for determination of local distributions

M. Şeker, Z. Yücel, H. Özcan and S. Ertop

University of Canakkale Onsekiz Mart, Faculty of Agriculture, Department of Horticulture, Canakkale, Turkey

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.

P - 78

Effect of N-phenyl-phthalamic acid and fertilization on flowering, fruit setting and fruit quality parameters of sweet cherry

S. Thurzó[1], J. Racskó[1], Zs. Veres[2], M. Soltész[5], Z. Szabó[1], J. Nyéki[1], G. Drén[1], T. Szabó[3] and I.J. Holb[4]

[1]University of Debrecen Centre of Agricultural Sciences, Institute for Extension and Development, 4032 Debrecen, Böszörményi út 138. Hungary
[2]University of Debrecen, Centre of Agricultural Sciences, Faculty of Agriculture, Department of Vegetable Crops, H-4032 Debrecen, 138 Böszörményi Street, Hungary
[3]Fruit Research Station Újfehértó, H-4244 Újfehértó, 2 Vadastag, Hungary
[4]University of Debrecen, Centre of Agricultural Sciences, Faculty of Agriculture, Department of Plant Protection, H-4032 Debrecen, 138 Böszörményi Street, Hungary
[5]College of Kecskemét, Faculty of Horticulture, Department of Fructiculture, H-6000, Kecskemét, 1-3 Erdei Ferenc Square, Hungary

On five sweet cherry cultivars (Bigarreau Burlat, Germersdorfi, Hedelfingeni óriás, Katalin, Van), the authors studied the influence of N-phenyl-phthalamic acid combined with fertilization on flowering, fruit setting and fruit quality in 2003-2004. Nutrient application was carried out in winter and the N-phenyl-phthalamic acid in 50% flowering state of trees both year. Application of the regulator was increased the working life of stigma and supported the better pollination. Research results showed, that the date of flowering was deferred 2,5 days on average in treatments. Moreover, the fruit setting increased in many cases when N-phenyl-phthalamic acid was applied. The nutrient supply could enlarged the fruit setting too, however its effect was low. The increase of fruit setting was not in close relation to increase of yield in all cases, because fruits were frittered away or dropped from the tree as a consequence of oversetting in certain cases.

Quality parameters determined by fertilization and fruit number per tree. For example, when N-phenyl-phthalamic acid was applied without fertilization, fruit number per tree increased considerably, however it caused a significant frittering away. Increase of fruit weight was considerable on all cultivars when fertilization was applied without auxin sinergistic preparation. However fruit weight decreased when N-phenyl-phthalamic acid was applied without fertilization. In this case the fruit set was high and fruit received not enough nutrition for growing up. Similar tendency was found for the diameter and height of fruit, but differences among cultivars were very little. The soluble solids contant was decreased in several cases by the tretments.

P - 79

Fertilizer supplies to different sweet cherry varieties by Szucs' Method

V. Ughini and A. Roversi

Istituto di Fruttiviticoltura- Facoltà Agraria-Università Cattolica S. C.-Piacenza, Italy

A problem that fruit grower often faces is the determination of fertilizer quantities to apply to satisfy both needs for a high quantity of high quality fruit and eco-environmental aspects. In this regard, although it is very important to know the quantity of macronutrients an orchard extracts from the soil, this alone is not enough to determine the right amount of fertiliser that growers have to apply every year. Among the available solutions, one of the most reliable and effective is the Szücs algorithm. The algorithm considers many parameters including the quantity of mineral elements the fruit grower removes from the orchard, leaf mineral diagnosis and physical and chemical characteristics of the soil. In this work, Szücs algorithm was applied to data from a sweet cherry orchard in order to calculate the quantity of N, P_2O_5 and K_2O in Kg per hectare per year to be supplied through mineral fertilisation to 8 sweet cherry varieties grown in South of Italy.The quantities of the 3 nutrients to be replaced vary greatly according to cultivar and the difference seems to be related both to the yield and leaf mineral composition.

P - 80

Influence of genotype, year and soil composition on mineral leaf composition of sweet cherry

A. Roversi, V. Ughini and A. Monteforte

Istituto di Fruttiviticoltura- Facoltà Agraria- Università Cattolica S.C.-Piacenza, Italy

The nutritional status of a cherry orchard located in the Bari area was monitored by means of mineral leaf composition. Leaf analysis was made over a 13-years period started from the first growing season in 15 sweet cherry cultivars grafted onto 6 different rootstock (Colt, Mahaleb, seedling, ICAP 40, Mazzard and SL7). Foliar nutritional data are also completed with soil mineral composition. First results have confirmed the great variability of mineral leaf composition in every parameter considered, i.e. genotypes, tree age and rootstock.

P - 81

Growth and productivity of the sweet cherry cultivar Van under different soil management systems

V. Tasseva

Institute of Agriculture, Kyustendil, Bulgaria

The study was carried out in an experimental sweet cherry plantation, established in the spring of 1991 at the Institute of Agriculture - Kyustendil, Bulgaria on leached cinnamonic forest, moderate to heavy sandy-loamy soil. It was found that the trees grown under the conditions of permanent fallow, combined with N10, had the best vegetative characteristics. The rye-peas mixture, grown and used as green manure and especially as an interrow crop, reduce the trunk growth and crown volume of the trees. It was most strongly manifested after the fertilization with N10.

It is established that the yield was the highest under fallow with green manure every tree years and annually application of N20. The growth of interrow crop reduced the yield, especially under fertilization with N10.

P - 82

Improved technology for growing of cherry

V. Tasseva and D. Domozetov

Institute of Agriculture, 2500 Kyustendil, Bulgaria

The investigation were carried out in an experimental plantation of the Institute of agriculture - Kyustendil, Bulgaria, established in spring of 1991 on leached cinnamonic forest moderate to heavy sandy-loamy soil. There are included two cultivars, grafted on mahaleb rootstocks, and distance of planting was 5.7 m between rows and 4.5 m between trees in row.

Two levels of nitrogen fertilization - N10 and N20, applied from 1992, and tree floo management variants – permanent fallow, combined the rye-peas mixture, grown and use as green manure and as an interrow crop, applied during period 1994-2003. Three systems o shaping of the tree crown – free grown crown, crown with 5 scaffold branches and bus crown, and two variants with different height of the trunk – 40 and 80 cm, were studied.

There are suggest two technological decisions of growing of cherry orchards, based on th perennial study, which are biological and economic efficiency – fallow with organic an mineral fertilization and bush crown. A full characteristic of the technological decisions wa described.

P - 83

Micropropagated cherry rootstock "Gisela®5" growth control after greenhouse acclimation

E. M. Lodolini[1], D. Neri[1], G. Dradi[2], M. Cavallari[1], R. Roncasaglia[2] and P. Santarelli[2]

[1]Dipartimento di Energetica, Università Politecnica delle Marche, Ancona, Italy
[2]Azienda Agricola Vivai Piante Battistini s.s., Martorano di Cesena (FC), Italy

Superior biometric characteristics for fruit tree rootstocks are large collar calibre, considerable shoot lignification and sufficient plant height. Generally after the *in vitro* propagation and acclimation phase in greenhouse, multipot plants growth is enhanced through N fertilisation. Nevertheless, due to high density, overshadowing and abscission of basal leaves may reduce the whole plant quality and frequent toppings of the elongating shoots are required. The objective of the present experiment was to investigate how to increase diametrical growth and lignification of micropropagated cherry rootstock "Gisela ® 5" shoots, limiting the height of the whole plant.

Hardened plantlets of different age, grown in 60 cells multipot (50, 30 and 5 days after acclimation phase in greenhouse that takes about 30 days) were chosen for the trial, lasted from June to October. Treatments with potassium sulphate at 0,2 %, potassium phosphate + magnesium sulphate at 0,2 % and water solution (control) were weekly applied for a period of 4 months. During the fourth month of the trial, in September-October, important macro-elements like P-K were substituted with the same amount of a complex fertilizer (8:20:30) utilizing a commercial organic product (UNICAM 14, made of humic acids extracted from Leonardite in KOH, 14% of organic matter on fresh weight) at 100 ml/q.

The results showed a significant increase in height of the plants, particularly in the first month, due to the treatments compared to control, while the collar calibre did not evidenced big differences. Younger plants collar calibre grew less than that of old plants. During all the period of the trial the pH of the soil constantly increased from optimal (between 5.5 and 6.5) to higher values (between 7 and 8), with a clear negative effect on the growth rate.

P – 84

Identification of sweet cherry accessions using RAPD markers

F. Shokoohifar, F. Moshiri and A. Bagheri

Ferdowsi University of Mashhad - Research Center for Plant Sciences, Iran

Many Sweet cherry accessions are grown commercially for their fruits in Iran, that are characterized only with their morphological traits depending to the fruit shape. But, Accurate and unambiguous identification of these accessions is essential for planting Sweet Cherries Orchards and germplasm preservation. So, twelve sweet cherry accessions that are mostly planted in Iran are provided from Toos Khavaran Co. collection and tried to determine the patterns of genetic diversity within them using RAPD markers. On the basis of literature, Twenty-five primers were chosen to identify benefit markers to differentiate the accessions. Out of them, 16 primers amplified 174 loci that 90 of them were polymorph. Depend on primer used; one to eighteen polymorph fragments were amplified, with an average of 6 per primer. Eleven loci detected by 6 primers, which were unique for 6 of the accessions. The most informative loci were amplified using three primers, ubc9, ubc43 and ubc152. The genetic distances were varied from 0.41 to 0.88. All the 12 sweet cherries were differentiated with primers that will be used for fingerprinting sweet cherry accessions in Iran.

P - 85

New sweet cherry varieties and hybrids obtained in Iasi, Romania

G.I. Gradinariu, L. Petre, G. Comeanu, M.I. Istrate, C. Margareta and S. Budan

University of Agricultural Sciences and Veterinary Medicine, 3, M. Sadoveanu Alley 700490 Iasi, Romania

During 1981-2004 at Research and Development for Fruit Growing Station in Iasi-Romania, there were made 590 intra- and interspecific hybrid combinations, using 125 genitors (Boambe de Cotnari-clones, Germersdorf–clones, Van, Stella, Bigareau Moreau, Ulster, Bing, Lambert compact, Rainer, Sam, Cerna, etc.), As a result, 20500 hybrids of sweet cherry were obtained. From the biological material resulted, only between 1982-1984, five varieties of sweet cherry (Cetatuia, Maria, Catalina, Golia, Marina) and 2 of bitter cherry (Amar Maxut, Amar Galata) were homologated as new varieties. Other four sweet cherry hibrids were also proposed for homologation at I.S.T.I.S. Bucarest – Romania. (HC 830204; HC 840803; HC 840819 and HC 841703).

The quality of new sweet cherry fruits was compared with Van variety. All new varieties are competitive by a very early ripening period (Cetatuia), an early ripening period (Catalina), self-fertility (Maria), a distinctive fruits quality (Golia) and a late ripening period (Marina). All five varieties have precocity, productivity and a high quality of fruits and also a good resistance to frost, drought and specific sweet cherry diseases (antracnosis and Monilinia). Ripening period for these sweet cherry varieties is 21 May-07 July, which covers 48 days of fresh fruits crop. Golia variety has little vigor and the other 9 and the elite hybrid HC 830204 have a medium vigor. Bitter cherry varieties are qualitatively superior compared to their previous homologues, being very well adapted to ecological conditions from Northeastern Romania

P - 86

The national germoplasm genotypes used in cherry improvement and new varieties creation in Romania

G.I. Gradinariu, L. Petre, G. Comeanu, M.I. Istrate and G. Felicia

University of Agricultural Sciences and Veterinary Medicine, 3, M. Sadoveanu Alley 700490 Iasi, Romania

National cherry germoplasm collection in Iasi-Romania contains more than 550 genotypes of sweet cherry and more than 120 genotypes of sour cherry. It includes Romanian and foreign varieties and also local old and new biotypes. This represents the initial biological material for varieties improvement. The main objectives of this activity are: high productivity, high quality of fruts, little vigor, self-compatibility, resistance to soil, frost, drought, pests, specific diseases, and also fruit resistance to cracking and mechanical injury.

Lately we tried to harmonize the research methods concerning phenotype characters according to I.P.G.R.I. system, used in all European countries, in order to make compatible the database and editing the European catalogue. On the basis of the observations and determinations made in this national collection, we identified the potential genitors for different useful characteristics that we used in controlled intra- and interspecific hybridizing. The results of the utilisation of Romanian germoplasm during 1981-2004 in new cherry varieties creation, are the following: there were achieved 639 hybrid combinations out of 125 genitors, polinating 680379 flowers, obtaining 126687 hybrid fruits, extracting 87662 hybrid stones fit for sowing. 7513 of them have risen and 1650 have fructified. After the selection, 72 hybrids were choosen as elites, 33 of them being breeded and planted in competitive microorchards.

P – 87

Cancelled

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Identification of some sweet cherry cultivars grown in Amasya by RAPD markers

L. Demirsoy[1], T. Demir[1], H. Demirsoy[1], A. Okumuş[2] and Y. A. Kaçar[3]

[1]OMU., Agric. Faculty, Horticulture Department, 55139-Kurupelit, Samsun, Turkey
[2]OMU., Agric. Faculty, ZB, Biometry-Genetics Unit, 55139-Kurupelit, Samsun, Turkey
[3]CU., Agric. Faculty, Horticulture Department, Balcalı, Adana, Turkey

In this study, sweet cherry cultivars of 14 grown in Amasya were identified by RAPD (Random Amplified Polymorphic DNA) markers and the genetic relationships among the cultivars were determined. RAPD primers of 21 were screened and eleven primers produced useful amplification for PCR. Totally 68 bands (43 polymorphic) varied band size from 350 to 2800 bp were obtained. Similarity index among the cultivars and their dendogram was constructed in terms of considering the 43 markers.

The dendogram was divided two major groups. Most of the sweet cherry cultivars were settled on the first group while 'Honey Heart' was placed on the second group. Although '0900 Ziraat' was taken place on the first group, it showed to be far in terms of genetic similarity to other cultivar displayed in the first group. However, '0900 Ziraat' and 'Honey Heart' displayed a similarity of 50 per cent. The most similarity in the first group were seen in 'Haciali' and 'Camgöz' cultivars.

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S-allele investigations in sweet cherries (*P. avium* L.)

M. Schuster[1], T. Sunneveld[2] and K. R. Tobutt[3]

[1]Federal Centre for Breeding Research on Cultivated Plants, Institute for Fruit Breeding, D-01326 Dresden, Germany
[2]The University of Nottingham, Sutton Bonington Campus, Plant Science Division, Loughborough, Leicestershire LE12 5RD, United Kingdom
[3]East Malling Research, New Road, East Malling, West Malling, Kent ME19 6BJ, United Kingdom

Sweet cherries are self-incompatible, caused by a gametophytic self-incompatibility system. Two genetic factors (S-alleles) determine the fertility of sweet cherry genotypes. Dependent on the S-allele constitution of the cultivars, cross-incompatibility groups of sweet cherry cultivars exist. Those genotypes have the same S-allele constitution, are self-incompatible and can not be pollinated by each other. The knowledge about the S-allele combination of the cultivars is very important for the fruit growers and breeders. In the last time molecular methods were developed to distinguish the S-alleles in sweet cherry. The S-allele constitution was analysed in 160 sweet cherry cultivars/clones by PCR analysis (Sonneveld, 2003). In result 20 known S-allele combinations and 17 new combinations were determined. Two new S-alleles, S19 and S22, described before only in wild cherries, were identified in 5 sweet cherry cultivars.

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Results of pollination and fruit set incompatibility studies in some Romanian sweet cherry varieties

S. Budan[1], A.N. Popescu[2] and G. Gradinariu[3]

[1]Research Institute for Fruit Growing, 110012 Pitesti-Maracineni, Romania
[2]University of Pitesti, 110040 Pitesti, Targul din Vale 1, Romania
[3]University of Agricultural Science and Veterinary Medicine, 700490 Iasi, M. Sadoveanu 3, Romania

Almost a dozen of highly valuable sweet cherry varieties were released in Romania within the past two decades as result of a sustained breeding program. Some of these new varieties are already found in the recently established sweet cherry orchards. Other is expected to find soon their place alongside the foreign good at the moment varieties or even to replace some of them in commercial orchards. Due to the genetic barriers involved in reproduction and, as a consequence, to the special relations between different varieties, the profitability of the new sweet cherry orchards is not only a result of good quality of fruits, resistance to specific pests and diseases, but also of the right pattern in combining varieties according to their corresponding high yielding pollination suitability. Therefore, since 2001, an extensive study was initiated with the aim of establishing to which of the already known intersterility groups are belonging the new Romanian sweet cherry varieties. So far, based on the ability to form fruits by either pollinating the Romanian varieties with pollen from varieties appertain to as many as possible intersterility groups, or by using them as pollenizers, a draft of their possible belongings to one of the eighteen recognized incompatibility (intersterility) groups was made. An important finding was that many of the investigated varieties were highly interfertile when pollinated reciprocally, this indicating their different genetic background. Daria, Izverna and Superb are among the new Romanian sweet cherry varieties for which S alleles present at the locus for pollination (in)compatibility seems to become certain. Thus, based on the very low fruit set when pollinated by Jaboulay, and furthermore inability of the formed fruit to reach maturity, Daria variety could be considered as appertaining to the intercompatibility group X. Superb, another highly valuable Romanian variety, can be assigned to the same intercompatibility group with Vogue (IV), since in two consecutive years none of the several hundreds of flowers pollinated were able to set fruit. Izverna variety could also be assigned to the intercompatibility group IV.

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Selection and clonal propagation *in vitro* of Oblacinska sour cherry genotypes in Eastern Serbia

R. Miletic, M. Zikic, N. Mitic and R. Nikolic

Center for Agric and Tech Research, Grljanski put b.b., 19000 Zajecar, Yugoslavia

Obacinska sour cherry is fruit species suitable for cultivation in arid conditions of eastern Serbia. This population is heterogeneous including a numerous genotypes with diverse biological properties. Heterogenity of population creates problems in the production process, efforts have been made to select genotypes with desirable properties. Over 30 genotypes were selected from ten locations in eastern Serbia. Eight most promissing genotypes were singled out for having particularly favourable biological charachteristics: favourable begining of vegetation, flowering and fruit maturation, medium–sized fruits (3.0-3.8 g), mesocarp content (88.7-90.8 %) and good chemical composition. The selected genotypes were multiplied by clonal propagation *in vitro*. The shoots were excised from vegetative buds sampled from trees of the selected genotypes and cultivated on a multiplication medium containing modified MS (Murashige and Skoog, 1962) mineral solution and 1.0 mg L-1 BAP, 0.1 mg L-1 NAA and 0.1 mg L-1 GA3. Average multiplication rate was 3.2. Elongated plantlets were rooted on MS medium containing 1.0 mg L-1 IBA (85 %). Rooted plants were acclimated in glasshouse and then grown in collection plantation.

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Effects of 2002-2003 winter frosts on 0900 ziraat sweet cherry variety in Turkey

H. C. Sarısu, S. Kaymak and A. Aşkın

Bahçe Kültürleri Araştırma Enstitüsü Eğirdir/Isparta, Turkey

Sweet cherry productions of many countries are effected from climate conditions, especially from low temperatures. Flower buds and flowers of sweet cherry trees are damaged from low temperatures in winter or early spring,. Some of the important export regions of Turkey are Afyon, Isparta and Konya. In these production areas, the temperature was below of -15 oC through 10-44 hours in late December-2002. These low temperatures made flower buds of sweet cherry damaged in Afyon (%61,01), Isparta (%40,59) and Konya (%34,33).

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Determination of potential cherry production zones in Turkey

Y. E. Yıldırım[1], S. Kodal[1], S. Akgül[2] and M. Asar[3]

[1]Professor, Ankara University Faculty of Agriculture 06110 Dışkapı – Ankara, Turkey
[2]Agricultural Engineer, Ministry of Agriculture and Rural Affairs Ankara Research Institute 06275 Lodumlu –Ankara, Turkey
[3]Agricultural Engineer, Turkish State Meteorological Services 06110 Kalaba – Ankara, Turkey

Turkey is one of the leading cherry producer in the world and ranked as second cherry exporter country with 35 000 tons just behind the biggest exporter the USA with 40 000 tons. Although cherry can be produced in several agro-ecological regions of Turkey, intensive production areas are mainly located in western regions of the country. Developed packaging technologies both prevented several export problems and increased the demands for quality products. This increasing demand has also increased the production areas. In this study, potential cherry production areas were tired to be determined by GIS technology based on nation-wide elevation, topography, climate, and land capability classes of soils data.

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Quality certification "Cherries from South Patagonia"

E. Pugh, A. Ñancucheo and M. Winograd

INTA EEA Chubut Casilla de Correo 88 (9100) Trelew – Chubut, Argentina

The Project is a regional strategic plan of production, conditioning and marketing of high quality cherries. It is part of an international agreement between INTA and CTIFL and the basic idea is to develop a program for certification of the production, handling, storaging, packing and transporting processes. Moreover, it shows sale and marketing strategies to producers, packers and governments of the region (Chubut and Santa Cruz provinces, Argentina). The objective is to present a methodology to the productive chain and to the Provincial Governments, to get quality certifications for increasing that quality and the production process, and to identify strengths and weaknesses of the sector to develop integral strategies. The cherries from South Patagonia do not have a quality characterization. The ones that are sold in the external market are mostly handled by a small group of clients related to the big distribution and the commercial functioning of the domestic market in Argentina is unknown. The quality certification has a functioning structure administrated by the different stakeholders of the productive chain. In that project, the characterization of the product and its conditioning process was defined. In the commercial side sale prices and quality of the fruit in the domestic market were evaluated, showing very variable results. In the external market, a test shipment to a specialized wholesaler of Rungis obtained prices between 13 and 14 Euro per kg for very high quality fruit.

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Sweet cherry production in South Patagonia, Argentina

E. D. Cittadini, C. Sanz, S. E. Szlápelis, F. A. Manavella, L. S.Martino, M. Á. Cárcamo, C. A. Mundet, P. L. Per. N. Kikuchi, J. A. Ñancucheo and H. van Keulen

INTA - EEA Chubut, Casilla de Correo 88 (9100) Trelew, Argentina

In South Patagonia, the total sweet cherry area has increased from 187 ha in 1997 to 438 ha in 2005, of which 152 ha are located in the Lower Valley of Chubut River (LVCHR) (43° 16' SL; 30 m.a.s.l.), 170 ha in Los Antiguos (46° 19' SL; 220 m.a.s.l.), 52 ha in Sarmiento (45° 35' SL; 270 m.a.s.l.), 29 ha in Comodoro Rivadavia (45° 52' SL; 50 m.a.s.l.) and 35 ha in Esquel (42° 55' SL; 570 m.a.s.l.). The most common varieties are 'Lapins', 'Bing', 'Newstar' and 'Van' grafted on 'Mahaleb', 'Pontaleb', 'SL64', 'Colt' and 'Mazzard'. Trees are generally drip–irrigated, and planted at high densities, using training systems such as tatura, central leader and vase (2700, 1100 and 1000 trees ha-1, respectively). Growers in Los Antiguos are more traditional, planting mainly in vase at 400 to 1000 trees ha-1 and irrigating by gravity (74% of the area). Only 4.4% of the trees are frost protected, as growers strongly rely on the moderating effect of lake Buenos Aires. Frost control systems are absent in Comodoro Rivadavia, because the orchards that are already in the productive phase are located next to the sea, in an area with low frost risk. The frost-protected area is 49% in Sarmiento, 35% in Esquel and 57% in LVCHR. Cherry fruits are harvested from November (LVCHR) to the end of January (Los Antiguos and Esquel), and only for picking, the labour demand during the 2004/2005 season was 97500 hours. In that season, 7 packing houses exported 440 tons (45% of the total production) to Europe. Most orchards have not yet reached their mature stage and new ones are being established. Therefore, fruit volumes will continue to increase and shortage of labour and packing facilities can become a constraint.

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The white cherry production economics in farm enterprises of Ereğli province, Konya

C. Oğuz, Z. Karakayacı, K. Peker and Y. Çelik

Selçuk University, Agricultural Faculty, Department of Agricultural Economics, Konya, Turkey

In this study is examined to white cherry as obtaining new trade opportunities in Turkey. The study area is Ereğli province of Konya where grows the best quality cherry of the world and demands abroad too density. This study determines that the 40% of incomes of the examined enterprises based on white cherry and its comparative degree, as the 78%, is too high in terms of the other crops in terms of Gross Production. The gross profit of white cherry as the average of the enterprises examined is as 1.473.487.000 TL and Its ratio in the Gross Production is 86%.

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The foreign trade of white cherry and its economics value in Ereğli province in Konya

C. Oğuz, Z. Karakayacı, K. Peker and Y. Çelik

Selçuk University, Agricultural Faculty, Department of Agricultural Economics, Konya, Turk

Turkey is the most important country for cherry production in the World. Though it is the m important producer, just 3,5% of the cherry production exports in Turkey. The white ch production is increasing day by day with the respect of its foreign demand. Almost to Turkish' white cherry export is produced in Ereğli, Konya. In this study was examined current circumstances and opportunities of Turkish's trade on white cherry in Ereğli, as wel its economics value for the area economics. Italy is the most import country for the ch which is produce in the area and also, a cherry company has been established in Er White cherry export was 1 million dollar value added to the area economics in 2003. value of the cherry export in area can be increased by organization the producers.

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Growth and performance of cherry cultivars in elevated tropical regions-Oman

Y.K. Alhinai, Q.R. Auladthani and F.A. Alsuqri

Royal Gardens and Farms-Oman. PO Box 553, Code 132- Alkoud, Oman

This experiment was conducted at "Reyad Al-Jabal Royal Farm" at El-Jabal El-Akhder-Oman as a part of a regional project to investigate the growth and performance of newly imported temperate fruit crops. El-Jabal El-Akhder, the highest mountain in Oman, reaches 3000 m above sea level. It is a dry cold climate with average summer and winter temperatures of 22 and -5° C respectively. The cherry orchard was planted in 1999 with eleven cultivars grafted on the same rootstock (Mazzard- *Prunus avium*). Accumulated chilling units were calculated at different elevations to suite different cultivars. Dry cool climate, high light intensity (702-744 W/m2), and long days promote high photosynthetic rates and high dry matter accumulation. Annual shoot growth ranged from 38-54 cm in length. Tree performance, including vegetative growth, flowering, fruit set, and fruit quality, showed promising results for future work.

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Productivity of fruiting wood on slender spindle sour cherry trees

K. Hrotkó , V. Hrotkó, K. Csigai and L. Magyar

Corvinus University Budapest, H-1118, Budapest Villányi út 35-43, Hungary

Sour cherry slender spindle trees in high density orchard are suitable for production of hand picked high quality fruit, however, the mechanical harvest of those orchard is also investigated. The architecture of slender spindle tree is based on permanent basal branches and on light fruiting wood on central leader. These fruiting branches should be regularly renewed. To develop a pruning protocol for the fruiting wood renewal on the central leade more information is needed on the development and productivity of those fruiting branches Our test orchard with slender spindle trees of cv. Újfehértói fürtös was planted in spring 1998 The trees turned to bearing in 2000. In spring 2003 three fruiting branches/tree in differen thickness (thin, medium and thick) on the central leader of 40 trees were selected an marked. Length and thickness of shoot sections of different ages was measured, number c inflorescences, flowers, fruits and leaves were counted. Crop weight also was measurec Distribution of flowers, inflorescences, fruits, average fruit weight and fruit set was calculate on basis of shoot length and basal cross section area of branches.Based on the results th fruiting branches of around 10-11 mm basal diameter can be expected as most productiv ones on the central leader of sour cherry slender spindle trees. Along the fruiting branch th two- and three-year-old section are the most productive, the productivity of the four-year-o part is considerably decreasing. The largest fruit weight was achieved on the three-year-o section of the branches with 9-10 mm basal diameter. However, the largest leaf/fruit ratio wa calculated on thin shoots, the fruit/basal cross section mm^2 ratio was very high. This might b contributed to the fact that branches of medium thickness produced the largest fruit weig Branches thicker than 12 mm develop towards vegetative growth and form easily strong limbs. Based on the results the renewal of four-year-old fruiting branches is recommended pruning onto a 20-25 cm long stub. Branches exceeding the basal diameter of 12 mm, al should be pruned back to provide new shoot growth for the new fruiting wood formation.

P - 100

Use of bioregulators to hasten sweet cherry tree canopy development

T. Jacyna and E. Rozpara

University of Agriculture, ul. Leszczynskiego 58, 20-058 Lublin, Poland

Scaffold branches of 3-year old 'Summit' sweet cherry trees planted at c. 2500/ha were treated with either BA+GA4+7 (P) at 5000 mg/l disolved in latex paint or P combined with foliar application of prohexadione-Ca (R) at 200, 300 or 400 mg/l. P on its own or combined with R contributed to increase the number of laterals and their uniform distribution along treated branch (to prevent branch bareness) as compared with control; this phenomenon was especially evident on vertical branches. R did not bring about any retardation effects. No carry-over effects of either P or P+R were observed on treated branches except some reduction in the number of spurs caused by all chemical treatments in comparison with control trees.

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Gibberellic acid shows potential as a sweet cherry crop load management tool

O. Lenahan[1], M. Whiting[1] and D. Elfving[2]

[1]Irrigated Agriculture Research and Extension Center, Washington State University, Prosser, WA 99350., USA
[2]Tree Fruit Research and Extension Center, Washington State University, Wenatchee WA, USA

The widespread adoption of efficient sweet cherry (*Prunus avium* L.) orchard systems based on precocious dwarfing rootstocks will require novel crop load management strategies. This paper reports on the potential of gibberellic acid to reduce sweet cherry floral bud induction and balance fruit number and improve fruit quality in the season following application. In 2003 we applied GA3 to 'Bing'/'Gisela® 1' trees at 30, 50, and 100 mg/L at the end of stage I (of fruit development), end of stage II and on both dates. Fruit quality was evaluated in the year of application (non-target crop) and return bloom, fruit yield and quality were assessed in the subsequent season. In 2003, GA3 had no effect on fruit weight, but all treated fruit were delayed in maturity. In 2004, bloom density and fruit yield were related negatively and linearly to GA3 concentration. 30 and 50 mg/L increased the number of fruit >25.5 mm diameter by 12% and 16%, respectively. 100 mg/L improved fruit weight by 9.6% and soluble solids by 7.9%. Double applications were more beneficial than single applications. In a separate isomer trial in 2004, GA3 and GA 4+7 were applied to 'Bing'/'Gisela® 1' trees at 100 and 200 mg/L at both the end of stage I and II. Fall 2004 floral meristem and bud counts showed that GA3 and GA 4+7 (200 mg/L) reduced potential flowers per spur by 59% and 50%, respectively. Treatment effects on return bloom, fruit yield, quality, and crop value in 2005 will be reported.

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Productivity of 4 sweet cherry varieties as influenced by summer and winter pruning

A. Roversi, V. Ughini and A. Monteforte

Istituto di Fruttiviticoltura- Facoltà Agraria-Università Cattolica S.C.-Piacenza, Italy

In order to compare pruning strategies and frequencies similar to those applied by cherry growers, productivity as a consequence of combining alternatively either summer/winter pruning or both prunings was recorded in 7 consecutive years for 4 sweet cherry varieties (Colafemmina, Denissens, Drogans and Stark Glorious Gold) grown in a orchard with 8 years old trees at the beginning of the investigations In particular, for each variety 5 different types of pruning strategies were chosen combining winter (made with 2 levels of cut intensity) and summer prunings and comparing these pruning thesis to a test (never pruned trees). The negative effect on productivity seems to be related to winter and severe pruning mainly when it is associated with summer pruning. On the contrary, the effect on fruit production is positive when summer pruning is applied alone, in alternate years. However, among the tested cultivar a great variability of the yielding response is evidenced. In fact, Colafemmina and Denissens have clearly shown positive effects in case of summer pruning only, in alternate years. This was not confirmed by both other cultivars. The unpruned trees have never given the highest productivity even if it was acceptable for Stark Glorious Gold, its loss of productivity in uncut trees being only 4%.

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Is it possible to reduce Ethrel® doses and facilitate mechanical harvesting of sweet cherries?

A. Roversi and A. Monteforte

Istituto di Fruttiviticoltura- Facoltà Agraria, Università Cattolica S.C.-Piacenza, Italy

Ethrel as loosener facilitates mechanical harvest of cherries. Nevertheless, its use has some secondary negative aspects such as phylloptosis, gummosis and sometimes shoot apex phytòxicity. Even its cost is not so cheap. In order to reduce both cost and secondary negative aspects by the reduction of Etherl doses, the solution was added with substances that it is said to increase the efficiency of the loosener. At this regard for 2 sweet cherry varieties (Drogans and Denissens) grown in the South of Italy, the efficiency on fruit removal and harvest was monitored after the application of 6 different types of loosener solutions sprayed 3 weeks before the expected date of harvesting. The solutions tested on 20 trees/ thesis, with 3 replicates, were: Etherl at 1.000 ppm, Ethrel at 500 ppm, Ethrel at 500 ppm +glycerol, Ethrel at 500 ppm +ethylene glycol, glycerol, ethylene glycol; all compared with untreated trees Results have evidenced the efficiency on the removal of cherries for Ethrel at half doses wher added with glycerine or ethylene glycol. These satisfactory results are also joined to a reduction of the costs ranging from 44 to 47%.

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The influence of different rootstocks on the growth and yield of sweet cherry trees during the first four years after planting in the double row system

M. Sitarek, Z.S. Grzyb and B. Koziński

Research Institute of Pomology and Floriculture, Pomologiczna 18, 96-100 Skierniewice, Poland

'Regina', 'Sylvia', 'Lapins', and 'Summit' sweet cherry trees grafted on 'GiSelA 5', 'P-HL A' and 'P-HL B' dwarfing rootstocks were compared with trees of the same cultivars on the vigorous rootstock 'F 12/1'. The trees were planted in the double row growing system at distances of 4.5 x 2.5 + 1.5 m. The data collected included tree vigour, yield and fruit weight as well as the number of buds on each tree in the second year after planting. The results revealed that the rootstocks 'GiSelA 5', 'P-HL A' and 'P-HL B', in comparison to 'F 12/1', significantly reduced the growth of sweet cherry trees. Depending on the cultivar, trunk cross-sectional areas of four-year-old trees grafted on 'GiSelA 5' were from 22% ('Lapins') to 59% ('Sylvia') smaller than those on 'F 12/1'. 'P-HL A' depressed tree growth in the range between 43 and 49%, and 'P-HL B' from 21 to 28%. It is important to note that 'Lapins' trees, regardless of the rootstock, tend to produce branches with narrow crotch angles. No suckers under the trees have been found so far. All sweet cherry trees grafted on 'GiSelA 5', 'P-HL A' and 'P-HL B' rootstocks had a higher number of flowers than the control trees. It means that these are precocious and very early-bearing rootstocks. Cumulative yields for all of the sweet cherry trees on the dwarfing rootstocks were higher than for the control trees. Already in this preliminary period the productivity of the dwarf trees was a few times higher than that of the trees on 'F 12/1'. The rootstocks influenced fruit weight significantly. However, in the case of each cultivar the results were a little different. Generally, 'P-HL B' and 'GiSelA 5' had the best effect on fruit size.

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Pollinizer distance affects crop load of young 'Regina' sweet cherry trees

R. Nunez-Elisea, H. Cahn, L. Caldeira and A. Azarenko

OSU-MCAREC 3005 Experiment Station Dr., Hood River, OR 97031, USA

'Regina' is a self-incompatible cultivar that is gaining interest in Oregon, USA, owing to its late harvest, excellent fruit quality and shelf life and its tolerance to rain cracking. Unfortunately, yields of 'Regina' have been low compared to other cultivars grown in the region, a problem believed to be related to deficient pollination and/or pollen development. In 2004 we recorded initial yields of 4th-leaf 'Regina'/Gisela 6 trees located at different distances from 'Sam' pollinizers, both within rows and in adjacent rows without pollinizers. Trees were planted in N-S rows at 5.5 m x 3.1 m between trees. Pollinizers were planted in alternate rows at a ratio of 1:9. Trees were trained to a central leader. Within pollinizer rows, trees immediately adjacent to a pollinizer produced the highest average yields at 12.6 kg/tree. Yields decreased by 27%, 52%, 58% and 59% for trees located 2, 3, 4 and 5 trees (6.2 m, 9.3 m, 12.4 m and 15.5 m) away from a pollinizer, respectively. A similar trend was observed in adjacent rows, although average yields were about 30% to 40% lower compared to rows with pollinizers. Possible implications of pollinizer distance effects on 'Regina' orchard design and pollination management will be addressed.

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The current situation of sweet cherry production in Isparta region of Turkey

M. A. Aşkın, A. Kankaya, F. A. Yıldırım, A. Yıldırım and M. Şahin-Çevik

Süleyman Demirel University, Agriculture Faculty, Department of Horticulture, 32260 Isparta, Turkey

Region of Isparta is one of the most important sweet cherry (*Prunus avium* L.) production areas in Turkey. The current status of sweet cherry production in Isparta, including planting density, pruning and training methods, cultivars, rootstocks, harvesting, problems in cherry production and future prospects will be discussed in this paper.

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Cherry production in Bulgaria

M. Borovinova, V. Taseva, D. Domozetov, N. Christov and I. Sredkov

Institute of Agriculture, 2500 Kyustendil, Bulgaria

The soil, climatic and topographical conditions in some regions of Bulgaria are favourable for cherry growing and production of high quality fruits. In Bulgaria the areas of cherry orchards have been constantly increasing up to 1991 when it reaching 11700 ha, but recently the area planted with cherry trees has decreased considerably and nowadays there are about 7000 ha. One of the reasons for reduction of the planted area is the land reform and the change of the ownership of the land. The present paper is a review of the climatic conditions, cherry regions, production, cultivars, rootstocks, distance of planting, shaping of the trees crown, soil management and plant protection of cherry in Bulgaria. It is performed the cultivars and rootstocks created in Institute of Agriculture, Kyustendil. Sweet cherry breeding improvement activity in Bulgaria performed at the Institute of Agriculture, Kyustendil. The three sections are discussed in brief: breeding – classical and experimental mutagenesis, introduction and cultivar studies. As a result from the application of classical breeding, seven new firmness, dark-colored cultivars are created – Pobeda, Cherna Konyavska, Kyustendilska hrustyalka, Bulgarska hrustyalka, Mizia, Danelia and Stefania, the candidate cultivars- Diana and Vasilena and a considerable number of elites were selected. By the use of the experimental mutagenesis several mutants were created - № 2185Ò № 2186 and № 2187 of the cultivar Drogans gelbe knorpelkirsche, characterized by a relatively wÅÁË vegetative vigour and a good fruitset. During the period 1953-2004, 138 sweet cherry iultivars were introduced out. At present time the spine of our sweet cherry assortment are the cultivars Van, Bing, Kozerska, Germersdorf, Lambert and Bigarreau Burlat imported in the early stage of our introduction activities and proved their valuable characteristics in the referred cultivars studies ff the Institute of Agriculture, Kyustendil.

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Organic cherry production project in Kemalpasa (Izmir) Turkey results of the first year (2004) experiments

S. Tezcan, A. Ünal, B. Okur, A. Olgun, A. Mısırlı, D. Anaç, N. Eryüce, F. Tezcan, M. A. Ul, B. Karaturhan, A.R. Ongun, N. Gülperçin and H. Adanacıoğlu

Faculty of Agriculture, University of Ege, 35100 Bornova, Izmir, Turkey
Plant Protection Research Institute, Bornova, Izmir, Turkey

Kemalpasa is one of the most important cherry production district with its more than 1 000 000 trees and 30 000 tons of fruit production in Turkish fruit market. In this district the cherry production has been realised by conventional, integrated and organic ways. Because of the increasing importance of organic cherry production all over the world, a project supported by the State Planning Organisation has been initiated in this particular district. In this project soil, leaf and fruit samples were taken and according to the obtained results of their analyses, green manuring and farmyard manure have been applied in these orchards. In this district sticky yellow traps against Rhagoletis cerasi L. (Diptera: Tephritidae) and bait traps against Archips spp. (Lepidoptera: Tortricidae) which are the key pests have been applied in these orchards. Alongwith the carried out project, wihtin the framework of this study, the farmers dealing with this method have also been educated to know the importance of organic cherry production. The results obtained in the first year in this study will also lead us to further studies in future

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The effects of different pollinators on the fruit set and pomological characteristics of "0900 Ziraat" sweet cherry cultivar

K. Kaynaş, M. Şeker, Z. Yücel and T. Alkan

University of Çanakkale Onsekiz Mart Faculty of Agriculture Department of Horticulture Çanakkale, Turkey

"0900 Ziraat" is the leading cultivar with high quality fruit characteristics among sweet cherry cultivars in Turkey. Although the importance of the cultivar, pollination problems resulting in poor fruit set in different ecological conditions of the country. In this research, it was aimed to determine the effects of different pollinators on the fruit set and fruit quality parameters in "0900 Ziraat" sweet cherries. For this purpose, Primer Giant, Van, Stark's Gold, Celeste, Sunburst, Merton Late, Bing, Lapins, Bigarreau Gaucher, Sweet Heart, Canada Giant, North Wonder, Early Burlatt and Lambert cultivars were chosen as pollen sources for fruit set of "0900 Ziraat" cherries. During the research, prebloom and full bloom dates were recorded in 2002 and 2003 flowering time in Çanakkale ecological conditions. After the fruit set, they were counted monthly for determination of fruit set percentage and cross compatibility. After the fruits matured, they were analysed for pomological characteristics such as fruit and stone weight, fruit size, pH, internal and external fruit coloration, stem length, titrable acidity and total soluble solids.

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Preliminary testing of a reflective ground cover on sweet cherry growth, yield and quality in USA and Chile

M. Whiting[1], *C. Rodriguez*[2] *and J. Toye*[3]

[1]Washington State University, Irrigated Agriculture Research and Extension Center, Pros
USA
[2]Empack Ltd., Santiago, Chile
[3]Extenday Ltd., Auckland, New Zealand

In Washington, U.S.A. a reflective ground cover (Extenday®) was applied to the alleyw
between rows of 8-yr-old 'Bing'/'Gisela® 1' sweet cherry (*Prunus avium* L.) trees from
bloom to harvest. In 2004, we measured fruit set, fruit and shoot growth rates, leaf expansi
trunk-cross sectional area (tcsa), leaf gas exchange, fruit yield and quality for treated a
untreated trees. The ground cover increased shoot growth rates - final shoot length was 32
higher than untreated. Annual tcsa increment from trees with ground cover was 90% grea
than untreated trees. Based on comparisons of fruit color, firmness, and soluble solids, fr
from treated trees reached optimum maturity ca. 5 days before untreated. At comparab
maturity, fruit from Extenday®-treated trees were similar in size and soluble solids, but ha
9% greater firmness than untreated fruit. Following 3-weeks in cold storage, Extenday
treated fruit had 8% higher soluble solids, and were 16% firmer compared to untreated fru
Leaf net CO2 exchange rate (NCER) of sunlit leaves was similar between treatments b
NCER of leaves in the shaded canopy interior was 50% higher from Extenday®-treated trees
In 2005, treatments will be repeated to examine carry-over effects. In 2005 we will als
document bloom density and location along with vegetative growth and fruit yield and quality
In addition, results from similar trials conducted in central Chile during 2004-2005 will be
presented.

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oven polypropylene groundcovers enhance growth and production of young 'Regina' weet cherry trees

. *Nunez-Elisea, H. Cahn, L. Caldeira and C. Seavert*

regon State University, Mid-Columbia Agricultural Research and Extension Center, 3005 xperiment Station Dr., Hood River, OR 97031, USA

Black, woven polypropylene row covers 2.4 m wide were installed for permanent ground vegetation control in a recently planted 'Regina'/Gisela 6 experimental orchard. Trees were planted in April 2001 at 5.5 m x 3.1 m and groundcovers were installed within 1 month of planting. Trees were trained to a central leader. Compared to trees in non-covered ground (controls), trees in row covers had significantly larger trunk cross sectional area (ca. 30%) in 2002, 2003 and 2004. Row covers conserved soil moisture for longer periods. In 2003, row covers increased production of 1-yr-old shoots by 45% and total shoot length by 109%; however, yields were minimal for both treatments (ca. 1 kg/tree). By summer 2004, trees with ground covers had filled their allotted space within rows, while control canopies were ca. 50 cm apart. Trees in row covers produced significantly higher average yields than controls (7.4 kg/tree vs. 3.2 kg/tree). Fruit from ground covered trees was larger and firmer and maturity was delayed by 2-3 days in relation to controls. Groundcovers slightly increased soil temperature from April to September (by ca. 2C at 5 cm and 10 cm depths), but did not increase air temperature at 10 cm and 30 cm heights. Roots under groundcovers were denser and more spread out than in controls. Although ground covers are initially expensive, their cost is expected to be offset by earlier and higher production and by savings in labor, water use and herbicides.

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Extinction, a new way of pruning in low density sweet cherry orchards

V. Simard

Domaine Expérimental La Tapy 1881 Chemin des galères 84200 Carpentras Serres, France

In Vaucluse (South-East of France), the most important traditional cherry growing area in France, growers use winter heading cut to train their cherry tree Today, there is a growing need to improve early yields and general productivity of these orchards. In traditional orchards where dwarfing rootstocks are not suited because of poor soil conditions, new traning systems are based on thinning cut, scoring and bending.

The problem with this training is that the trees can over crop. To reduce fruit set, some growers are still using heading cut. Others begin to use fruiting spurs removal (extinction), a more equilibrate way of pruning.

To help growers to know which is the adequate technique of pruning for the mature trees in traditional orchards, the cherry MAFCOT network is experimenting extinction on various cultivars to control fruit set and fruit size even in vigorous and low density orchards.

This paper presents a 4-year trial on the effect of various pruning techniques on a 12-year old orchard grafted on SL 64 with cultivar 'Belge'. Four treatments were compared : 1/ Thinning cut only as the control, 2/ Thinning cut with heading cut, 3/ Thinning cut with extinction of 20 to 30 % of the fruiting spurs, 4/ Thinning cut of 50 to 60 % of the fruiting spurs.

Results of the development of the trunk cross area, yield, fruit quality (weight, soluble solids) and number of flowers and fruit per fruiting spurs observed in 2004 will be presented and discussed. Thinning cut with extinction of 20 to 30 % of the fruiting bud gave the best balance between fruit set and fruit size.

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Fruit growth curve analysis of seven sweet cherry cultivars

A. N. Azarenko and A. Chozinski

Oregon State University, Department of Horticulture, 4017 Ag Life Science, Corvallis, OR, 97331, USA

Fruit diameters were measured three times weekly from shuck split to maturity for seven cultivars of sweet cherries during years 2001-2004 in Corvallis, Oregon, USA. Cumulative growing degree hours (GDH) at 5C were calculated from peak bloom for each cultivar using an asymmetric curvilinear model. To determine GDH accumulation at temperatures between 4 and 25C (base and optimum) the following formula was applied: GDH=[(25-4)/2](1+cos(p+p(hourly T°-4)/(25-4))). At temperatures above optimum a second formula (Anderson, et al., 1986) was applied incorporating the critical temperature for fruit trees (36C): GDH=(25-4)(1+cos(p/2 +p/2 (hourly T°- 25)/(critical T°- 25))). Cumulative GDHs at 5C were calculated from peak bloom for each cultivar. Diameter data were plotted against GDH revealing a double sigmoidal curve. The second derivative f''' was used to identify concavity changes, or end points for each stage of development. Mean slopes for each stage were calculated using ending/beginning points in the data. Data were analyzed using general linear model and lsmeans separation of means (SAS Institute, Cary, N.C.)The double-sigmoid growth curve illustrates a clear separation of physiological stages: first rapid stage (cell division and enlargement) (I), pit hardening (II), second rapid stage (cell enlargement) (III) and fruit maturity(IV). Duration of stages II and III increased as fruit ripened later. While the RGR's in stages II and III were slower as cultivars ripened later.

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A new decline of cherry

G. Charlot[1], P. Gentit[1], A. Marais[3], D. Breniaux[2] and M. Millan[1]

[1]Ctifl, 22, rue Bergere 75009 Paris, France
[2]SPV 251, rue de Vaugirard – 75732 Paris Cedex 15, France
[3]INRA, Bordeaux, France

Foliar symptoms observed for several years have in the past 3 to 4 years occurred i combination with cases of decline of cherry.

These symptoms do no correspond to the usual assortment of well-known cherry diseases (asphyxia, fungus, bacteria). The foliar symptoms without decline have been observed in numerous plots in all producing regions. In contrast, few cases of decline of the trees have been observed, but can be quite serious in specific locations.

The symptoms consist of reddish spots that become brown and sometimes cause holes. They become numerous and more visible beginning with the first warm weather in early July.

In the event of a major onset, the tree may lose its leaves during the summer. The symptoms do not necessarily lead to a decrease in the vigour or a decline of the trees.

We suspect two viruses : CNRMV and CVA.

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Budding height is slightly effective to reduce sweet cherry growth

A. Santos[1], V. Cordeiro[2], R. S. Ribeiro[1], A. Bento[3] and J. L. Lousada[4]

[1]CECEA, Departamento de Fitotecnia, Universidade de Trás-os-Montes e Alto Douro, Ap. 1013, 5001–911
[2]CETQ, Quinta do Valongo, Direcção Regional de Agricultura de Trás-os-Montes, 5370–087 Carvalhais
[3]CIMO, Departamento de Fitotecnia, Escola Superior Agrária de Bragança, Quinta de Stª Apolónia, Apartado 172, 5300-855 Bragança
[4]Cege, Departamento de Florestal, Universidade de Tras-os-montes E Alto Douro, AP. 1013, 5001–911 Vila Real - MDL

The effects of several rootstocks and budding heights upon the growth of three sweet cherry (*Prunus avium* L.) cultivars were investigated during the first seven years of tree life. The trials were established in 1998 at three locations of northeast Portugal. "Burlat", "Summit" and "Van" cultivars were budded on Edabriz, Gisela 5, and Maxma 14 at 10, 20, and 30 cm above soil level, and onto Cab and *Prunus avium* (Mazzard) at 10, 30, and 60 cm above soil level. Trunk diameter was yearly recorded since the tree raising in the nursery until the end of the 6th leaf stage in the orchard. As early as at transplantation, the effects of budding height, rootstock, rootstock x budding height interaction, and cultivar, were significant in the trunk cross sectional area (TCSA), being responsible for 11.6%, 9.6%, 9.3%, and 7.8% of the total variance, respectively. At the 6th leaf stage, more than 70% of the expected variance was attributable to rootstock, and less than 5% was due to budding height, minor differences being noticed between the locations. Overall tree TCSAs on Gisela 5, Edabriz, Cab 11E, and Maxma 14 were, respectively, 22%, 40%, 62% and 84% of those on Mazzard. Increasing budding height decreased tree vigour for all the rootstocks in any location. In the nursery, it was already noticeable that vigour reductions between extreme budding levels were evident, mainly on Cab 11 E (44%), but also in Gisela 5 (40%), Edabriz (21%), and *P. avium* (12%); on Maxma 14 it was only 4%. In the 6th year of the orchard, tree TCSA reduction on Edabriz and Gisela 5 was 25% and on Maxma 14 it was 20%, when comparing buddings made at 10 and 30 cm. The reduction for the trees on Cab 11E and *P. avium* was 7 and 21%, respectively, when comparing buddings made at 10 and 60 cm. In our trial conditions the rootstock was the main influencing factor on plant growth, and budding height revealed to be the second most determinant factor on tree growth, irrespective of rootstock vigour. Consequently, budding height, while not so decisive in dwarfing as with apple and pear trees, can contribute to cherry tree growth and can also control and help to manage canopy size and crop rentability.

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Comparative assessment of growth and cropping of the sour cherry trees grafted on *Prunus mahaleb* L. seedlings and originated from *in vitro* propagation in the young orchard

L. Klaas, H. Jänes and K. Kahu

Institute of Agricultural and Environmental Sciences of the Estonian Agricultural University, Kreutzwaldi 64, 51014 Tartu, Estonia

Growth and bearing potential of cherry trees originated *in vitro* (TC trees) and grafted on *Prunus mahaleb* L. seedlings were compared. Three cultivars: 'Läti Madalkirss', 'Nõmme Liivakirss' and 'Kampesur' were used in the trial. The orchard was established in the spring 1998 at the Polli Horticultural Institute in South Estonia. The plant materjal for propagation *in vitro* and for grafting was taken from one and same mother-tree. The following characters were compared: trunk cross-section area (TCSA), yield, mass of 100 fruits, winter damage. The trees started to fruit in 2000, all cultivars flowered abundantly, but late spring frosts killed the flowers. The first yield was obtained in 2001. It was observed that growth of TC trees was greater than the grafted trees. In the first year of cropping the higher yield was also obtained in the TC trees. Tree damages in winter 2001/2002 were more serious on grafted trees than on TC trees.

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Evaluation of pollen viability and germinating capacity of some sweet cherry cultivars grown in Isparta, Turkey

F. Koyuncu and F. Tosun

Süleyman Demirel University, Faculty of Agriculture, Department of Horticulture, Isparta, Turkey

The aim of this study was to establish a reliable method for *in vitro* pollen viability of sweet cherry. The pollen of eight sweet cherry cultivars (Stella, Vista, Starks Gold, 0900 Ziraat, Noble, Bing, Van, Bigarreu Gaucher) was collected and pollen performance tests were assessed. Three stain tests (TTC, IKI and FDA) and 'agar in plate' method were applied to determine the pollen viability and germinating capacity in these sweet cherry cultivars. There are significant differences among the viability and germination ratio of cultivars. The pollen viability rates showed differences according to stain tests. 'Noble' has the highest (93.91 %) viability while 'Vista' has the lowest (74.5%) as mean of stain tests. The pollen germination rates in 15% sucrose + 0.5%agar + 5ppm H3BO3 solution varied between 34.75% ('Starks Gold') and 59.25% ('Bing'). *In vitro* pollen germination increased with increasing incubation period, and the highest germination was obtained after 48 hours for all cultivars.

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New sweet and sour cherry selection at the Research Institute for Fruit Growing and Ornamentals in Hungary

J. Apostol

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 released, 5 candidate sweet cherry; 8 released and 2 candidate sour cherry varieties. Released sweet cherries on the last years: Alexâ Ripens 6-8. July, 40-45 days after Bigarreau Burlat. Fruit size: 24-26 mm, 7-9- g. Rita. â Ripens 20. May, 14 days before Bigarreau Burlat. Fruit size: 25-28 mm, 7-8 g. Deep Veraâ Ripens: 10-12. June, about. 10-12 days after Bigarreau Burlat. Fruit size: 24-27 mm, 9-10 g.. Released sour cherry varieties: Piramisâ Ripens: 2-5 June. Fruit size is 25-28 mm, 8-9 g. Candidate sweet cherries: Sándor âRipen: 26. May, 4-6 days before Bigarreau Burlat. Size: 23-25 mm, 7 g. Fruit Carmenâ Ripens 10-12. June, 10-12 days after Bigarreau Burlat. Size: 27-30 mm, 10-12 g. Petrusâ Ripens 6. June, 6-7 days after Bigarreau Burlat. Size: 25-26 mm, 8-9- g. Deep Anitaâ Ripens 2. June, 2-4 days after Bigarreau Burlat. Size 23-25 mm, 7-8 g. Heart Paulusâ Ripens 10-12. June, 10 days after Bigarreau Burlat. Fruit size: 25-27 mm, 8-9- g Aidaâ Ripens 10-12. June, 10-12 days after Bigarreau Burlat. Size: 28-32 mm, 11-13 g. Candidate sour cherry variety: Du-1. (Ducatâ) Ripens: 20-22. May. One month before Montmorency in Hungary. Fruit size:23-25 mm, 6-7 g.

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Germination possibilities of 0900 Ziraat bred lines seeds by stratification

A. Fidancı, M. Burak and M. Baş

Atatürk Central Horticultural Research Institute-Yalova, Turkey

In order to obtain self-fertile and high quality sweet cherry cultivars a breeding program was initiated. However, the seeds of breds were conventionally stratified but non of them germinated. To solve the problem, different methods were tried. Thus embriyo resque was selected for obtaining new plants from the breds, however percentage of germination was high, but seedling rate was very low. Another new method which is described below, was applied.

In this study, hybrids seeds were taken from the orchards after fruit maturation. Their flesh were seperated and seeds were disenfected. After the surface sterlization , seeds were put in the large vessels and double distilled water were added and the water changed every other day ten days later seed coat were removed and the seeds put in the Petri dishes containing wet perlite under the srerile conditions. The petri dishes were kept in a refrigerator at +40C for two months.. Germinated seeds were sown in the viyol or small plastic pot containing kokos or peatmost under the greenhouse conditions.

P - 120

New sour cherry cultivars from Dresden-Pillnitz

M. Schuster[1] and B. Wolfram[2]

[1]Federal Centre for Breeding Research on Cultivated Plants, Institute for Fruit Breeding, D-01326 Dresden, Germany
[2]D-01257 Dresden, Guerickestraße 15 , Germany

Sour cherry breeding has a long tradition in Germany. The main breeding goals are fruit quality, high productivity, self-compatibility, suitability for mechanical harvesting and resistance to diseases. In result of the sour cherry breeding programme two new sour cherry cultivars, 'Achat' and 'Jade', were selected and got the plant breeders right in 2004. The cultivar 'Achat' (Pi-Sa 5,55) is a result of the cross of 'Köröser' x clone 2,40 ('Fanal' x 'Kelleriis 16'). This clone is characterized by a healthy and vigorous growth and good fruit quality. The flower buds are spread over the whole branches. The fruits are dark red brown and have a weight of 7,0 g. The ripening time is in the middle of July. The cultivar 'Jade' (Pi-Sa 19,130) is characterized by an excellent taste and a fruit set similar to the cultivar 'Schattenmorelle'. This clone is a result of the cross combination 'Köröser' x 'Röhrigs Weichsel'. The fruits are characterized by a dark red brown colour and an average fruit weight of 6,2 g. The ripening time is from the middle till the end of July. Both cultivars are self-compatible.

P - 121

Resistance to *Myzus cerasi* in an open pollinated population of sweet cherry (*Prunus avium* L.)

A. R. Granger

Lenswood Horticultural Centre, Swamp Road, Lenswood, SA, 5240, Australia

A population of 265 open pollinated seedlings grown at Lenswood in South Australia displayed variation in natural infestation by Black Cherry Aphid (*Myzus cerasi*). Seedlings were rated as susceptible, moderately resistant and resistant. Twenty eight seedlings were resistant to Black Cherry Aphid. Crosses between resistant and susceptible seedlings have been conducted with the aim of producing a segregating population so that the mode of inheritance may be determined.

P - 122

New sweet cherry selections for testing from the Pacific Agri-Food Research Centre, Summerland BC

F. Kappel and R. MacDonald

Pacific Agri-food Research Centre, Agriculture and Agri-Food Canada, 4200 Highway 97, Summerland, BC V0H 1Z0, Canada

Summerland has had a sweet cherry breeding program since 1936 and has introduced varieties that have made an impact in our local industry. These include 'Van', 'Lapins', and 'Sweetheart'. Most recently 'Staccato' was introduced as a late maturing cultivar and growers are planting this variety because of its good fruit quality and late picking date. A number of new selections have been moved into advanced testing stage where they will be made available for grower testing. These will be described and briefly compared to standard cultivars. Picking dates at Summerland of these selections range from June 27 to July 28. The long-term average for 'Bing' and 'Van' is July 9. These picking dates are for cherries that have not been treated with gibberellic acid. Fruit size ranges from 9 g. average fruit weight to 14 g. Average cracking rates (rain-induced cracking) vary from 18 % to 52%. Most of the selections are as firm as or firmer than standards.

P - 123

Using Van cultivar for the improvement of the range of cherry cultivars in Bulgaria

A. Zhivondov

Ostromila 12, 4004 Plovdiv, Bulgaria

Van cherry cultivar continues to be one of the major cultivars in the world production o cherries. The cultivar underlies the breeding programmes for the improvement of the range o cherry cultivars in most countries with developed cherry production. Van is of great importanc for the cherry cultivar improvement activities in Bulgaria, too. Its use in the breeding proces has already given good results. A population has been established, in which a significar percentage of the hybrids repeated to a great extent a number of pomological characteristic of the fruit, some of the hybrids even surpassing the qualities of Van. It created real condition for prolonging the season of offering on the market fresh cherry fruits quite resembling thos of Van, by 28 days.

P - 124

Results of the study of new sweet cherry cultivars and elites in Kyustendil region, Bulgaria

N. Christov, M. Borovinova and A. Borisova

Institute of Agriculture, 2500 Kyustendil, Bulgaria

The investigations were made on 13 sweet cherry cultivars in an experimental orchard of cherry cultivar collection in the Institute of Agriculture at Kyustendil, Bulgaria during the period of 1997 – 2005. The trees were planted in 1996. All cultivars were grafted on *Prunus mahaleb*. Six biological properties of the cultivars were assessed such as crown volume, increase of the stem diameter, blooming time, fruit ripening, fruit mass and average yield per tree. Early ripening cultivars Biggareau Burlat, Seneca and elite 5645 were with better average yield than other. Good results about more of the biological properties were established of the late ripening cultivar Krupnoplodnaya. The susceptibility of the cherry cultivars and elites to cherry leaf spot caused by Blumeriella jaapi was assessed in mid-September in each year. All cultivars showed symptoms of cherry leaf spot but the degree of susceptibility was different. Cultivars Ranochoaya and Krupnoplodnaya were the least susceptible, while cultivars Bing and Merchant were the most susceptible to Blumeriella jaapi. It was assessed the virus status of the trees of the investigated cultivars for the most important stone fruit viruses by DAS-ELISA test.

P - 125

Evaluation and characterization of some sweet cherry cultivars in Estonia

H. Jänes, L. Klaas and K. Kahu

Institute of Agricultural and Environmental Sciences, Estonia

Sweet cherry is a popular crop in Estonia, growing mainly in home gardens since critically lov temperatures occur often in Estonian conditions make a growing of sweet cherry hazardous Research work with cherries in Estonia is concentrated at the Polli Research Centre of the Institute of Agricultural and Environmental Sciences. Ten Estonian cultivars 'Arthur', 'Elle' 'Karmel', 'Meelika', 'Norri', 'Piret', 'Polli 6-2', 'Polli 10-8', 'Tontu', 'Tõmmu' and one cultiva 'Gronkavaya' from the Byelorussian breeding program were evaluated for winter hardiness flowering time, tree productivity, ripening time, susceptibility to leaf spot (Asterula beyerink Sacc.) and fruit characteristics during the years 1995-2004 at the Polli. 'Leningradskay Chernaya' was chosen as control cultivar. Results obtained indicated that 'Polli 6-2', 'Elle and 'Norri' showed the best winter hardiness while 'Gronkavaya' was the most winte susceptible. The earliest ripening cultivars were 'Elle' and 'Karmel' whereas the latest one were 'Polli 6-2' and 'Polli 10-8'. The highest average yield was got from 'Polli 6-2', 'Tõmmu and 'Arthur' and the least yield was got from 'Gronkavaya'. Three cultivars: 'Gronkavaya 'Arthur' and 'Polli 10-8' have the biggest average fruit weight. The soluble solid concentration in fruits ranged from 14.6 % in 'Elle' to 20.6 % in 'Norri'. The total sugar conter ranged from 9.6 % in 'Elle' to 12.7 % in 'Piret. Cultivars 'Meelika' and 'Polli 6-2' wer observed relatively resistant to leaf spot.

P - 126

A series of new commercial varieties of sweet cherry from the French sweet cherry breeding programme of the "Institut National de la Recherche Agronomique"

J. Claverie, Y. Tauzin and F. Laigret

INRA-Unité de Recherches sur les Espèces Fruitières et la Vigne (UREFV), 71 Av E. Bourleaux, 33883 Villenave d'Ornon, Cedex, France

The French sweet cherry breeding programme of the "Institut National de la Recherche Agronomique" has begun 30 years ago. Its aims were to increase fruit size, quality and firmness, to expend maturity period, and to improve tree habits. Recently, the search for a reduced sensitivity to fruit cracking was included in this programme and supported by genetic mapping studies with molecular markers. In the last four years five new varieties have been selected and are commercially distributed by our editor CEP innovation. These varieties are: FERPIN, FOLFER, FERMINA, FERDIVA, FERTARD. Their allow to extend the maturity period from Burlat maturity to 40 days after Burlat. They share a large fruit size with firmness. FERMINA is tolerant to fruit cracking even in bad weather conditions. In the next future three new varieties from the same series will be made ab vailable. They have been proposed the following names: FERLIZAC (very large fruit size), FERDOUCE (large fruit size of good quality with attractive aspect), FERDELICE (high productivity and firmness).

P - 127

Sweet cherry tree (*Cerasus avium* L.) genotypes characterization based on stones mophological traits evaluated by the neuron-net mathematical method

J. Brindza, I. Kvetko, B. Stehlíková, J. Nôžková and P. Brindza

Neuron-net mathematical method has been applied to verify the 6 sweet cherry tree genotypes characterization, where 8 different traits on fruit and stones were evaluated (weight, length, width and thickness). From every genotype 75 fruits and stones we used for evaluation. In the training process from five genotypes (Nos. 29, 69, 106, 108 and 201) all data were properly filed. With the genotype No. 28 only one mistake was made. In the verification process with five genotypes (Nos. 28, 29, 69, 106 and 201), and in the control testing with four genotypes (Nos. 28, 29, 69 and 106) correct results were achieved. It was confirmed the suitability of this mathematical method for genotypes characterization

P – 128

Biological control of postharvest diseases of sweet cherry with EPS125 strain of *Pantoea agglomerans*

J. Alonso[1], R. Alique[1], C.E. Sotelo[1], E. Montesinos[2] and A. Bonaterra[2]

[1]Instituto del Frío (CSIC). C/ José Antonio Novais, 10. Ciudad Universitaria 28040-Madrid, España
[2]Centro de Innovación y Desarrollo en Sanidad Vegetal. Instituto de Tecnología Agroalimentaria. Universitat de Girona. Avda. Lluís Santaló, s/n. 17071-Girona, España

In the present work, we have evaluated the strain EPS125 Pantoea agglomerans for its use in the control of the three main post harvest cherry diseases. This has been done by controlled inoculation of the different pathogens and also in semi industrial scale assays. Results show that a) The treatments with 107• CFU ml-1 of EPS125 Pantoea agglomerans were successful in the control of Penicillium expansum, decreasing the incidence and size of the damage produced by the pathogen in the fruits. Its efficacy was higher than that obtained by the BIO-SAVE 10 LP® biocontrol agent, which is based upon the strain ESC-10 of Pseudomonas syringae. b) EPS125 Pantoea agglomerans treatments slowed down the growth and size of the damage produced by Botrytis cinerea, with a dose effect between 5•106 and 5•108 CFU•ml-1. c) EPS125 107 CFU ml-1 Pantoea agglomerans decreased the decay incidence produced by Monilia fructigena at 3.5•104 conidias•ml-1, its efficacy being similar to that of BIO-SAVE 10 LP® biocontrol agent. In semi industrial scale assays, the treatments with EPS125 Pantoea agglomerans did not alter the respiratory intensity of the fruits, or the equilibrium atmosphere in MAP. No changes were observed either in the evolution of the quality parameters of the fruit at 2-4 weeks´ storage at 0 °C. Treatments with 107 CFU•ml-1 EPS125 Pantoea agglomerans decreased the natural decay incidence and severity in 20°C stored fruits, in a similar way as that found with 10 ppm NaClO treatment.

P – 129

Results of the growth and yielding of eleven sweet cherry cultivars in central Poland

E. Rozpara

Research Institute of Pomology and Floriculture, Skierniewice, Pomologiczna 18 96-100 Skierniewice, Poland

Cultivars play a fundamental role in the modern production of sweet cherry in Poland. By choosing the right cultivar it is possible to minimize the problems occurring during the growth of this species, such as frost damage or fruit cracking and decay in wet weather. Cultivar has also an influence on the growth and yielding of the trees and the quality of the harvested fruit and very often determines the profitability of sweet cherry production. In the experiment carried out from 1994 to 2002 eleven cherry cvs. were evaluated: 'Valera', 'Victor', 'Vista', 'Venus', 'Summit' and 'Lapins' from Canada, 'Vanda' and 'Techlovan' bred in the Czech Republic, as well as one German cultivar 'Regina', and one American cultivar 'Rainier'. From among the relatively late and late cultivars 'Vanda', 'Rainier', 'Regina', and 'Lapins' have the greatest potential for commercial production in Central Poland. This is because of the high yield efficiency of the trees, as well as very good quality of their fruits. A valuable cultivar of medium ripening time was 'Techlovan'. Its commercial value was very high, however sometimes it was reduced by the high susceptibility of its fruits to cracking.

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Effect of orchard cover on the evolution of fruit ripening of sweet cherry varieties in Cova da Beira region, Portugal

L. Maria[1], J. Carvalho[1] and R. S. Coelho[2]

[1]Departamento de Fitotecnia. Escola Superior Agrária. Quinta da Srª de Mercoles, 6000 Castelo Branco, Portugal
[2]CERCOBE- Associação de Produtores de Cereja da Cova da Beira. Fundão, Portugal

In order to determinate ripening indices, cherries were characterised using physical and chemical parameters for several years. This work aims to evaluate the effect of covering orchard with plastic net in those ripening indices for main cherry varieties in Cova da Beira region, Portugal, namely Burlat, Brooks, Arcina, Sunburst and Early Van Compact. Samples (2 kg each) of each of these sweet cherry varieties were picked in the same orchard, both in trees with and without cover, from 2001 to 2004. Physical (colour, firmness, calibre and fruit weight) and chemical (acid content pH and sugar content) parameters were individually registered. The number of cracked fruits was also observed. The main result is the great influence of covering sweet cherry trees in fruit firmness, which is the parameter mostly responsible for post-harvest sweet cherry quality. Ripening dates should be anticipated since orchard cover leads to the decrease of fruit firmness more than any other parameter.

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Pressurized liquid extraction of phenolic compounds from sour cherry pomace

I.H. Ifrij, E. Yener and A. Bayındırlı

METU Food Engineering Department 06531 Ankara, Turkey

Pressurized liquid extraction is a fast and effective technique for isolating compounds f solid plant matrices. It has the advantages of enhancement of extraction with high press The objective of the research was to evaluate the effectiveness of pressurized liquid extra of phenolic compounds from sour C)°cherry pomace by using different pressure (50-2 MPa), temperature (20-80 and time (5-20 min) combinations. The solvent was ethyl ac with solid to solvent ratio of 0.1 to 0.3 g/ml. During the experiments, the amount of t phenolic compounds extracted and the antioxidant activity of the extract were meas Folin-Ciocalteau method was used for the determination of the amount of total phen compounds. The antioxidant activity was measured by using free radical (DPPH.) scaven activity assay. A significant increase in the amount of total phenolic compounds extracted the antioxidant activity was observed by pressurization at 50 MPa. An increase in extra temperature had a positive effect on the extraction of phenolic compounds and antiox activity. Increasing the solid/solvent ratio to 0.2 g/ml provided an extract with higher phe content and antioxidant activity.

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A molecular approach to understand rootstock-induced dwarfing in cherries

C. Prassinos[1], G. A. Lang[2] and K.H. Han[1]

[1]Dept. of Forestry, Michigan State University, East Lansing, Michigan, 48823, USA
[2]Dept. of Horticulture, Michigan State University, East Lansing, Michigan, 48823, USA

Rootstock-induced dwarfing has been recognized as one of the most important attributes of modern tree fruit rootstocks. We have taken a genomics approach to identify genes that are putative regulators of tree growth in cherry. Using the molecular technique cDNA-AFLP, we compared 'Bing' sweet cherry grafted onto the sibling rootstocks Gisela5 (Gi5) and Gisela6 (Gi6) to identify genes that are differentially expressed between the two graft combinations. 'Bing'/Gi5 trees are dwarfing to semi-dwarfing while 'Bing/Gi6 trees are semi-vigorous to vigorous. Growth data (terminal shoot elongation, trunk circumference and node formation) were collected from non-fruiting trees in consecutive seasons to identify the phenotypic changes that are manifested as reduced growth in 'Bing'/Gi5. Concomitant rootstock and scion meristem tissue samples were collected for the molecular analyses. The growth data showed a consistent differential pattern, with cessation of 'Bing'/Gi5 shoot growth occurring 2 to 3 weeks earlier than 'Bing'/Gi6 trees. Node number and internode length did not differ between 'Bing'/Gi5 and 'Bing'/Gi6 trees. The data suggest that the timing of growth cessation is the major factor for the difference in canopy height and spread between graft combinations. In total, 360 cDNA-AFLP fragments were selected for further analysis. The cDNA-AFLP results were further confirmed with cDNA microarrays carrying 1040 cloned fragments. Of those, 109 fragments showed a statistically significant difference between the two rootstocks and were sequenced. Earlier up- or down-regulation of genes was apparent for the 'Bing'/Gi5 graft combination in both experiments, which is consistent with the changes in shoot growth. The candidate genes for rootstock-induced differential regulation of tree growth in cherry scions will be discussed.

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Effect of the packaging and the temperature of transport, in the cherry quality (*Prunu avium* L) for export

L. Rivero, M. I. Quiroga and E. Tersoglio

Centro de Estudios de Postcosecha. EEA Mendoza, INTA. San Martin 3853, Luján de Cuy (5507), Mendoza, Argentina

The shipment of perishable fruits as the cherry to distant and demanding markets in quality, not possible without an appropriate technology of containers and packings. On the other han during their storage and/or transport, the cherry requires temperatures among -1 to 0 °C ar 90-95% HR. The exhibition of the fruit to other temperatures, causes physiological disorde that diminish the quality of the product. The aim of this work was to evaluate the effect of th temperature of transport and of the packaging, in the cherry quality for export. Fruits of th Cv. Rainier was harvested by color in a state of maturity. They were hidrocooled, selected f quality and they were placed in: plastic pale, bags "carry bags" of polipropileno of 40 µ ar bags of polyethylene of 25 µ. the conservation was made to: 1) 7 days to temperatur according to registration of air shipment (three days to 0 °C; two days to 7 °C; and two days 15 °C); and 2) 7 days to 0 °C. Later on 2 days to 7 °C in refrigerator. It was determined: col loss of weight, stability, mechanical and pathological damage, soluble solids, total acidity, a quality of the peduncle. The fruits packed in bags of 25 µ presented smaller weight loss a browning of the peduncle, under both conservation conditions. For all the packaging: plas bucket, polypropylene and polyethylene bags, the intensity of browning of the peduncle w higher to temperature of air transport.

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Winter chilling and heat requirements study on cherry varieties

E. Tersoglio, G. Naranjo, L. Rivero and O. Quiroga

Lab. De Fruticultura, EEA Mendoza INTA, San Martin 3853, CC3 – CP 5507, Lujan de Cuyo, Mendoza, Argentina

Cherry trees have some needs that must be satisfy in order to obtain profitable harvest. One of the most important factors to get a normal flower and vegetative bud break is the chilling temperature exposition during the rest period. The amount of low temperatures required to release buds vary greatly among varieties. Bing, Van Early Burlat, Rubí, Garnet, Marvin 4-70, Celeste and Lapins varieties were study at two locations with different amount of chill unit (CU). The CU was calculated by Utah Method. The heat units were calculated as Growing Degree Hours (GDH). The vegetative bud break percentage increased whenever GDH or CU were bigger. But GDH only released bud break when some minimum amount of CU (threshold) occurred. It was possible to differentiate cultivars from chill requirements through comparison of mathematical regression model and also joined cultivars models that show a similar behavior.

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Molecular markers for the self-compatible S4'-haplotype

R. Tao[1], K. Ikeda[1], A. Watari[1], K. Ushijima[1], H. Yamane[1], N. R. Hauck[2] and A. F. Iezzoni[2]

[1]Laboratory of Pomology, Graduate School of Agriculture, Kyoto University, Kyoto 606-8
Japan
[2]Department of Horticulture, Michigan State University, East Lansing, MI 48824, USA

The S4' haplotype produced by X ray irradiation breeding is a pollen-part mutant that been extensively used to develop self-compatible cultivars of sweet cherry (*Prunus avium* The S4'-haplotype is known to have a functional stylar component and a non-functional p component. The pollen component in sweet cherry necessary for the specificity of the p reaction is believed to be an S-haplotype specific F-box protein gene, called SFB. This s describes two molecular markers that distinguish between SFB4 and SFB4' by ta advantage of a four base pair deletion in the mutant allele. The resulting PCR products either be separated directly on a polyacrylamide gel or they can be subjected to restri enzyme digestion and the different sized products can be visualized on an agarose gel. latter technique utilizes restriction sites created in the PCR products from the SFB4' allele not the SFB4 allele. These molecular assays can be used to verify self-compatibility conf by the S4'-haplotype.

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Results of the sour cherry clone selection carried out at the Research Station of Újfehértó

T. Szabó and F. Inántsy

Research and Extension Centre for Fruitgrowing, Vadastag 2, H-4244 Újfehértó, Hungary

The contribution of Hungary to the sour cherry production of the world is only 6% (50,000–60,000 tons). Most of the sour cherries are produced in four counties, out of which Szabolcs-Szatmár-Bereg county, where our research station in located, is leading by more than 25%.

In most sour cherry growing countries usually one or two main cultivars are widespread. Until the mid 1970s the self-sterile 'Pándy' types were planted mixed with 'Cigánymeggy' type pollinators. The mixed orchards had not solved the issues concerning the low productivity of 'Pándy' sour cherries, so these plantings were slowly pushed into the background, on the other hand, cultivars bred by crossings ('Meteor korai', 'Érdi bőtermő', etc.) started to spread.

In parallel with the cross-breeding, in the 1970s the exploration of self-fertile 'Pándy' types started. As the results of the selection work three sour cherry cultivars were accepted by the state and registered as new cultivars: 'Újfehértói fürtös', 'Debreceni bőtermő' and 'Kántorjánosi 3'. These cultivars have different ripening time, but according to the similar appearance of their fruits the harvest can be continuous and the quality of their fruits is also homogeneous. Their fruits detach from the stalk with dry abscission layer, have a real sour cherry taste, and are suitable for fresh consumption, processing and deep freezing. Their disadvantage is, that the canopies are large, are prone to produce bare wood, and in some years the degree of self-fertility is not adequate.

To eliminate the disadvantages, we continued the clone selection with the assistance of Mr. F. Szőke private breeder. From the selected clones two proved to be the best: 'Petri' (R) and 'Éva' (T). Their fruit quality is similar to that of the commercial cultivars, but produce far more fruiting wood, i.e. there are not any bare wood in the canopy.

Cherry leaf spot (*Blumeriella jaapii* (Rehm.) Arx.) and European brown rot (*Monilinia laxa* (Aderh. and Ruhl.)) frequently cause major damage in sour cherry orchards. The Bösniac sour cherry cultivar group have a high degree of resistance against these diseases. The fruits of these cultivars can be used for several purposes, mainly for juice extraction. Their disadvantage is that the fruits ripen in different times within the same tree, the fruits do not detach with dry abscission layer, and they are highly prone to bud mutation. During the selection work we picked two clones (Vn-1, Vn-4); their fruits detach with dry abscission layer, have bigger fruits (21–24 mm) that ripen uniformly.

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An outbreak of cherry leaf spot, caused by *Blumeriella jaapii* (Rehm) Arx., on swe cherry in Biga district of Canakkale province in Turkey

H. Tezcan

University of Uludag, Faculty of Agriculture, Department of Plant Protection 16059 Görükle, Bursa, Turkey

Sweet cherry plants had symptoms similar those caused by *Blumeriella jaapii* (Rehm) Arx. ir commercial sweet cherry orchard established with imported nurseries from Italy in Biga distr of Canakkale Province in Turkey. Nearly all of trees, in a 100 decares-orchard were infecte Identification of the fungus was done according to morphological taxonomy. The fung produced acervuli, which contain conidiophores and conidia, on the lower surface of infect leaves. Conidia are hyaline, two celled, elongated and curved or flexuous. But, The asci a ascospores of the pathogen haven't been determined. However, the reasons of the outbre and the control methods of the pathogen were discussed in the study.

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Determination of fruit quality parameters of sweet cherries grown in high elevation regions in Hatay (Turkey)

A. A. Polat, C. Durgaç and Ö. Kamiloğlu

Mustafa Kemal University, Agricultural Faculty, Department of Horticulture, Antakya-Hatay, Turkey

Belen region of Hatay, which has high elevation (around 1000 m) has suitable ecological conditions for sweet cherry production. Sweet cherry production is the main income for Benlidere's growers. However, the origins of the sweet cherries grown in the region are unknown and there is an important cultivar mixture. This study was conducted to determine quality parameters of the sweet cherries grown in the region and to contribute to the sweet cherry production.

The study was carried out in the production area in Benlidere village of Belen. Two sweet cherry orchards, 200 m in apart, were selected for the study and the genotypes grown on these orchards were compared. During four years, the fruits which harvested from these orchards were sampled and pomological analyses such as average fruit weight, fruit dimension, peduncle length, pit weight, soluble solids, acidity, color of the fruit juice and flesh, were measured.

As a result, it was concluded that sweet cherry production in the region could be improved with new cultivars and modern production techniques.

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Quality performance of sweet cherry varieties during the maturation period

J. P. Zoffoli, J. Rodríguez and F. Infante

Facultad de Agronomia e Ingenieria Forestal, Pontificia Universidad Católica de Chile, 306, Santiago 22, Chile

Santina, Sonata, Summit, Van, Lapins and Sweetheart sweet cherry varietie characterized along the maturation period and compared with Bing variety duri seasons. The parameters analyzed were soluble solid (%), titratable acidity (%), f (durofel unit) and skin color (hue angle, Chroma and visual color chart). The seve incidence of impact bruising were assessed dropping a steel ball on fruit surface usi maturity stages. The difference among varieties was maintained thought the seaso firmest varieties were Bing and Sweetheart (75 durofel unit) and the softest were So Summit (65-69 durofel unit). Intermediate firmness values (70 durofel unit) were obtai Lapins, Van and Santina. The sonata variety had the lowest soluble solid concentra the titratable acidity was high during the total maturation period. Santina was cons variety with low percentage of titratable acidity. In relation to impact bruising sensiti was the most resistant. Similar score was obtained with Santina (< 15% incidence). T sensitive varieties were Van and Sweetheart (>60% incidence). Sonata, Summit an were in the intermediate range (30-40% incidence). A high percentage of incide obtained with fruit in the more mature stage (dark mahogany). A color reference c developed to characterize the critical period of harvest for each variety include studied.

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Manipulation of crop load of sweet cherry tree cv. Van influences impact bruising susceptibility and fruit quality aspects

M. P. Zoffoli[1], L. Valenzuela[2], M. Reyes[2], S. Muñoz[1] and F. Barros[2]

[1]Facultad de Agronomía e Ingenieria Forestal, Pontificia Universidad Católica de Chile, casilla 306, Santiago 22, Chile
[2]Exportadora Copefrut

Impact bruising, a type of pitting symptom during postharvest evaluation, is the main cause of deterioration of Sweet cherry cv Van under commercial manipulation. Different levels of crop load were attained on four years central leader Sweet Cherry cv. Van trees. The natural crop load obtained on the trees, adjusted to 30 or 25 branches/tree (25 spurs/m), was compared with the thinning treatment of 20 spurs/m or fruit crop thinning (3-4 fruit/spur or 1:2 fruitless/fruiting spur ratio). The incidence of impact bruising was evaluated at harvest time, dropping a steal ball at five cm high on fruit of different treatments. Crop load of 120 to 130 fruits /m was the natural amount of fruit on the trees without spur thinning treatment (25 spurs/m), adjustment to 20 spurs/tree achieved around 100 fruits/m and 58.8 to 88 fruits/m was obtained with the fruit thinning treatments. Fruit thinning treatment of 3-4 fruit/m produced the largest fruit with high soluble solid concentration and it was the most resistant fruit to impact bruising. The tree fruit parameters for this crop load condition were 2.5 leafs/fruit or around 60 fruits/m. Both treatments of fruit thinning reached the lowest percentage of pitting after 50 days postharvest evaluation under modified atmosphere packaging, simulating commercial manipulation. However the fruit thinning treatment of 3-4 fruits /spur was significantly more susceptible to fruit cracking after storage.

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Effect of plant growth regulators on extending the marketing season of sweet cherry

S. Zilkah[1], I. David[1], A. Rotbaum[1], E. Faingersh[1], A. Weksler[2] and S. Lurie[2]

[1]Institute of Horticulture the Volcani Center, ARO, P.O.B. 6 Bet Dagan 50250, Israel
[2]Institute of Technology and Storage of Agricultural Products, the Volcani Center, ARO, P.O.B. 6 Bet Dagan 50250, Israel

One of the main problems in sweet cherry (*Prunus avium*) production is the limiting marketing period. Attempts have been made to evaluate the contribution of the PGRs (plant growth regulators) GA_3, CPPU (N-(2-Chloro-4-pyridyl)-N'-phenylurea), BA (benzyladenine) and 2,4-DP on extending the marketing season. Fruit maturation and picking time of 'Bing' sweet cherry was delayed for 7 days following application with GA_3, regardless to the GA_3 concentration (10 ppm x 4 times, 30 and 40 ppm). The firmness of the GA_3 treated fruits was higher and the pedicels preserved their greenness for longer duration of shelf-life. Application of CPPU (5 ppm) alone or following GA_3 (40 ppm) delayed the color development of the 'Bing' fruits. 2,4-DP alone or in combination with GA_3 had no effect on fruit maturation, but the late treatment increased fruit size at the late picking. BA application prior to fruit picking had no effect on fruit maturation. However it increased fruit firmness after storage and shelf-life. The treatments of PGR combinations should be further calibrated.

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Tree size, yield and fruit size of sweet cherry *(Prunus avium L.)* are affected by training system

M. Radunić[1], N. Pavičić[2], M. Pecina[2], T. Čosić[2] and A. M. Jazbec[3]

[1]Institut for Adriatic Crops and Karst Reclamation Split, Put Duilova 11, 21000 Split, Croatia
[2]Faculty of Agriculture Zagreb, Svetošimunska 25, 10000 Zagreb, Croatia
[3]Faculty of Forestry Zagreb, Svetošimunska 25, 10000 Zagreb, Croatia

In Croatia cultivating sweet cherry technically legs the world trends, production area and economic success in production are reduced. Effective system in modern production is needed to achieve high and early production, good fruit quality and successful harvest. This is possible to achieve by planting high quality cultivars in high density on the dwarfing rootstocks using the best training system. The object of this research was to examine sweet cherry growth and yield that were growing in spanish bush, spindle bush and «V» training system. From 1999. to 2001. tree trunk diameter was measured and those results were used in calculating with TCSA (trunk cross section area), yield per tree and yield per hectare, fruit weight and yield efficiency. Spanish bush had the lowliest TCSA and yield per hectare and the highest was noticed at «V» training system. Training system did not influence on fruit weight.

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Fruit quality of sweet cherries grown in Latvia

S. Ruisa

As worldwide, sweet cherries are a favourite fruit crop also in Latvia. However, their gro limited by climate. Winterhardiness is one of the main factors for successful growing o cherries in our country. Nevertheless, introduction of new cultivars and breeding is co at the Dobele Horticulture Plant Breeding Experimental Station.The main task in bree sweet cherries in Latvia is to obtain cultivars with adequate tree hardiness in combinati high quality fruits (large-fruited, attractive appearance, good flavour, resistant to rain i fruit cracking).

To choose the best cultivars and hybrids for wider growing, the fruit quality of 42 intr and local cherry cultivars and 3 hybrids were evaluated for 5 years.

The following parameters were determined: fruit weight, flesh firmness, ripening time, fruits, colour of fruits, calibre, content of soluble solids, titrable acids, total sugars, degree.

As a result several cultivars with good fruit quality were chosen for wider growing country.

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