

6th

International Chestnut Symposium

October 9-13, 2017
Samsun - TURKEY
www.chestnut2017.org

Book of Abstracts





6th International Chestnut Symposium
October 9-13, 2017, Samsun - TURKEY

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WELCOME TO THE 6TH INTERNATIONAL CHESTNUT SYMPOSIUM

Samsun- Turkey, 9-13 october, 2017

Dear colleagues,

On behalf of Organizing Committee, I am pleased to welcome to all of you to Sixth International Chestnut Symposium. These kinds of meetings are an opportunity to share experiences and research results among researchers, growers and companies.

Turkey is the leader country with 62000 tons chestnut production in Europe. Chestnut is a native plant in the Black Sea, Marmara and Aegean Regions in Turkey. It is very valuable for its nuts, timber and honey. Chestnut is not only an agricultural crop but also have great impacts on socio-economic and cultural life.

The International Chestnut Symposium is being organized for more than 25 years in different countries. The 1st International Chestnut Symposium was held in Italy in 1993, the second was in France in 1998. Since the third Chestnut Symposium was held in Portugal (2004) it was decided that International Chestnut Symposium is to be organized in every four years. Afterwards fourth International Chestnut Symposium was held in China (2008) and fifth in USA (2012). During the last Symposium held in USA (2012), participants have decided that sixth International Chestnut Symposium would be held in Turkey in 2016. Because of some unexpected problems, Sixth International Chestnut Symposium was postponed to 2017.

Hence, Sixth International Chestnut Symposium was decided to be held on 9-13 October, 2017. Total of 82 abstracts have been submitted for the symposium, after rejections and withdrawals 62 submission have been accepted including 30 oral and 32 poster presentations. In this symposium, there will be many participants from 10 different chestnut growing countries including USA, Italy, Croatia, Slovenia, Azerbaijan, Japan, Portugal, Romania, Slovakia and Turkey. Organization of the symposium was supported from several institutions and private sponsors (Ondokuz Mayıs University, Republic of Turkey Ministry of Food, Agriculture and Livestock, General Directorate of Forestry, ANG Foundation, Cardelion Company, Samsun Municipality, Rekor Gelisim, Bafra Municipality, Ondokuz Mayıs Municipality, Aydın Commodity Exchange, Cevat Fidancılık, Emreköy Tarım Hayvancılık, Black Sea Agricultural Research Institute, Öz Yeşil Fidan, Mevsim Gıda, Bursa Tarım, Arel Tarım, FAO-CIHEAM Nut Network, Ş.G Köleoğlu Gıda, Uludağ Exporters Association General Secretariat, Filiz Helva, Selinay Helva, Sultans International Gıda Sanayi, SAMMEY). We thank to all supporters.

I would like to thank all of the participants for their valuable submissions and participation as well as the members of Scientific Committee who spend their valuable time for abstract reviews.

As an Organizing Committee we wish a fruitful meeting for improve chestnut production and we hope you to enjoy your time in Turkey.

Sincerely,

Prof. Dr. Ümit SERDAR
Convener of Symposium



6th International Chestnut Symposium

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Scientific Programme

9 th October, Monday	
09.00-11.00	Registration
11.00-11.10	Welcome to participants, Prof. Dr. Umit Serdar
11.10-11.20	Welcome by Dean of Agriculture Faculty, OMU, Prof.Dr. Yusuf Demir
11.20-11.30	Welcome by Rector of Ondokuz Mayıs University, Prof.Dr. Sait Bilgiç
11.30-11.40	Welcome by Mayor of Samsun City, Yusuf Ziya Yılmaz
11.40-11.50	Welcome by Governor of Samsun City, Osman Kaymak
11.50-12.00	ISHS presentation- Roberto Botta
12.00-14.00	Lunch (University Restaurant)
14.00-14.30	Establishing a Successful Chestnut Industry in Michigan: Problem Solving Strategies <i>Dennis W. Fulbright (Invited Speaker), Mario Mandujano, Erin Lizotte, Andrew M. Jarosz, Joshua C. Springer, Carmen Medina Mora, Daniel E. Guyer, Irwin R. González, Roger Blackwell</i>
14.30-15.00	Tentative Increasing Chestnut Resilience Against Climate Change with Innovative Management Practices <i>Jose Gomes Laranjo (Invited Speaker), Lia-Tânia Dinis, Tiago Marques, Margarida Mota, Andreia Carvalho, Teresa Pinto, Rosário Anjos, Luís Martins, Guilhermina Marques, Maria J. Gaspar, Mário Gonzalez Pereira, Fernando Raimundo, Jorge Ferreira-Cardoso</i>
15.00-15.30	The Phytosanitary Situation of Sweet Chestnut After the Gall Wasp Invasion: Facing the 'Alliance' of New and Old Threats <i>Andrea Vannini (Invited Speaker)</i>
16.00-18.30	University and Samsun Trip
19.00-22.00	Welcome Dinner at OMTEL

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Scientific Programme

10th October, Tuesday

Oral Session - 1

09.30-10.30

General Aspects

Chairman: Arif Soylu

09.30-09.45

Advances in High Density Chestnut Plantations and Clonal Rootstocks: Re-Thinking a *Castanea sativa* Cultivation Model

Gabriele L. Beccaro, Gabriella M. Mellano, Giancarlo Bounous

09.45-10.00

Chestnut Regional Centre: 10 Years of Activity in Piemonte Region (Italy)

Gabriele L. Beccaro, Alberto Alma, Paolo Gonthier, Gabriella M. Mellano, Chiara Ferracini, Luana Giordano, Guglielmo Leone, Igor Boni, Andrea Ebone, Enrico Raina, Marco Rocca, Giancarlo Bounous

10.00-10.15

Importance and Presence of Chestnut (*Castanea sativa* Mill.) at the Model Forests; Case of Mediterranean Model Forest Network

Mehmet Özdemir, Sultan Bekiroğlu

10.15-11.30

Coffee Break

Oral Session - 2

11.30-12.30

Economy, Marketing and Physiology

Chairman: Gabriele L. Beccaro

11.30-11.45

Developments in the Chestnut Market of Turkey

Mehmet Bozoğlu, Uğur Başer, Nevra Alhas Eroğlu, Bakiye Kılıç Topuz,

11.45-12.00

The Cost and Profitability of Chestnut Production in Aydın Province, Turkey

Mehmet Bozoğlu, Uğur Başer, Nevra Alhas Eroğlu, Bakiye Kılıç Topuz

12.00-12.15

Studies to Determine Phenology and Pollination in The European X Japanese Hybrid cv. 'Colossal' in Michigan Orchards

Carmen M. Mora, Andrew Jarosz, Dennis W. Fulbright

12.15-12.30

Investigations on Male Flower Structures of Some Chestnuts

Başak Müftüoğlu, Cevriye Mert

12.30-14.00

Lunch (University Restaurant)



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10 th October, Tuesday	
Oral Session - 3	
14.00-15.00	
Post Harvest, Food and Processing	
Chairman: Toshihiro Saito	
14.00-14.15	Effect of Gamma Irradiation on Physico-Chemical and Nutritional Parameters of Chestnuts <i>Saadet Koç Güler, Saim Zeki Bostan</i>
14.15-14.30	Some Physical, Chemical and Antioxidant Properties of Chestnut (<i>Castanea sativa</i> mill.) Honey Produced in Turkey <i>Ilkay Koca, Belkis Tekgüler, Burçin Türkyılmaz, Bahtinur Taşçı.</i>
14.30-14.45	A Gluten Free Food Tarhana with Chestnut <i>Ilkay Koca, Volkan Arif Yılmaz, Belkis Tekgüler</i>
14.45-15.00	Chemical Properties of Chestnut Honeys Produced in Different Regions of Turkey <i>Feyzullah Konak, Fazıl Güney, Serdar Mehmetoğlu, Hilal Tekvür, Nurten Türkarıslan, Neslihan Çakıcı, Tahsin Demir, Ö.Faruk Atmaca</i>
15.00-16.00	Coffee Break
Oral Session - 4	
16.00-17.00	
Breeding	
Chairman: Dennis W. Fulbright	
16.00-16.15	Evaluation of The Descriptive Characteristics of Chestnut <i>Ümit Serdar, Giancarlo Bounous, Ümran Ertürk, Burak Akyüz</i>
16.15-16.30	Some Interspecific Hybrid Chestnut Genotypes from Turkey <i>Ümit Serdar, İdris Macit, Ercan Er, Burak Akyüz</i>
16.30-16.45	Progress in Chestnut Breeding at The Institute of Fruit Tree and Tee Science, Naro, Japan <i>Toshihiro Saito, Hidenori Kato, Norio Takada, Sogo Nishio</i>
16.45-17.00	Development of a Genetic Linkage Map for Molecular Breeding of Chestnut <i>Daniela Torello Marinoni, Ezio Portis, Nishio Sogo, Nadia Valentini, Chiara Sartor, Francesca Dini, Paola Ruffa, Sara Oglietti, Gabriele Martino, Aziz Akkac, Roberto Botta</i>
11 th October, Wednesday	
Poster Session	
Chairman: Gabriella M. Mellano	
09.30-12.30	Poster Session
12.30-14.00	Lunch (University Restaurant)
14.00-17.00	Field trip to Blacksea Agricultural Research Station
18.30-20.30	Dinner at Blacksea Agricultural Research Station

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Scientific Programme

12th October, Thursday

Oral Session - 5

09.30-10.45

Genetics, Propagation and Orchard Management

Chairman: Timur Döken

09.30-09.45	Genetic Characterization of Wild Chestnut Populations in Japan <i>Sogo Nishio, Hiroyuki Iketani, Norio Takada, Atsushi Imai, Hidenori Kato, Toshihiro Saito</i>
09.45-10.00	Photomixotropic and Photoautotrophic Micropropagation of Phytophthora Resistant Chestnut Genotypes Using Liquid Media <i>Beatriz Cuenca, Laura Luquero, Luis Ocaña, Mario Mandujano, Anxela Aldrey, Beiro Blanco, Brais Bogo, Conchi Sánchez, Nieves Vidal</i>
10.00-10.15	Effect of Temperature on Tongue Grafting Success in Chestnut (<i>Castanea sativa</i> Mill.) <i>Şemsettin Kulaç, Emrah Çiçek, Ali Kemal Özbayram, Elif Dudu Küçük</i>
10.15-10.30	The Effect of Irrigation on Chestnuts' Physiology and Production (<i>Castanea sativa</i>) <i>Margarida Mota, Tiago Marques, Teresa Pinto, Fernando Raimundo, António Borges, João Caço, José Gomes Laranjo</i>
10.30-11.30	Coffee Break

Oral Session - 6

11.30-12.30

Pests

Chairman: Andrea Vannini

11.30-11.45	Determination on Damage Ratios of Ambrosia beetles (Coleoptera: Scolytidae) in Hybrid Chestnuts <i>İzzet Akça, Şeyma Toksöz, İslam Saruhan, Burak Akyüz, Ümit Serdar</i>
11.45-12.00	Studies on The Infestation Ratios of <i>Dryocosmus kuriphilus</i> on Different Chestnut Cultivars in Turkey <i>Nimet Sema Gençer, Cevriye Mert, Başak Müftüoğlu</i>
12.00-12.15	Monitoring of Seasonal Fluctuation of Goath Moth, <i>Cossus cossus</i> L. (Lepidoptera: Cossidae), in Chestnut Plantations in İzmir and Manisa, Turkey <i>Cevdet Kaplan, Tefrik Turanlı</i>
12.15-12.30	Secondary Metabolites in Buds of The Oriental Chestnut Gall Wasp (<i>Dryocosmus kuriphilus</i> Yasumatsu) Resistant and Susceptible Chestnut Cultivars <i>Anita Solar, Jerneja Jakopic, Vlasta Cunja, Nika Weber, Franci Stampar</i>
12.30-14.00	Lunch (University Restaurant)



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Chairman: Carmen Medina Mora	
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14.15-14.30	Importance of <i>Phytophthora</i> Dieback of Chestnut Trees in Marmara and Aegean Regions of Turkey <i>Seçil Akıllı, Çiğdem Ulubaş Serçe, Deniz Çakar, Yakup Zekai Katırcıoğlu, Salih Maden, Daniel Rigling</i>
14.30-14.45	Histopathology of Infection of <i>Castanea</i> Spp. Roots by <i>Phytophthora cinnamomi</i> <i>Patrícia Fernandes, Carmen Santos, Helena Machado, Maria do Céu Silva, Rita Costa</i>
14.45-15.00	Fungal Diversity on The Bark of Chestnut Tree Affected by <i>Cryphonectria parasitica</i> <i>Dilzara N. Aghayeva, Daniel Rigling, Joana Meyer, Nigar Mursal</i>
15.00-16.00	Coffee Break
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16.00-16.15	Testing Chestnut Hybrids for Resistance to <i>Cryphonectria parasitica</i> <i>Dănuț Chira, Răzvan Teodorescu, Mihai Botu, Gheorghe Achim, Anca Scutelnicu</i>
16.15-16.30	Which Method Should be Used to Determine the Reactions of Chestnut Cultivars to Chestnut Blight <i>Mustafa Oduncuoğlu, Himmet Tezcan</i>
16.30-16.45	Investigation of the Presence of dsRNA in <i>Cryphonectria parasitica</i> Isolates Obtained from The Black Sea and Marmara Region in Turkey <i>Serap Açıkgöz, Ömer Erincik, Eda Mersin, Sevdije Yorgancı, Sahra Hosseinalizadeh, Engin Mangil, M. Timur Döken</i>
16.45-17.45	Business Session
18.30-21.30	Gala Dinner at "Samsunum 1" ship
13 th October, Friday	
08.00	Departure from hotels
09.00	Visiting ANG Chestnut Research Station
13.00	Lunch at top of the Nebiyan mountain
14.30	Visiting an old chestnut orchard at Elma Çukuru village
17.00	Departure from chestnut orchard
18.00	Arrival to hotels

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ESTABLISHING A SUCCESSFUL CHESTNUT INDUSTRY IN MICHIGAN: PROBLEM SOLVING STRATEGIES

Dennis W. Fulbright^{1*}, Mario Mandujano¹, Erin Lizotte², Andrew M. Jarosz³, Joshua C. Springer¹, Carmen Medina Mora¹, Daniel E. Guyer⁴, Irwin R. González⁴, Roger Blackwell⁵

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Abstract

The history of chestnut production in Michigan begins with hobbyists or small farm growers who decided to begin a commercial industry by planting Chinese chestnut seedlings. The American chestnut was never prevalent in Michigan and it was not known how the Chinese chestnut trees would grow and produce in this northern state. Many of these early growers followed protocols predicated on model chestnut farms established in other midwest or eastern states such as Ohio and Pennsylvania, respectively. Years later, Michigan State University researchers were contacted as growers began to question the lack of chestnut production in their orchards. It was discovered that few of the seedling trees actually produced chestnuts and that the lack of size made the Michigan chestnut less commercially desirable. Being a seedling tree also meant that it took longer for the trees to mature and produce chestnuts. Researchers suggested European X Japanese hybrid cultivars that growers on the west coast of North America were growing. Some of these cultivars performed much better than the Chinese chestnut seedling trees and went into production faster and with larger nuts. Once several growers switched or established orchards of European X Japanese hybrid cultivars, yields increased, a cooperative was formed and a commercial chestnut industry quickly developed. Growers can now expect to produce 2,500 to 5,000 kg chestnuts per hectare. To reach this achievement, several challenges have been encountered. These challenges include chestnut blight, internal kernel breakdown, and insect pests, spring frost events, winter injury and death, production of enough nursery stock, harvesting issues, storage rots, marketing avenues, and return on investment. How we dealt with these challenges will be discussed.

Keywords: Cultivars, chestnut blight, hypovirulence, internal kernel breakdown, IKB, Asian chestnut gall wasp, winter hardiness

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TENTATIVE INCREASING CHESTNUT RESILIENCE AGAINST CLIMATE CHANGE WITH INNOVATIVE MANAGEMENT PRACTICES

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Abstract

Climate change is ongoing but the magnitude, extent and duration of its impacts is far from being known and, in particular, its consequence on Earth's life is still under study. The observed alterations include changes in air temperature and precipitation regime, namely the increase of mean air temperature, the decrease of total precipitation but the increase of the frequency and magnitude of extreme precipitation events. In the northern of Portugal, where more than 80% of chestnut production area is concentrated, annual mean air temperature increased 0.8°C (from 15.3°C to 16.1°C) while annual total precipitation decreased 50 mm (from 850 mm to 800 mm) (IPMA, 2017). Chestnut trees dislikes chalky and poorly drained soils but appreciate sedimentary, siliceous and acidic to neutral soils. This species also seems to appreciate annual mean values of sunlight spanning between 2400 and 2600 h, rainfall ranging between 600 and 1500 mm and annual mean air temperature between 9 and 13°C while 27°C is the maximum air temperature allowed. The amount of heat between May and October must range between 1800 °D and 2400 °D. Trás-os-Montes region is characterized by a high number of different genotypes and *C. sativa* can respond genetically quite well to environmental changes by natural or artificial selection. Found only small differences between Judia ecotypes suggesting that the gene retention allow effective biochemical, physiological and phenotypical adaptation to different cultivation conditions and edaphoclimatic stresses. Natural or controlled hybridization have originated interesting resistant chestnuts against ink disease. The Portuguese ColUTAD from *Columbano Taveira Fernandes* breeding programme and posteriorly developed by UTAD researchers in the 1980's is already on the market as a rootstock. ColUTAD and Ca90 constitute the two main options for new plantations, being the former less vigorous and less tolerant to water stress. Other rootstocks with different ecophysiological characteristics from controlled pollination are in development since 2007, integrating a breeding programme in a partnership coordinated INIAV. Long-term sustainability



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of chestnut orchards is currently threatened by declining trends in stand density due to adult tree mortality caused by biotic and abiotic stresses. The sown of biodiverse pastures (with *Trifolium* sp. and *Ornithopus* sp.) could reverse the degradation of Mediterranean ecosystems, increasing organic matter, nutrient availability (e.g., nitrogen), carbon sequestration and the functioning of mycorrhizal associations. Recent works on photosynthesis rate suggest a high plasticity of photosystem II when air temperature increases from 20 to 40°C, since oxygen evolution was not affected. Contrarily, the functionality of the thylakoid membrane during this process significantly decreased despite of an adjustment on fatty acid composition of thylakoid membrane. Smart irrigation was also tested based on midday stem water potential. Irrigation was triggered for when values were lower than -1.2 MPa in close relationship with soil moisture. Production on of watered trees canopy was 1.05 kg/m², which is 22% higher than non-irrigated trees, while the calibre fruit size increased 27%. The well-known benefits of silicon for plants grown under abiotic and biotic stresses include improved resistance to insect attack, pathogenic fungi and drought. In chestnuts, there was a demonstrated improvement on ink and blight disease resilience as well as on water and heat stress. In adult trees, the application of the nitrogenated organo-mineral biofertilizer Ergofito[®] increased nut production by about 45% with a significant decrease on nut tortrix, *Cydia splendana* (28% to 20% of affected nuts). These are, among others, some cultural practices that should be taken into account to increase the resilience of this species to climate change effects, namely to maintain the productivity and the quality of the fruits, both in terms of nutritional value and in relation to the organoleptic characteristics.

Keywords: Climate change, chestnut resilience, irrigation, silicon, rootstocks, biofertilizers, biodiverse pastures



THE PHYTOSANITARY SITUATION OF SWEET CHESTNUT AFTER THE GALL WASP INVASION: FACING THE 'ALLIANCE' OF NEW AND OLD THREATS

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Abstract

In the last 100 years sweet chestnut (*Castanea sativa* Mill.) has been challenged by a number of pests and diseases that severely impaired the productivity of orchard as well as the sustainability of forests. Ink disease and chestnut blight traditionally represent the most important diseases of sweet chestnut in Europe. Following the introduction of the hypovirulence, the impact of chestnut blight decreased along most of the European range of the species. Ink disease still represents a serious threat although it causes serious losses in patches where the environmental and climatic condition are particularly favourable to the disease development. Minor diseases, such as black rot of fruits and mycosphaerella leaf spots use to cause problems in restricted areas, without representing a real threat. After the severe gall wasp infestation in 2006, new sets of associated symptoms showed up in chestnut groves with increasing severity, especially associated to fruits and crown. Brown rot of kernels, associated to the cryptic fungus *Gnomoniopsis smithogilvyi*, a common endophyte of chestnut, and wilting of terminal branches associated to the chestnut blight fungus *Cryphonectria parasitica* are the most evident new symptoms in Mediterranean orchards and coppices. The epidemic spread of these two new syndromes appears to be associated to the gall wasp infestation likely through the overlap of their respective biological and disease cycles. These aspect are considered and discussed in the present work.

Keywords: *Cryphonectria parasitica*, *gnomoniopsis castanea*, sustainable control



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Oral Session - 1

General Aspects



10th October, Tuesday

Oral Session - 1

09.30-10.30

General Aspects

Chairman: Arif Soylu

09.30-09.45	Advances in High Density Chestnut Plantations and Clonal Rootstocks: Re-Thinking a <i>Castanea sativa</i> Cultivation Model <i>Gabriele L. Beccaro, Gabriella M. Mellano, Giancarlo Bounous</i>
09.45-10.00	Chestnut Regional Centre: 10 Years of Activity in Piemonte Region (Italy) <i>Gabriele L. Beccaro, Alberto Alma, Paolo Gonthier, Gabriella M. Mellano, Chiara Ferracini, Luana Giordano, Guglielmo Lione, Igor Boni, Andrea Ebone, Enrico Raina, Marco Rocca, Giancarlo Bounous</i>
10.00-10.15	Importance and Presence of Chestnut (<i>Castanea sativa</i> Mill.) at the Model Forests; Case of Mediterranean Model Forest Network <i>Mehmet Özdemir, Sultan Bekiroğlu</i>



ADVANCES IN HIGH DENSITY CHESTNUT PLANTATIONS AND CLONAL ROOTSTOCKS: RE-THINKING A *CASTANEA SATIVA* CULTIVATION MODEL

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Abstract

The Chinese chestnut (*Castanea mollissima*), a medium-sized tree, and the Japanese chestnut (*C. crenata*) that normally does not exceed 8–10 m in height, for their habit, are grown in China, Japan and South Korea in very high density plantations (2x3m; 4 x4m) thinned in the following few years to 4x8 m and 8x8 m respectively. The European Chestnut (*C. sativa*), a tall tree, is grown mainly in forests or plantations and spacing ranges from 10-12 m apart in rows and 12 m or more between rows. In the last 20-30 years the trend to increase plant density to develop maximum bearing per unit area in a minimum of time is interesting also the eurojapanese chestnut hybrids and *C. sativa* cultivars. High density chestnut plantations have been successfully established in many European countries (Italy, France, Spain) and in Australia, Chile, USA. High or semi high density schemes (8x8 m, 7x8 m) implement the productivity and the economics returns and can be an opportunity of conversion for many chestnut countries, mainly in the Mediterranean areas that are still producing according to the traditional methods. The majority of such plantations are established with eurojapanese chestnut hybrids (*C. crenata* x *C. sativa*) cultivars (resistant to gall wasp and producing large size nuts), sometimes grafted onto clonal rootstocks tolerant to *Phytophthora*. In more recent years many high density plantations are also successfully established with the European chestnut (*C. sativa*) cultivars too. The growing criteria to manage these trees are similar to those adopted in modern orcharding: irrigation, fertilizing, pruning, pest management follow precise schemes in a frame of sustainability. The hybrid rootstocks clones, still lacking on the market, can contribute to the renewal of chestnut culture, following modern agrotechniques and allowing to realize orchards with trees standardized for strength, habit and productivity, resulting in a facilitation of crop and agronomic field operations. Strengths and weaknesses of the two different models (traditional and innovative) of chestnut culture are discussed.

Keywords: Eurojapanese hybrids, intensive agrotechniques, sustainability, chestnut orchards



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CHESTNUT REGIONAL CENTRE: 10 YEARS OF ACTIVITY IN PIEMONTE REGION (ITALY)

Gabriele L. Beccaro^{1,2*}, Alberto Alma^{1,2}, Paolo Gonthier^{1,2}, Gabriella M. Mellano^{1,2}, Chiara Ferracini¹, Luana Giordano¹, Guglielmo Lione¹, Igor Boni^{2,3}, Andrea Ebone^{2,3}, Enrico Raina^{2,4}, Marco Rocca^{2,4}, Giancarlo Bounous^{1,2}

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Abstract

To improve the R&D strategies in chestnut cultivation and to further develop the chestnut industry, the University of Torino, Dept. of Agriculture, Forestry and Food, with the financial support of the Piemonte Region, established in 2005 the Chestnut Regional Centre, located in Chiusa Pesio (Cuneo Province, North Western Italy). The Piemonte Region supported the institution of the Centre with human resources and structures (nurseries, land to realize the arboretum). The main activity of the Centre is the research, on several fields, including chestnut germplasm, advanced propagation techniques, optimization of cultural practices, pest and diseases management, extension service activities. In the Centre, a germplasm collection of chestnut genetic variability has been established on a 3 ha surface. Main local and national cultivars are included, with several European varieties from Portugal, Spain, France, Switzerland and other accessions from U.S.A., China, and Japan. The collection is in progress and will be completed in the next years. A newsletter published in English and Italian informs researchers, technicians and growers periodically (www.centrocastanicoltura.unito.it/newsletter.html). The Centre aims to become a national conservatory of the chestnut biodiversity and a reference center for research activities on *Castanea* species.

Keywords: Germplasm collection, agrotechniques, in vitro propagation, chestnut insects, chestnut diseases

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IMPORTANCE AND PRESENCE OF CHESTNUT (*CASTANEA SATIVA* MILL.) AT THE MODEL FORESTS; CASE OF MEDITERRANEAN MODEL FOREST NETWORK

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Abstract

Model Forests are organisations targeting sustainable management of natural resources. Many model forests were established in terms of Mediterranean Model Forest Network. These organisations are established by stakeholders in their locations. The concept “Model Forest” was created in the early 90s, when the Government of Canada thought an alternative to the conflicts between forest loggers and communities living in forested areas. International Model Forest Network was established by the government of Canada after that the United Nations Conference on Environment and Development held in 1992, Rio. After that, six regional networks were created in this context all over the world. One of these is Mediterranean Model Forest Network in which Turkey is included. Countries like Spain, France, Italy, Croatia, Greece, Algeria, Morocco, Tunisia and other initiatives are represented as regional in this network. The aim of this study is to contribute to the sustainable management of chestnut forests creating awareness through model forests established with participatory approach. For this purpose, strategic plans and various publications of these in terms of Mediterranean at Model Forest were examined where chestnut grows. According to the assessment made, it was seen that there are many activities in these strategic plans and every model forest is unique according to their regional characteristics. It is understood that multi-purpose use of chestnut. According to this, chestnut is also used as an important food source beside the precious wood used in construction. Main non-wood forest products are chestnut and chestnut honey. These products are used widely at network. As a result, chestnut forests as a genetic resource should be protected against harmful effects. For this purpose, the contribution of stakeholders at each stage should be taken.

Keywords: Chestnut, Model Forest, governance, importance, non-wood forest products



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Oral Session - 2

Economy, Marketing and Physiology



10th October, Tuesday

Oral Session - 2

11.30-12.30

Economy, Marketing and Physiology

Chairman: Gabriele L. Beccaro

11.30-11.45	Developments in the Chestnut Market of Turkey <i>Mehmet Bozođlu, Uđur Bađer, Nevra Alhas Erođlu, Bakiye Kılıç Topuz,</i>
11.45-12.00	The Cost and Profitability of Chestnut Production in Aydın Province, Turkey <i>Mehmet Bozođlu, Uđur Bađer, Nevra Alhas Erođlu, Bakiye Kılıç Topuz</i>
12.00-12.15	Studies to Determine Phenology and Pollination in The European X Japanese Hybrid cv. 'Colossal' in Michigan Orchards <i>Carmen M. Mora, Andrew Jarosz, Dennis W. Fulbright</i>
12.15-12.30	Investigations on Male Flower Structures of Some Chestnuts <i>Başak Müftüođlu, Cevriye Mert</i>

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DEVELOPMENTS IN THE CHESTNUT MARKET OF TURKEY

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Abstract

This study aims to evaluate the developments in the chestnut market of Turkey. In 2013, chestnut area and production of the world were about 552.478 hectares and 2 million tons, respectively. The chestnut production and area harvested in Turkey were 39 thousand hectares and 60 thousand tonnes, respectively. Turkey was the third biggest chestnut producer in the world with a share of 2.99 percent. During the last three decades, while the chestnut area harvested had shown a decreasing trend, the production quantity had increased 9.1 percent. While chestnut yield per hectare was 2.4 tons during the second half of 1980's, nowadays it was 1.5 tons. There had been an increasing trend in chestnut producer prices since 2001 and it had reached from \$ 1000 to \$ 3000 per tonne. Turkey had increased chestnut export quantity from 857 to 18.449 tonnes during the last three decades. However, Turkey had increased chestnut import quantity from 78 tons to 206 tons during the last two decades.

Keywords: Chestnut, market, development, Turkey



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THE COST AND PROFITABILITY OF CHESTNUT PRODUCTION IN AYDIN PROVINCE, TURKEY

Mehmet Bozoglu¹, Ugur Baser^{1*}, Nevra Alhas Eroglu², Bakiye Kilic Topuz¹

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Abstract

This study investigates the cost and profitability of chestnut production in Aydin Province of Turkey. Aydin Province is the top producer in Turkey, and produced 21.215 tons of chestnut which accounts for 33,3% of the national output. The research data were collected by a questionnaire from randomly selected sample chestnut farms. Information such as the structure of chestnut farms, socio-demographic characteristics of the chestnut farmers, chestnut growing systems, chestnut production cost and profit of the farms, marketing channels of chestnut will be collected from the farms. The production cost was defined as the financial cost associated with growing chestnut trees. The profitability will be measured by net income and operators' labor and management income.

Keywords: Chestnut production, cost, profitability, Turkey



STUDIES TO DETERMINE PHENOLOGY AND POLLINATION IN THE EUROPEAN X JAPANESE HYBRID CV. 'COLOSSAL' IN MICHIGAN ORCHARDS

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Abstract

Little is known about the phenology of chestnut and the timing of pollination in Michigan-grown chestnuts. The purpose of this study was to improve our understanding of chestnut phenology, pollination, and its relation to nut set (yield) by conducting both wind pollination (natural), and hand-pollination experiments. In these experiments, *Castanea sativa* X *C. crenata* cv. 'Colossal' was selected as the mother tree due to its popularity in Michigan orchards. Wind pollination of the cultivar 'Colossal' was monitored for three years at two orchard sites located in mid-Michigan. Two cultivars were used as pollinizers of 'Colossal', a *C. crenata* X *C. pumila* var. *pumila* cv. Okei and *C. mollissima* cv. 'Benton Harbor'. Wind pollination was permitted or inhibited by placing bags over flowers or by removing bags from flowers at predetermined times. Wind pollination of 'Colossal' female flowers was initiated on 2-July (2008), 25-June (2009), and 18-June (2010). The highest number of nuts resulted when 'Colossal' flowers were continuously exposed to pollen until 22-July (2008), 5-July (2009), and 2-July (2010). To perform hand pollination experiments with 'Benton Harbor' or 'Okei' pollen, a single catkin was removed from the paternal trees and gently rubbed onto the stigmata of 'Colossal' female flowers. Prior to and after hand pollination, flowers were protected from unwanted pollen by placing bags over the flowers. In 2009 and 2010, hand pollination experiments were conducted in two orchards. 'Colossal' female flowers were pollinated once, twice or three times at pre-anthesis, anthesis and post-anthesis flower development stages. Results suggested that pollen applied only a single time at anthesis produced more nuts than when pollen was applied before or after anthesis. Results from the wind-pollination and hand-pollination experiments strongly suggest that the highest 'Colossal' nut production is achieved when pollen is available at anthesis. Anthesis in mid-Michigan is generally between late-June and early-July, regardless of the year, and that the specific date for optimal pollination fluctuates slightly from year to year.

Keywords: Anthesis, female flowers, pollen, pollen timing, pollen application



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INVESTIGATIONS ON MALE FLOWER STRUCTURES OF SOME CHESTNUTS

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Abstract

This study was carried out to determine the effects of selection of 17 prominent chestnut (*Castanea sativa* Mill.) cultivars / genotypes and two hybrid (*Castanea sativa* x *Castanea crenata*) varieties according to selection studies in different ecologies cultivated under Bursa conditions in 2014-2015. The average length of the male catkins ranged from 6.41 cm to 20.06 cm, the mean number of cluster per catkin varied from 61.85 to 154.35 depending on cultivar/genotypes. The average number of male flowers per cluster ranged from 3.21 to 8.68, and the mean number of stamens per flower varied between 7.36 to 11.61. Significant differences were found in stamen structures in chestnut varieties; They were classified as 5 kinds of astamine, 1 kind of brachistamine, 4 kinds of mesostamine and 9 kinds of longistamine. The cultivar/genotypes had a mean anther length of 366.03 µm to 732.60 µm, longest length changed between 365.59-609.11 µm. Three different forms of anthers were observed as oblate spheroidal, prolate spheroidal, and subprolate.

Keywords: Chestnut, male flower, stamine type

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Oral Session - 3

Post Harvest, Food and Processing



10th October, Tuesday

Oral Session - 3

14.00-15.00

Post Harvest, Food and Processing

Chairman: Toshihiro Saito

14.00-14.15	Effect of Gamma Irradiation on Physico-Chemical and Nutritional Parameters of Chestnuts <i>Saadet Koç Güler, Saim Zeki Bostan</i>
14.15-14.30	Some Physical, Chemical and Antioxidant Properties of Chestnut (<i>Castanea sativa</i> mill.) Honey Produced in Turkey <i>Ilkay Koca, Belkis Tekgüler, Burçin Türkyılmaz, Bahtinur Taşçı</i>
14.30-14.45	A Gluten Free Food Tarhana with Chestnut <i>Ilkay Koca, Volkan Arif Yılmaz, Belkis Tekgüler</i>
14.45-15.00	Chemical Properties of Chestnut Honeys Produced in Different Regions of Turkey <i>Feyzullah Konak, Fazıl Güney, Serdar Mehmetoğlu, Hilal Tekvür, Nurten Türkarlan, Neslihan Çakıcı, Tahsin Demir, Ö.Faruk Atmaca</i>



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EFFECT OF GAMMA IRRADIATION ON PHYSICO-CHEMICAL AND NUTRITIONAL PARAMETERS OF CHESTNUTS

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¹ *Ordu University, Faculty of Agriculture, Department of Horticulture, Ordu, Turkey*

Chestnut (*Castanea sativa* M.) is an important food resource in several countries. The main region for production of chestnuts is Asia (85%), followed by Europe (12%). In the present study, Sarı Aşlama variety and 52509 type were treated with 0, 1, 3 and 5 kGy of gamma irradiation. The irradiated and unirradiated chestnuts were stored at 4°C and 90 % r.h. Physico-chemical (color, texture) and nutritional (energetic value, protein, fat, ash, carbohydrates) parameters were evaluated immediately after irradiation, 15 and 30 days of storage. In addition, sprouting and mold growth were observed. Gamma irradiation in the applied doses did not significant change chestnut physico-chemical and nutritional composition.

Keywords: Chestnut, irradiation, storage



SOME PHYSICAL, CHEMICAL AND ANTIOXIDANT PROPERTIES OF CHESTNUT (*CASTANEA SATIVA* MILL.) HONEY PRODUCED IN TURKEY

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Abstract

Chestnut honey is produced from the flowers of *chestnut by honey bees*. It is consumed as a nutritional food. Also it's used as an alternative medicine for the treatment of some health problems like asthma and respiratory diseases and cancer in Turkey. In the present study, it was aimed to investigate some physical, chemical and antioxidant properties of chestnut honey produced in Turkey. Honey samples were harvested from 25 different honey producers of some city including Artvin, Edirne, Kastamonu, Kocaeli, Samsun, Sinop, Trabzon and Rize in Turkey at 2015. Chestnut honey samples were analyzed for color (L^* , a^* , b^*), moisture, pH, free acidity, total phenolics, antioxidant activity and viscosity. Total phenolic content was measured using Folin-Ciocalteu assay. The antioxidant activity of the samples have been tested both the average content of DPPH (1,1-diphenyl-2-picrylhydrazyl) scavenging activity and FRAP (ferric reducing ability power) assays. Viscosity was analyzed by rheometer. The levels of L^* , a^* , b^* , moisture, pH, free acidity, total phenolics, DPPH and FRAP of the honey samples were within the range of 19.72-25.11 (22.52 ± 1.58), -0.04-1.82 (0.93 ± 0.53), 3.15-6.98 (5.26 ± 1.06), 17.5-21.5% ($18.96 \pm 1.21\%$), 3.84-5.54 (4.90 ± 0.42), 12.2-45.8 meq kg^{-1} (22.82 ± 8.22 meq kg^{-1}), 332.56-1134.61 mg GAE kg^{-1} (683.73 ± 231.80 mg GAE kg^{-1}), 5.71-74.97 mmol g^{-1} (as trolox equivalents, 25.50 ± 16.94 mmol g^{-1}), and 8.83-62.88 mmol Fe^{+2} g^{-1} (29.33 ± 16.94 mmol Fe^{+2} g^{-1}). Viscosity values of the samples ranged between 5.44 Pa.s and 21.58 Pa.s (13.17 ± 4.73 Pa.s). The honey samples behaved as Newtonian fluids.

Keywords: Honey, chestnut, antioxidant activity



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A GLUTEN FREE FOOD: TARHANA WITH CHESTNUT

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Abstract

Tarhana is a traditional fermented Turkish food. It's produced by mixing yoghurt, wheat flour, yeast, salt, and some raw and cooked vegetables such as onions, tomatoes, green and red peppers and spices such as mint, paprika, basil, dill followed by lactic and alcoholic fermentation. The fermentation may occur in a period from one to seven days. In this study, instead of wheat flour, gluten-free corn flour and chestnut flour were used to produce tarhana for celiac patients, and the acceptability of the tarhana was evaluated. Tarhana production was carried out by using the mixtures of corn flour and chestnut flour in five rates (0, 25, 50, 75 and 100%). Tarhana samples were fermented for 48 hours. The color, pH, titratable acidity values of tarhana samples were analyzed at the beginning (0 hour) and the end (48 hours) of the fermentation. The tarhana samples were dried to <6% moisture content at 50°C and 0.5 m s⁻¹ air flow after fermentation. The dry matter, color, pH, titratable acidity values were determined in dried tarhana samples, and the sensory and viscosity analysis were done in the tarhana soups. According to the physical, chemical and sensory analysis, the acceptability of the samples was evaluated. While chestnut flour ratio increased, *a**, pH and acidity of the samples increased, *L** and *b** values decreased significantly (*p*<0.05). The viscosity values at 60°C increased when compared with the control group. All tarhana soup samples exhibited pseudoplastic behaviour. The points of the sensorial parameters were decreased with the increase of chestnut flour concentration. The overall acceptability point of control tarhana was 9.4 over 10 point, and in all other samples the points were over the 7.5. It was concluded that the chestnut flour is suitable for tarhana production with or without adding corn flour.

Keywords: Chestnut, celiac, soup, tarhana, gluten free foods



CHEMICAL PROPERTIES OF CHESTNUT HONEYS PRODUCED IN DIFFERENT REGIONS OF TURKEY

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Abstract

Our country provide a suitable environment for beekeeping through its rich flora, geographical and climate conditions. Composition of honeys obtained from this rich flora varies depend on plant origin. In particular, chestnut honeys can be distinguish via their distinctive taste, colour and aroma. In Turkey these honeys obtained from trees of *Fagaceace* family *Castanea* genus which grow naturally in forestlands of Black Sea, Marmara and Aegean Region are demanded and approved by especially customers. In this study; pollen, sugar composition, electrical conductivity, proline, diastase, moisture and pH analyses of 25 chestnut honey samples from 9 cities located in Marmara and Black Sea region, were performed. Fructose compound of honeys varied between %32,4 - 43,8 and mean value determined as %38,6. Glucose compound varied between %30,3 – 23,9 and mean value found as %38,6. Proline value varied between 348,1 – 977,0 mg/kg and mean value found as 663,9 mg/kg. Diastase number of honeys varied between 12,0 – 33,0 and mean value determined as 19,3. Electrical conductivity value varied between 0,9 – 2,5 mS/cm and mean value measured as 1,5 mS/cm. pH value varied between 5,8-4,2 and mean value determined as 4,9. Moisture content of honeys varied between %16,5-20,5 and mean value found as %19,2.

Keywords: Black Sea,chestnut,diastase,honey,proline



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Oral Session - 4

Breeding



10th October, Tuesday

Oral Session - 4

16.00-17.00

Breeding

Chairman: Dennis W. Fulbright

16.00-16.15	Evaluation of The Descriptive Characteristics of Chestnut <i>Ümit Serdar, Giancarlo Bounous, Ümran Ertürk, Burak Akyüz</i>
16.15-16.30	Some Interspecific Hybrid Chestnut Genotypes from Turkey <i>İdris Macit, Ümit Serdar, Ercan Er, Burak Akyüz</i>
16.30-16.45	Progress in Chestnut Breeding at The Institute of Fruit Tree and Tee Science, Naro, Japan <i>Toshihiro Saito, Hidenori Kato, Norio Takada, Sogo Nishio</i>
16.45-17.00	Development of a Genetic Linkage Map for Molecular Breeding of Chestnut <i>Daniela Torello Marinoni, Ezio Portis, Nishio Sogo, Nadia Valentini, Chiara Sartor, Francesca Dini, Paola Ruffa, Sara Oglietti, Gabriele Martino, Aziz Akkak, Roberto Botta</i>



EVALUATION OF THE DESCRIPTIVE CHARACTERISTICS OF CHESTNUT

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Abstract

Chestnut is very valuable tree for its nuts, timber, and honey. Chestnut (*Castanea*) genus is a native plant to the temperate zone of the northern Hemisphere. The 13 *Castanea* species have been identified, five in East Asia, seven in North America and one in Europe. Many cultivars have been developed with selection and hybridization studies conducted with different aims such as nut or timber quality, yield, resistance to different disease or pests. Registrations of new cultivars, distinctness, uniformity and stability (DUS) of them have to be proven. For this aim, morphological characteristics of the genetic materials should be determined. There are lots of morphological characteristics for identifying the cultivar candidates. However, reliable characteristics should be selected. For this aim, generally UPOV criteria have been used. However, they need to update. In this review, descriptive morphological characteristics of chestnut have been discussed.

Keywords: Nut crops, pomology, variety registration, cultivar releasing, Turkey.



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SOME INTERSPECIFIC HYBRID CHESTNUT GENOTYPES FROM TURKEY

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Abstract

This research has been conducted with the aim to select interspecific chestnut genotypes which have superior yield and nut characteristics. Hand crossing studies were made between ‘King Arthur’ and ‘Lockwood’ at The Connecticut Agricultural Experiment Station in 2004. The former is a *mollissima/seguine* hybrid and the latter is a *crenata/sativa/dentata* hybrid. Seeds of a complex hybrid were imported from USA in 2005. They were planted at The Black Sea Agricultural Research Institution in 2006. Seven genotypes were examined in 2006-2014. For this aim, yield, precocity, number of nut per bur, nut size (number of nut/kg), color, brightness and thickness of shell, kernel color, penetration of testa into the seed (mm), and taste were investigated. The data was evaluated by the weighted-rankit method with the scores of the chestnut genotypes being determined by their qualitative and quantitative characteristics. Additionally, their relative values were evaluated with regards to fresh consumption and processing. The genotypes found to be superior were as follows: A-14, A-25, A-100.

Keywords: Chestnut, hybrid, breeding

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PROGRESS IN CHESTNUT BREEDING AT THE INSTITUTE OF FRUIT TREE AND TEE SCIENCE, NARO, JAPAN

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Abstract

Organized, government-funded chestnut (*Castanea crenata*) breeding has been undertaken since 1947 at the Institute of Fruit Tree and Tea Science, NARO (NIFTS) in Japan. The initial breeding objective was instituted to develop cultivars that ripen in the early or mid-season and excel in yield, nut size and nut quality by intra-specific cross of Japanese chestnut or interspecific cross between Japanese and Chinese chestnut. Serious damage from the chestnut gall wasp (*Dryocosmus kuriphilus*) (Dk) spread rapidly across Japan soon after the beginning of the breeding program, and resistance to Dk was therefore added as a goal of the breeding program in 1952. By the early 1990's, six Japanese chestnut cultivars had been released, including the currently leading cultivars, 'Tanzawa' (early-ripening), 'Tsukuba' (mid-ripening), and 'Ishizuchi' (late-ripening), that excel in yield, nut size, nut quality and are resistant to Dk. With the successful establishment of *Torymus sinensis*, a parasitoid of Dk introduced from China, in the breeding field at NIFTS by the end of the 1980's, the breeding objective since the 1990's has been focused on improving nut quality by introducing genes of the Chinese chestnut. 'Shuuhou' and 'Mikuri', cultivars developed in this project, have been released. Furthermore, a simple, practical method for evaluating pellicle peeling ability was developed for breeding selection around 2000. Using this method, 'Porotan', an easy pellicle peeling cultivar of Japanese chestnut, was released in 2006. The current breeding objectives at NIFTS focus on good fruit quality with easy pellicle peeling. To increase breeding efficiency, marker-assisted selection (MAS) for easy pellicle peeling has been performed in the 2010's. Furthermore, the development of DNA markers associated with other horticultural traits is currently in progress for future breeding.

Keywords: Gall wasp, nut quality, easy pellicle peeling, MAS



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DEVELOPMENT OF A GENETIC LINKAGE MAP FOR MOLECULAR BREEDING OF CHESTNUT

Daniela Torello Marinoni¹, Ezio Portis¹, Sogo Nishio², Nadia Valentini¹, Chiara Sartor¹, Francesca Dini¹, Paola Ruffa¹, Sara Oglietti¹, Gabriele Martino¹, Aziz Akkak³, Roberto Botta^{1*}

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Abstract

In the last 50 years the nut production of *Castanea sativa* in Europa has strongly declined due to various factors: the aging of the population in the areas of growing, changes in the structure of society, and the spread of diseases and pests, including the chestnut gall wasp (*Dryocosmus kuriphilus*, Yasumatsu). Yet, recently, the interest for the planting of new and modern orchards has grown in many areas of Europe and there is an increasing demand for cultivars and rootstocks more tolerant to biotic factors and adapted to the changing climate. The spread of the gall wasp in Italy has promoted breeding strategies and studies on resistance to the insect. In this frame the *Castanea sativa* cultivar 'Madonna' and the Eurojapanese hybrid 'Bouche de Bétizac' (*C. crenata* x *C. sativa*), susceptible and resistant to gall wasp respectively, were used to create progenies for selecting new cultivars, investigating the mechanism of resistance to the cynipid and studying agronomical and technological traits. A progeny of 250 plants segregating for resistance to the pest and for phenological, vegetative and nut traits was obtained. One hundred and fifty plants of the progeny, currently 8 years old, were analysed at 100 SSR loci, and for agronomic traits such as time of budburst, tree habit, and resistance to *D. kuriphilus*. Data were statistically analysed to obtain a genetic linkage map and identify putative QTL regions and markers associated to the resistance traits. The map consisted of 12 LG; the resistance traits was confirmed to follow a simple Mendelian segregation and was mapped on LG 2. For improving the results this preliminary map will be saturated with further SSR loci and new types of markers, such as EST-SSR and SNPs, retrieved from transcriptome sequences; moreover further field observations will be conducted on the progeny during the next years, to get reliable QTL detection and to develop markers for MAS.

Keywords: *Castanea*, QTL, SSR, *Dryocosmus kuriphilus*, pest resistance

Oral Session - 5

Genetics, Propagation and Orchard Management



12th October, Thursday

Oral Session - 5

09.30-10.45

Genetics, Propagation and Orchard Management

Chairman: Timur Döken

09.30-09.45	Genetic Characterization of Wild Chestnut Populations in Japan <i>Sogo Nishio, Hiroyuki Iketani, Norio Takada, Atsushi Imai, Hidenori Kato, Toshihiro Saito</i>
09.45-10.00	Photomixotropic and Photoautotrophic Micropropagation of Phytophthora Resistant Chestnut Genotypes Using Liquid Media <i>Beatriz Cuenca, Laura Luquero, Luis Ocaña, Mario Mandujano, Anxela Aldrey, Beiro Blanco, Brais Bogo, Conchi Sánchez, Nieves Vidal</i>
10.00-10.15	Effect of Temperature on Tongue Grafting Success in Chestnut (<i>Castanea sativa</i> Mill.) <i>Şemsettin Kulaç, Emrah Çiçek, Ali Kemal Özbayram, Elif Dudu Küçük</i>
10.15-10.30	The Effect of Irrigation on Chestnuts' Physiology and Production (<i>Castanea sativa</i>) <i>Margarida Mota, Teresa Pinto, Tiago Marques, António Borges, João Caço, Fernando Raimundo, José Gomes Laranjo</i>



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GENETIC CHARACTERIZATION OF WILD CHESTNUT POPULATIONS IN JAPAN

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Abstract

Local cultivars and their progeny have been used as parents in the Japanese chestnut breeding program for many years. Currently, the most important target of the program is to release cultivars that have good fruit quality with easy pellicle peeling. However, as few local cultivars have the easy peeling trait, the gene pool for breeding is narrow. To diversify the genetic resource, we collected scions from 12 wild populations from Kanto (central Japan), Tanba (western Japan, the putative region of domestication of Japanese chestnut), and southern Kyushu (southern Japan). We extracted DNAs from the scions and genotyped them by using 29 simple sequence repeat markers (SSRs) and 5 chloroplast SSRs. Heterozygosity and allelic richness were slightly lower in the southern Kyushu populations than in the Kanto and Tanba populations. Bayesian structure analysis revealed that the populations from the 3 regions have different genetic structures ($K = 3$). In particular, the populations from southern Kyushu are genetically far from those from Kanto and Tanba. Using the chloroplast SSRs, we detected two chloroplast haplotypes (Hap 1 and 2) from Japanese cultivars and wild chestnuts. All of the Japanese cultivars and the Kanto and Tanba populations carried Hap 1, whereas only the southern Kyushu populations carried Hap 2. These results suggest that the populations from southern Kyushu have a distinct genetic structure, and that they and the other populations originated from different refugia during the last glacial maximum. Therefore, the southern Kyushu populations would be effective materials to broaden the genetic diversity in the Japanese chestnut breeding program.

Keywords: Genetic resource, genetic structure, simple sequence repeat



PHOTOMIXOTROPIC AND PHOTOAUTOTROPHIC MICROPROPAGATION OF *PHYTOPHTHORA* RESISTANT CHESTNUT GENOTYPES USING LIQUID MEDIA

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Abstract

The aim of the study was the micropropagation and rooting of ink resistant chestnut genotypes, in liquid media in order to reduce costs, to automatize and to future employ a photoautotrophic micropropagation system. For this, commercial bioreactors for temporary immersion have been used (Plantform™), as well as self-designed continuous immersion ones. Axillary shoots were cultured both in photomixotrophic conditions (with 10 or 30 g/l of sucrose and photosynthetic photon flux –PPF- of 50 $\mu\text{mol m}^{-2} \text{s}^{-1}$), and under photoautotrophic conditions (with no added sugars, PPF of 150 $\mu\text{mol m}^{-2} \text{s}^{-1}$ and CO₂ enriched air -2000 ppm inside bioreactors-). Half nitrates MS media added with 0,05 mg/l of BA was used for multiplication phase, with rock wool cubes 1 cm side as a substrate, to maintain the vertical position of the explants. For rooting, elongated shoots (more than 4 cm long) were basal dipped in a 1 g/l IBA solution for 2 min, and laid to root in two different commercial rock wool based substrates. The variables measured were, during multiplication phase: number of segments obtained per initial explant, length of the longest shoot, number of rootable shoots and content of photosynthetic pigments, and during the rooting phase: percentage of rooted explants and percentage of acclimated plants. For temporary immersion system (TIS), 10 genotypes were successfully propagated. For continuous immersion system (CIS) in photoautotrophic conditions, 4 genotypes were tested in multiplication phase and 15 genotypes in rooting phase. Every genotype yielded vigorous plants easy to acclimatize, although contamination rate was much higher when using CIS biorreactor for multiplication phase.

Authors thank technical assistance of Maite García, Begoña Pato and Begoña Correa. This research has been partially supported by FEDER ININTERCONECTA program 2013/2014 (INTEGRACASTANEA EXP00064828/ITC-20133040).

Keywords: Chestnut, in vitro; photoautotrophic; rooting



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EFFECT OF TEMPERATURE ON TONGUE GRAFTING SUCCESS IN CHESTNUT (*CASTANEA SATIVA* MILL.)

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Abstract

Chestnut (*Castanea sativa* Mill.) is one of the important broadleaved trees in Turkey because of its nut, valuable wood, and fast growing ability. Therefore, it is has significant ecological, economic and social values. However, it is neglected and has not been adequately studied. More research is needed for conservation and sustainable use of the species. In this study, the effect of temperature on tongue grafting success in chestnut was investigated. One-year old potted seedlings were used as rootstock. Seeds for rootstock were collected from natural chestnut populations in Akçakoca-Düzce in the fall of 2013 and stored in the refrigerator. The seeds were pre-germinated in the laboratory and then sowed in February 2014. Growing media in pots contained forest soil, peat and perlite in a 1:1:1 volume rate. Scions were collected from trees in Erfelek-Sinop. The controlled environment temperatures tested in the laboratory were 10°C, 15°C, 20°C, and 25°C constant temperatures 15/5°C (8/16 hours), and 10/20°C (8/16 hours) variable temperatures. We also used a polyethylene tunnel outside. The seedlings were tongue grafted in March 2015 and then placed into climate chambers and the polyethylene tunnel. After forty days, the grafted seedlings were controlled and percent graft success was determined. Results showed that the highest grafting success were at the 15/5°C variable and 15°C constant temperatures, 81.6 and 78.3% respectively. The lowest grafting success was at 25°C constant temperature (18.7%). The 20°C, polyethylene tunnel, 10/20°C and 10°C treatments conferred 60.0, 54.0, 50, and 33.3% success, respectively. According to the study results, environmental temperature around 15°C is suggested for successful tongue grafting in chestnut seedlings.

Keywords: Chestnut, *Castanea sativa*, temperature, grafting



THE EFFECT OF IRRIGATION ON CHESTNUTS' PHYSIOLOGY AND PRODUCTION (*CASTANEA SATIVA*)

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Abstract

This study aims to evaluate the influence of the irrigation on the chestnut's physiology, fruit calibre and yield. The study carried during 2015 and 2016, in a chestnut orchard of 'Judia' variety located in Bragança, northeast of Portugal. Two irrigation systems were placed in ten trees each: drip (TI) and micro-sprinkler (SI). Irrigation was triggered when stem water potential fall below -1.2MPa. Other ten sample trees were kept in rainfed conditions (NI). From June to October, the stem water potential, chlorophyll fluorescence, photosynthetic and transpiration rate were monitor and production per tree was weighted. The mean total amount of water furnished was of 470 and 925 m³/ha in 2015 and 2016, respectively. On both years, the photosynthetic and transpiration rate was higher in irrigated trees (8.6 $\mu\text{molCO}_2\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ and 1.9 $\text{mmol H}_2\text{O}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$) than none irrigated ones (7.6 $\mu\text{molCO}_2\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ and 1.8 $\text{mmol H}_2\text{O}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$). The chestnut production was 26% higher in irrigated trees with 48.2 kg/tree and fruit size was smaller in non irrigated trees (93 fruits/kg) than irrigated (75 fruits/kg). Although these differences, the climatic conditions particularly the hotter temperature in 2016, affected the production and fruit size. From 2015 to 2016, the production decreased 16%, 27% and 33% for SI, TI and NI respectively. The fruit size also decreased 90%, 45% and 24% for NI, TI and SI, respectively, when the temperature sum (May-October) varied from 2,348 to 2,504°D. The introduction of irrigation in the chestnut's orchard is beneficial but temperature's plays an important role in the tree's physiology and production.

Keywords: Irrigation scheduling, plant-soil relationship, photosynthesis, chlorophyll fluorescence



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Oral Session - 6

Pests



12th October, Thursday

Oral Session - 6

11.30-12.30

Pests

Chairman: Andrea Vannini

11.30-11.45	Determination on Damage Ratios of Ambrosia beetles (Coleoptera: Scolytidae) in Hybrid Chestnuts <i>İzzet Akça, Şeyma Toksöz, İslam Saruhan, Burak Akyüz, Ümit Serdar</i>
11.45-12.00	Studies on The Infestation Ratios of <i>Dryocosmus kuriphilus</i> on Different Chestnut Cultivars in Turkey <i>Nimet Sema Gençer, Cevriye Mert, Başak Müftüoğlu</i>
12.00-12.15	Monitoring of Seasonal Fluctuation of Goath Moth, <i>Cossus cossus</i> L. (Lepidoptera: Cossidae), in Chestnut Plantations in İzmir and Manisa, Turkey <i>Cevdet Kaplan, Tefik Turanlı</i>
12.15-12.30	Secondary Metabolites in Buds of The Oriental Chestnut Gall Wasp (<i>Dryocosmus kuriphilus</i> Yasumatsu) Resistant and Susceptible Chestnut Cultivars <i>Anita Solar, Jerneja Jakopic, Vlasta Cunja, Nika Weber, Franci Stampar</i>



DETERMINATION ON DAMAGE RATIOS OF AMBROSIA BEETLES (COLEOPTERA: SCOLYTIDAE) IN HYBRID CHESTNUTS.

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Abstract

Turkey has an important role in the world's chestnut production. Pests are among important factors affecting the yield in chestnut production. In observations done in recent years, ambrosia beetles are seen to have damaged chestnut trees. Ambrosia beetles are known to dry out branches of hazelnut trees in the Black Sea region, causing significant loss and threatening hazelnut production. In addition, this pest occasionally damages pome and drupes. This study was carried out on the Cilek Tepesi lot of Ali Nihat Gokyigit Research Station in the Karaguney village of Samsun province. The experiment was carried out to determine the damage of the chestnut ambrosia beetle in 4 different hybrid chestnut genotypes in two-year-old chestnut trees. In determining the damage rate, all holes made by the ambrosia beetles on a certain number of plants (50-70) from the hybrid chestnut were counted. As a result of the study, the highest number of holes per plant was found to be in the A14 hybrid genotype (1.99) and the lowest was in the Marigoule hybrid (0.33). In genotypes A25 and A100, 0.96 and 1.09 per plant were found respectively. As a result of the statistical analyses, it was determined that A14 genotype is more sensitive to chestnut ambrosia beetle than any other variety or genotypes.

Keywords: Chestnut, damage, Ambrosia beetle, hybrid



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STUDIES ON THE INFESTATION RATIOS OF *DRYOCOSMUS KURIPHILUS* ON DIFFERENT CHESTNUT CULTIVARS IN TURKEY

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Abstract

The Asian chestnut gall wasp, *Dryocosmus kuriphilus* Yasumatsu (Hymenoptera: Cynipidae), is a global pest of chestnut trees. *D. kuriphilus* adversely affects chestnut tree growth and nut production in Asia, Europe, and North America. This pest was first recorded in Turkey (Yalova-Gacık village) in 2014. This study was carried out in 2016 in Yalova (Gacık village) and Bursa (Cumalıkızık village) provinces. The aim of the study was to determine gall infestations of the 'wild' chestnut trees, 'Bursakestanesi', 'Hacıomer', 'Osmanoglu', 'Marigoule', 'Maraval' and 'Alimolla' chestnut cultivars. Infestation ratio was calculated by counting the number of infested buds on 100 shoots. Leaf, stem and petiole galls were recorded in gall counts. It has been determined that gall ratios change between 2% to 100% on cultivars. The highest infestation ratio was found on 'wild' chestnut trees (100%) and 'Marigoule' cultivar (84%), the lowest on 'Tülü' (2%) and 'Maraval' (7%) cultivars. Some differences were determined in the ratios of stem, leaf and petiole gall formation on cultivars. The highest stem gall ratio was determined in 'wild' chestnuts and 'Marigoule' cultivar, leaf gall ratio was in 'wild' chestnuts and 'Hacıomer' cultivar and petiol gall ratio was determined in 'Marigoule' and 'Hacıomer' cultivars. These results indicate that there were differences in the gall ratios on cultivars. This work is being continued and observations are made on the other chestnut cultivars.

Keywords: Asian chestnut gall wasp, chestnut cultivars, gall types, infestation ratio



MONITORING OF SEASONAL FLUCTUATION OF GOATH MOTH, *COSSUS COSSUS* L. (LEPIDOPTERA: COSSIDAE), IN CHESTNUT PLANTATIONS IN IZMIR AND MANISA, TURKEY

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Abstract

The goath moth, *Cossus cossus* L. (Lepidoptera: Cossidae), is a polyphagous pest and harmful on many fruit trees, poplar, park and garden trees. Despite the known secondary harmful pest, in recent years, its density was greater in the chestnut groves. Control of this pest is very hard because of the larvae live inside trunks and branches, the period of moth flight and oviposition period are very long. Intensive and direct spraying of chemical insecticides against these pest extremely difficult, hence alternative control methods are needed. This study was conducted in order to create future requirement data of alternative control methods such as adult mass trapping in chestnut groves. The studies were carried out during the flight period of the moth, in Beydağ, Ödemiş and Kemalpaşa towns of İzmir and Turgutlu town of Manisa in 2013 and 2014. The traps and trapping apparatus supplied by Trece Incorporated firm were used to capture adult moths. The traps were suspended to branches near the trunk 1.5-2 m above the ground in the middle of May. Traps were checked weekly, removing and counting all captured individuals until the late of September. As result of study, adults of *C. cossus* started to appear in the late of May. Flying period of adult continued until first week of September. Maximum adult emergence occurred between mid July and mid August. Population density and damage ratio were higher in the orchards infected with *Cryphonectria parasitica* Murr. cancer and larvae in different stages of the pest were determined under bark and within tree trunks during the year.

Keywords: Chestnut, *Cossus cossus*, Cossidae, Population fluctuation



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SECONDARY METABOLITES IN BUDS OF THE ORIENTAL CHESTNUT GALL WASP (*DRYOCOSMUS KURIPHILUS* YASUMATSU) RESISTANT AND SUSCEPTIBLE CHESTNUT CULTIVARS

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Abstract

Buds of chestnut cultivars Bouche de Betizac (BB) and Marsol (MS) were analyzed for their total phenolic content (TPC) and total tannin content (TTC) in order to compare differences in the content of secondary metabolites between the oriental chestnut gall wasp resistant cultivar BB and susceptible cultivar MS. Fresh buds without any symptoms of the gall wasp infestation were taken four times during a growing season, from April towards late August. They were analysed using high performance liquid chromatography (HPLC) system with a diode array detector (DAD). Total phenolic content was determined using the Folin-Ciocalteu method and tannin content was determined using insoluble polyvinylpyrrolidone (PVPP). The results for TPC were presented as equivalents of gallic acid while for TTC was calculated as equivalents of tanninic acid. Buds of both cultivars contained more TPC than TTC in all sampling dates. TPC ranged between 10,98 and 45,63 mg gallic acid/g FW, while the TTC appeared within a range from 8,25 up to 40,93 mg tanninic acid/g FW. Both groups of secondary metabolites increased from April towards July, followed by nonsignificant decrease in August, regardless to the cultivar. Buds of the BB cultivar contained 1,2 up to 2,2 fold more TPC and 1,2 up to 2,4 fold more TTC than the buds of the MS cultivar, dependent on a specific phenological stage. Chestnut gall wasp resistant BB cultivar showed significantly higher TPC and TTC contents than the susceptible MS cultivar. Higher content levels and seasonal alterations of the TPC and TTC may be a source of natural resistance of the BB cultivar to the oriental chestnut gall wasp.

Keywords: Bouche de Betizac, Marsol, chestnut gall wasp, buds, tannins, total phenolic content

Oral Session - 7

Diseases



12th October, Thursday

Oral Session - 7

14.00-15.00

Diseases

Chairman: Carmen Medina Mora

14.00-14.15	Evaluation of Turkish <i>Cryphonectria parasitica</i> Isolates Containing dsRNA in Terms of Their Vegetative Compatibility, Mating Type, Virulence and Cultural Characteristics. <i>Ömer Erincik, Timur Döken, Engin Mangil, Serap Açıkgöz, Eda Mersin, Sevdiye Yorgancı, Sahra Hosseinalizadeh</i>
14.15-14.30	Importance of <i>Phytophthora</i> Dieback of Chestnut Trees in Marmara and Aegean Regions of Turkey <i>Seçil Akıllı, Çiğdem Ulubaş Serçe, Deniz Çakar, Yakup Zekai Katırcıoğlu, Salih Maden, Daniel Rigling</i>
14.30-14.45	Histopathology of Infection of <i>Castanea</i> Spp. Roots by <i>Phytophthora cinnamomi</i> <i>Patrícia Fernandes, Carmen Santos, Helena Machado, Maria do Céu Silva, Rita Costa</i>
14.45-15.00	Fungal Diversity on The Bark of Chestnut Tree Affected by <i>Cryphonectria parasitica</i> <i>Dilzara N. Aghayeva, Daniel Rigling, Joana Meyer, Nigar Mursal</i>



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EVALUATION OF TURKISH *CRYPHONECTRIA PARASITICA* ISOLATES CONTAINING dsRNA IN TERMS OF THEIR VEGETATIVE COMPATIBILITY, MATING TYPE, VIRULENCE AND CULTURAL CHARACTERISTICS

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Abstract

In the last decade or so, chestnut blight has been causing an incremental tree destruction in the chestnut plantations of Aydın Province, Turkey. Unfortunately, no effective hypovirulent strains have been detected in the Aydın Province, therefore, artificial introduction of hypovirulence are necessary. A total of 215 dsRNA-containing *Cryphonectria parasitica* isolates obtained from elsewhere in Turkey were evaluated for their vegetative compatibility (*vc*) types, mating types, virulence, and cultural characteristics. Majority of the isolates were the *vc* type EU-1 (89%). Both mating types were found but MAT-1 was dominant and represented 72% of the isolates. Fifty one percent of the isolates grew rapidly on PDA and produced colonies with regular margin. On the contrary, 36 isolates grew slowly and produced irregular colonies with lobate margin. According to the colony color, 70 isolates were white or cream, 130 were light orange and 26 were orange. White isolates produced significantly less conidial stroma than light and orange isolates. In the virulence test, 92 isolates produced small lesions (< 31.5 mm in length) on chestnut wood whereas 45 of them caused larger lesions (>51 mm) that were similar to the ones produced by the virulent isolates. All the tests, primarily regarding *vc* and mating type, indicated that the isolates belonging to EU-1/MAT-1 and EU-1/MAT-2 genotypes with low virulence could be used in biological control of chestnut blight in the Aydın Province.

Keywords: *Cryphonectria parasitica*, hypovirulence, biological control, vegetative compatibility, mating types, virulence



IMPORTANCE OF *PHYTOPHTHORA* DIEBACK OF CHESTNUT TREES IN MARMARA AND AEGEAN REGIONS OF TURKEY

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Abstract

During our study on chestnut canker in Marmara and Aegean Regions of Turkey, chestnut dieback causing complete death on trees was observed in many areas. For this reason, the role of *Phytophthora* spp. on chestnut dieback was investigated by using soil and root samples collected from the trees showing dieback symptoms from 93 locations in 7 provinces. Samples were mainly collected from the chestnut trees showing more intensive dieback symptoms. *Phytophthora* spp. in the forests and nurseries was determined by using baiting technique with the young leaves of white carnation and chestnut saplings. Carnation leaves showing watery lesions were plated on the selective medium P5ARPNH. *Phytophthora* spp. were identified by using morphological and cultural aspects of the isolates and by analysing their gene sequences of their ITS regions. In the chestnut forests of the Marmara and Aegean regions *Phytophthora* spp. were recovered from 32 location out of 93 tested. The ratio of *Phytophthora* infestation could be higher than the found if sampling were done repeatedly and timely. The most widespread species found in two regions was *Phytophthora cambivora*, which was obtained from 19 locations, mostly from the high altitude areas away from sea shore. It was followed by *P. cinnamomi*, which was isolated from 8 locations at lower altitudes near the sea shore in İstanbul. *P. plurivora* was obtained only from 4 locations in İzmir and Aydın provinces. *P. cryptogea* was recovered from one location in İzmir. All the *Phytophthora* species were found pathogenic on chestnut saplings. The most aggressive species were *P. cambivora* and *P. cinnamomi*. No traditional ink disease symptoms on diseased chestnut trees were observed in this region. *Phytophthora* dieback is considered a serious threat to chestnut, especially in İstanbul, as it eliminates trees in the forest and landscape.

Keywords: Marmara, Aegean region, *Phytophthora*, disease, chestnut, Turkey.



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HISTOPATHOLOGY OF INFECTION OF *CASTANEA* SPP. ROOTS BY *PHYTOPHTHORA CINNAMOMI*

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Abstract

Castanea sativa, a multipurpose species of great economic importance, is susceptible to *Phytophthora cinnamomi*, while *C. crenata* demonstrates field resistance to this aggressive pathogen that causes ink disease. This study aims to clarify the pattern of infection and histological changes induced by *P. cinnamomi* in order to understand the cellular mechanisms involved in chestnut susceptibility and resistance to the pathogen. Roots of six months-old plantlets, obtained by *in vitro* culture, were inoculated with a zoospore suspension of *P. cinnamomi*. For control (non-inoculated), two plantlets per genotype were used. Samples of healthy and infected roots (collected at 3.5, 24, 48 and 72 hours after inoculation - hai) were prepared and sectioned for light microscopic observations. In both susceptible and resistant chestnut species, the pathogen developed the initial stages of infection at 3,5hai through zoospore encystment, germination and root penetration. By 24hai, hyphae colonizing the cortex of *C. sativa* roots were observed, suggesting that thin roots may be the possible infection entry points. The cortex cells collapsed and the infection reached the vascular tissues at more advanced stages of infection, indicating high *P. cinnamomi* virulence. The progression of pathogen infection in both chestnut species will be presented.

Keywords: Chestnut; Histological changes; Ink disease; Resistance; Susceptibility



FUNGAL DIVERSITY ON THE BARK OF THE CHESTNUT TREE AFFECTED BY *CRYPHONECTRIA PARASITICA*

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Abstract

In Azerbaijan chestnut (*Castanea sativa* Mill.) forms small patches in the natural mountainous forests growing together with other deciduous tree species. There are also planted chestnuts near villages along the south-eastern part of Great Caucasus. Chestnut blight fungus (*Cryphonectria parasitica* (Murill) Barr. was reported since 2008, and the continuous expansion of the threatening disease has been observed in the country. Population studies showed that the pathogen has a low genetic diversity in Azerbaijan. One dominating vc-type was found which do not belong to one of the 64 defined EU vc-types. The purpose of present study was to identify the fungi other than *C. parasitica* isolated from the bark samples collected from chestnut blight cankers in 2015. Those were identified based on morphology, and ITS sequencing was used for confirming species identity. The obtained sequences were compared to those in the NCBI database. Results put all samples into three groups. Six of the specimens belonged to the ascomycetes: *Diaporthe amygdale* (\equiv *Phomopsis amygdali*), *Epicoccum nigrum*, *Gnomoniopsis* sp., *Trichoderma koningiopsis*, and *Xenoacremonium falcatus* showed a high homology to those in NCBI. Few sequences were identified with generic name, such as *Jattaea* sp., *Hypocrea* sp., *Eutypella* sp. Sequences of four basidiomycetes, such as *Coprinellus domestics*, *Hyphodermella rosae* and *Irpex lacteus* were identical those in NCBI and one of the sequences close to Polyporales sp. Two sequences were recorded as zygomycete *Umbelopsis isabellina*. *Epicoccum nigrum* and *Irpex lacteus* were recorded in Azerbaijan before. The other fungi are representing new record for the country. Few of these fungal species are considered parasitic on other host plants. Ecological role of these fungi are not clearly known yet and need further investigations.

Keywords: Chestnut, blight, fungus, ITS, sequence



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Oral Session - 8

Diseases



12th October, Thursday

Oral Session - 8

16.00-16.45

Diseases

Chairman: Jose Gomes Laranjo

16.00-16.15	Testing Chestnut Hybrids for Resistance to <i>Cryphonectria parasitica</i> <i>Dănuț Chira, Răzvan Teodorescu, Mihai Botu, Gheorghe Achim, Anca Scutelnicu</i>
16.15-16.30	Which Method Should be Used to Determine the Reactions of Chestnut Cultivars to Chestnut Blight <i>Mustafa Oduncuoğlu, Himmet Tezcan</i>
16.30-16.45	Investigation of the Presence of dsRNA in <i>Cryphonectria parasitica</i> Isolates Obtained from The Black Sea and Marmara Region in Turkey <i>Serap Açıkgöz, Ömer Erincik, Eda Mersin, Sevdije Yorgancı, Sahra Hosseinalizadeh, Engin Mangil, M. Timur Döken</i>



TESTING CHESTNUT HYBRIDS FOR RESISTANCE TO *CRYPHONECTRIA PARASITICA*

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Abstract

The Asiatic pathogen *Cryphonectria parasitica* has produced dramatic dieback of American chestnut (*Castanea dentata*) and European or sweet chestnut (*Castanea sativa*) throughout their natural or artificial range. In Romania all the sweet chestnut orchards (including collections) have been destroyed. Searching for natural resistance of European and American chestnut has failed. Therefore chestnut breeding in order to improve resistance to pathogen and fruit / wood production is still a promising option. Transferring resistance to *Cryphonectria parasitica* from Japanese to European chestnut was tested. Direct and indirect hybrids (*Castanea crenata* x *C. sativa*, *C. sativa* x *C. crenata*) naturally pollinated have been the tested variants. A collection of Romanian wild sweet chestnuts was used as control. All trees were under natural infection of *C. parasitica*. The following characteristics were used to evaluate the tree resistance: i) fungus presence (fruitbody, mycelium, infection, canker), ii) dead shoot / branch / stem, water sprouts, stem rot. Tolerance of the hybrids tested to *C. parasitica* is very promising: few trees have developed fruitbodies or cankers and tree deaths were purely accidental, while the Romanian sweet chestnut collection was severely damaged by the Asian pathogen. The health status of the chestnut hybrids is very good, showing good acclimatization to the local continental climate. Their productivity and fruit quality are also good.

Keywords: Interspecific hybrid chestnuts, resistance to chestnut blight, Carpathian climate.



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WHICH METHOD SHOULD BE USED TO DETERMINE THE REACTIONS OF CHESTNUT CULTIVARS TO CHESTNUT BLIGHT

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Abstract

There are several methods to determine the pathogenicity of *Cryphonectria parasitica* isolates. Researchers working on this topic would like to know which method is more reliable than others. In this research, some studies were conducted on the methods used to determine the pathogenicity of *Cryphonectria parasitica* isolates. Three isolates of *C. Parasitica*, isolated from diseased chestnut trees in Bursa Province of Turkey, were used and pathogenicity tests were conducted by inoculating living-trees, excised shoots, bark tissue sections, apple fruits and chestnut leaves. Apple test was done using fruits of cultivar 'Golden Delicious' and the other tests were carried out using a local chestnut cultivar named Kara Aşı in Bursa. At the end of the study, the results obtained from living tree test were similar to the results from excised shoots and chestnut leaves. Therefore, we suggest chestnut leaf inoculations because it is a fast and reliable method.

Keywords: Chestnut, *Cryphonectria parasitica*, pathogenicity tests



INVESTIGATION OF THE PRESENCE OF dsRNA IN *CRYPHONECTRIA PARASITICA* ISOLATES OBTAINED FROM THE THE BLACK SEA AND MARMARA REGION IN TURKEY

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Abstract

The presence of hypovirulent strain in Black Sea and Marmara regions of Turkey has been known for a while. Up to date, efficient hypovirulent strain has not been detected in Aydın province in which 34% of Turkey's chestnut production takes place. In Aydın province, chestnut blight can also be controlled by use of hypovirulent strains. For this purpose; firstly 1236 tissue samples were taken from the trees exhibiting hypovirulent cancer type of symptoms in the chestnut areas of the Black Sea and Marmara regions. Cultural characteristics of the isolates were evaluated and then, 258 isolates which were estimated to be hypovirulent were examined for dsRNA in cytoplasm. DsRNA isolation method was performed that according to by Balijja et al. (2008). Isolated dsRNA was electrophored in the %1 agarose gel at 80V/45 min. with 1XTBE buffer. The size of the dsRNA was estimated at approximately 12.0-13.0 kbp using λ DNA/ HindIII as size marker. After the dsRNA analyses, dsRNA profiles were obtained in 197 of the these isolates. Positive dsRNA isolates were found in all of the sampling provinces. Highest number of positive dsRNA isolates were obtained in the Sakarya, Düzce, Sinop and Kocaeli provinces of the West Black Sea and Marmara regions. Research* is ongoing to achieve the purpose mentioned above.

Keywords: Chestnut blight, *Cryphonectria parasitica*, hypovirulence, dsRNA

*This study is part of the project supported by TÜBİTAK/TOVAG- 1140403.



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Poster Session - 1

General Aspects





A MULTIDISCIPLINARY AND MULTISCALE INTERPRETATIVE MODEL TO PLANNING AND MANAGE TRADITIONAL CHESTNUT LANDSCAPE IN ITALY

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Abstract

Chestnut groves represent a particular kind of agricultural landscape. In Italy, thousands of hectares of chestnut forest represent a dominant and irreplaceable part of the landscape and environment of the Alps and Apennines mountains. The spread of the species *Castanea sativa* contributed to unequivocally characterize the Italian mountainous landscape. The current traits of chestnut groves and their location are the result of the process of regression of chestnut cultivation on a regional scale. Despite this, a modest area of traditional chestnut groves is still preserved in some Piemonte valleys and, in particular, some specific elements of the traditional landscape are well-preserved in the Pesio Valley (CN). In the frame of the present study, this area was therefore chosen as representative of the Italian traditional Alpine chestnut culture and landscape. The study tried to answer to two main questions : 1. which are the main driving forces related to chestnut landscape transformation? 2. which are the future chestnut landscape scenarios? A focus group was organized with local stakeholders in order to answer to these two questions. The results showed that regarding the valorization and maintenance of traditional landscape features, the most important driving forces are: 1. local forestry policies directed towards supporting chestnut growers' income, 2. the need for new and specifically trained chestnut growers and 3. socio-economical needs. On the other side, fragmentation of mountainous land property and the intensive fruit growing (flat areas) might cause the loss of local knowledge and traditional productions.

Keywords: *Castanea sativa* Mill., focus group, driving forces, landscape scenarios, landscape protection.



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CHESTNUT GENETIC DIVERSITY IN CANTON TICINO (SWITZERLAND)

**Gabriele L. Beccaro^{1*}, Daniela Torello-Marinoni¹, Giorgio Binelli³, Paolo Boccacci⁴,
Gabriella M. Mellano¹, Roberto Botta¹, Dario Donno¹, Alessandro K. Cerutti¹, Marco
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Abstract

Castanea sativa Mill. shows a high variability in eco-morphological traits, vegetative and reproductive habits, wood characteristics, adaptability, and resistance to natural stresses. The present range of distribution of the species has been strongly influenced by human migrations: Romans played a crucial role in the spread of the cultivation in Europe, although in some areas there is also evidence of local domestication and spontaneous spread of the tree. In the South of Switzerland (Canton Ticino), the debate about the origin of the local germplasm (derivation from the survival, spontaneous migration of *C. sativa* on the territory, or introduction of the tree by Roman colonization) is still open. The aims of this study was to present the chestnut genetic situation in Canton Ticino as a contribution to the debate about the native character of the species. Three *C. sativa* populations were sampled and analyzed at 9 SSR loci. Populations showed a high degree of diversity, as observed in most natural population of tree-species: all nine SSR loci were polymorphic (no fixed alleles were detected), and genetic diversity, measured by expected heterozygosity, ranged between 0.647 and 0.721 (mean values). Results suggested that three homogeneous gene pools contributed to the formation of the considered populations. The genetic structuring was very mild in the Canton Ticino chestnut population, as already observed by the relatively low levels of differentiation and divergence among sites.

Keywords: *Castanea sativa*, chestnut population, DNA analysis



EXAMINATION OF FUEL CHARACTERISTICS OF CHESTNUT BURR

Mahmut Dok*, Ayşegül Çelik, Ufuk Akbaş
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Abstract

Turkey is known as a centre of different kinds of fruits' origins in worldwide. Chestnut is one of the fruit types which are adapted to the ecological conditions in our country. Chestnut tree, a natural forest tree has intensity in the regions of the Black Sea, Marmara and Aegean, and its entire production demand is met by these regions. The barbed outer skin of chestnut fruit is not economically assessed. In this study, the solid fuel characteristics of chestnut shell were investigated. The study was carried out in 2016 at the Department of Energy plants of the Black Sea Agricultural Research Institute. Chestnut burrs were used as material. After removing the chestnut fruit, the burrs were grinded by passing through a 4 mm sieve on the hammer mill which is present in the institute. Then, the obtained material was pelletized in the pellet machines. Calorific values, ash, physical analyzes and flue gas emission values of the pellets were investigated. According to the results obtained, chestnut burrs could be used as solid fuel by making pellets.

Keywords: Chestnut burr, solid fuel, pellet



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ALLOMETRIC EQUATIONS FOR PREDICTING MINERALOMASS IN HIGH-FOREST CHESTNUT STANDS IN PORTUGAL

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Abstract

The evaluation of nutrients in biomass tree-components is a process time consuming and expensive, often involving tree felling, not always possible or desirable. Thus, mineralomass prediction equations are an important tool for the quantification of the nutrients exported in management and harvesting activities towards to its replacement and sustainable management as well as to evaluate the effect of other disturbances in the balance of ecosystems. Thus, given the importance of the relationship of biomass and nutrients (mineralomass) for dynamic and sustainable management of chestnut woodlands, aboveground mineralomass was studied in sweet chestnut (*Castanea sativa* Mill.) high forest stands located in Northern Portugal. Nutrient specific prediction equations that allow estimating the mineralomass (N, P, K, Ca, Mg, S, B and C) above the ground, total and by components: stem-wood, stem-bark, branches, leaves and flowers, based on tree dendrometric variables, DBH (diameter breast height) and total height, were developed. Linear and non-linear regression estimation methods were used. Data analysis is based on information collected in destructive analysis of thirty-four felled trees, distributed by the existing diameter classes (10-65 cm) in three adult chestnut stands. Several linear and nonlinear equations were fitted by the least squares method to select models. A simultaneous fit by SUR method using iterative seemingly unrelated regression (ITSUR) was used for the final selected models. The best-fitting models are presented.

Keywords: *Castanea sativa* Mill., Allometric models, Above-ground tree mineralomass, Silviculture, Forest management

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Poster Session - 2

Economy, Marketing and Physiology





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EFFECTS OF WATER STRESS AND OSMOPROTECTANT APPLICATIONS ON THE PHYSIOLOGICAL AND MORPHOLOGICAL PROPERTIES OF THE CHESTNUT NURSERY TREES

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Abstract

This study was carried out in order to reveal the physiological and morphological changes of the chestnut nursery trees under water stress and to determine the effects of osmoprotectant application. N-3-4 genotype chestnut nursery trees were planted with the distance as 4x2 m in 2015. Five different irrigation levels were applied to the trees as; K_1 =rainfed, K_2 = Field capacity, provided by giving deficient water amounts every five days, K_3 = %75 of the K_2 level, K_4 = %50 of the K_2 level, K_5 = %25 of the K_2 level. In addition to water stress, glycine betaine (GB) was applied between june-september as osmoprotectant to chestnut nursery trees four times at 0.5% dose. In order to determine the physiological effect of different water levels and GB applications on chestnut nursery trees, the values of leaf relative water content (RWC, %), electrolyte leakage (EC, %), chlorophyll density (CD) and leaf surface temperature ($^{\circ}$ C) were defined in 8 periods, before and after the GB applications. In order to determine the morphological changes, leaf number and leaf area (cm^2) were measured . According to the results of the study, irrigation water amount applied throughout the vegetation period varied between 147,5 – 590,1 mm in GB applied treatments -except for rainfed treatment-. In parcels without GB application; irrigation water amount ranged between 90,9 -363,9 mm. It was revealed with morphological changes that chestnut nursery trees with 75% water deficit level and GB application had the best growth performance. The physiological effects of water stress and osmoprotectant applications were differed according to periods, and in this sense, it was determined that water level and GB applications had significant effects statistically on RWC, EC and CD after the third GB application.

Keywords: Chestnut, Water Stress, Leaf Relative Water Content, Chlorophyll, Glycine Betaine

Poster Session - 3

Post Harvest, Food and Processing





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ANALYSIS OF VOLATILE COMPOUNDS IN CHESTNUT USING SOLID-PHASE MICROEXTRACTION COUPLED WITH GC-MS

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Abstract

In this work volatile compounds of raw chestnuts (peeled and unpeeled) was evaluated. Samples of chestnuts (*Castanea sativa* Mill.) were obtained from area of the Una-Sana canton (Bosnia and Herzegovina), during the seasonal harvest. Freshly harvested chestnuts were ground with a *blender*. A portion of chestnuts was manually peeled before grinding. The samples were analyzed using solid phase microextraction (SPME) fibers in conjunction with gas chromatography/mass spectrometer (GC-MS). Compounds were identified on the basis of their retention times using the searchable EI-MS spectra library (NIST02). For each analysis, the integrated peak areas were expressed as relative percentages, taking the sum of total areas as 100%. All experiments were performed at least in triplicate. The results are presented as mean values \pm SD. Volatile fraction was composed of 34 and 31 main compounds for unpeeled and peeled chestnuts respectively. Among them, 25 peaks were found in both analyzed samples. The compounds that contribute to the volatile profile of unpeeled fruit were mainly alcohols (53.99% of total areas), followed by other components (28.16%), ketones (6.70%) and esters (5.59%). The main volatile compounds found in raw peeled chestnuts were also alcohols (52.80%), followed by other components (15.47%), acids (12.40%) and ketones (11.93%). The main compounds of the volatile fraction extracted from unpeeled chestnuts samples were styrene (22.64%), ethanol (14.19%), 1-octanol (13.06%) and 3-methyl-1-butanol (5.27%), whereas ethanol (20.61%), 1-octanol (18.40%), acetic acid (11.01%), 2-pentylfuran (10.26%), 1-hexanol (7.00%) and 2-heptanone (5.86%) were identified as the main volatile components of raw peeled chestnuts. This study indicates that peeling processes affected the chemical composition of volatile compounds.

Keywords: Chestnut, *castanea sativa* Mill., processing, solid phase micro-extraction, volatile compounds.



EFFECTS OF DIFFERENT SOAKING TIME ON STORAGE TIME AND FRUIT QUALITY IN CHESTNUTS

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Abstract

The study was carried out to determine the effects of water soaking application on storage time and fruit quality of 'Erfelek' and 'Salıpazarı' chestnut cultivars. Chestnuts were harvested on optimal harvest time. Different soaking time (3, 5, 7 and 9 days) were applied to chestnut fruits in room conditions and non-soaking group was used as control. Fruits were stored in perforated plastic bags at 2 °C in 80-85% relative humidity for 3 months. Fruit weight loss, rates of the wormy, moldy and rotten fruits and germination rate were determined 1.5 months interval during storage period. Additionally, kernel view and taste of roasted fruits were evaluated by degustation team. In 'Erfelek' cultivar effects of treatments and storage periods were found statistically significant on edible fruit and weight loss. The highest edible fruit ratio was obtained from treatment of 5 days soaking in water (95.5 %) for Erfelek chestnut cultivar. There were no statistical differences for healthy fruits and weight loss in different soaking periods for Salıpazarı cultivar. In both cultivars extended soaking time caused to increase germinated seed ratio.

Keywords: Erfelek, Salıpazarı, *Castanea sativa*, soaking



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OPTIMIZATION OF DRYING PARAMETERS FOR CHESTNUT FRUITS USING CENTRAL COMPOSITE DESIGN

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Abstract

The chestnut drying process were optimized by Response Surface Methodology (RSM). A central composite design with two numerical factors was selected for modelling the drying process. The numerical factors were air temperature from 40 °C to 60°C and air flow velocity from 0.75 m s⁻¹ to 1.75 m s⁻¹. The investigated responses were color values, including lightness (L*), redness (a*), yellowness (b*), total color changes (ΔE) and browning index (BI). The study revealed that the drying temperature was significantly effective on lightness, redness, total color changes and browning index. However, none of the independent variables were significant on yellowness. The L*, a*, ΔE and BI of chestnuts during drying process were adequately described by RSM models. According to desirability function, the optimum drying conditions of chestnuts were 40.0 °C and 0.75 m s⁻¹ air flow. At optimum conditions, predicted L*, a*, ΔE and BI values were 76.34, -0.20, 7.45 and 17.00, respectively. Under optimized conditions the experimental values of L* (77.46), a* (-0.36), ΔE (6.31) and BI (16.88) agreed with the predicted values. RSM was not successful to develop a satisfactory model for b* values of chestnuts during drying process.

Keywords: Chestnut, drying, color, optimization, response surface methodology

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CHESTNUT FRUIT AS FUNCTIONAL FOOD

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Abstract

The chestnut (*Castanea sativa*) belonging to the Fagaceae family, is important nut widely consumed throughout Europe, America, and Asia. in northern hemisphere. Chestnuts are reemerging as valuable functional food materials due to newly recognized nutritional quality and many potential health benefits. Chestnuts are rich in starch, presenting minerals and vitamins and appreciable levels of fiber, but low amounts of protein and fat. They are excellent sources of bioactive substances, including polyphenol antioxidant compounds. Phenolic acids such as gallic acid, ellagic acid have the beneficial effects of neutralizing free radicals. There is significant amount of the γ -aminobutyric acid (GABA) derived from arginine, which is important for central nervous system, in chestnut fruits. The studies showed that chestnut flour is recommended as an alternative to soybean in the treatment of lactose intolerance and cow's milk allergy. Chestnut is rich in lignans, especially secoisolariciresinol and isolariciresinol. Lignans are of increasing interest due to their potential anticarcinogenic, antioxidant, estrogenic and antiestrogenic activities. Chestnuts are consumed as apart of gluten-free diets in cases of celiac disease and chestnut honey prevents some neurodegenerative illnesses and asthma and respiratory diseases. The sugars such as sucrose, glucose, fructose, maltose and high starch content make chestnuts an energetically valuable food crop.

Keywords: Chestnut, functional food, health



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CHESTNUT CHIPS IN BEER PRODUCTION: APPLICABILITY AND EFFECT ON BEER QUALITY PARAMETERS

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Abstract

Even though traditional raw materials used for beer production include only (barley) malt, hops, water and yeast, a whole range of un-malted adjuncts are also used (corn, oats, rice, rye) in order to get new speciality beer or simply to cut down the production expenses. Furthermore, special consumers' health-related demands lead to the development of new types of beer, such as the gluten-free beer. Chestnut, as a raw material is gluten-free and is considered to be the best substitute for barley malt regarding its sensorial characteristics. The objective of this work was to evaluate the chestnut as an alternative raw material for beer production, used either as an adjunct or the main raw material. Three small-scale (10 L) brews were performed as follows: 100% malt pale ale (control), the substitution of 50% of malt by medium roasted chestnut chips (1) and the 100% chestnut chips pale ale (2). Commercially available amylolytic enzymes and pectinase were used for chestnut starch hydrolysis during mashing, which was prolonged (120 min) compared to that of control (75 min). All batches were boiled and hopped identically. The static fermentations using the same dry top-fermenting yeast were conducted at 20 °C until constant final gravity was reached. The beers were forced carbonated and allowed to mature for 4 weeks at 5 °C. Standard beer analyses were performed in all samples: alcohol by volume, specific gravity, original extract, apparent extract, turbidity, colour, pH and bitterness, whereas the colour was the most affected by substitution of malt by chestnut. The results showed no significant change in the course of fermentation between the samples, provided that thorough hydrolysis of chestnut was performed. Thus, chestnut could be used in beer production as a raw material for new types of beer, namely low gluten or gluten-free beers.

Keywords: Adjunct, beer, brewing, chestnut



GENOTYPE INFLUENCE ON CHEMICAL COMPOSITION OF CHESTNUT IN 20 CULTIVARS GROWN ON THE SAME ROOTSTOCK AND AT THE SAME AGRONOMIC CONDITIONS

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Abstract

Chestnut germplasm is still suffering a dramatic decrease in its growing areas therefore jeopardizing the species diversity. In this research we applied a combination of different approaches to describe and characterize chestnut cultivars located at the Piemonte Regional Chestnut Repository in Chiusa Pesio (CN, Italy). The aim of this research is to assess the diversity in bioactive compounds and sensory attributes of different chestnut cultivars grown in the same pedological and climatic conditions, under the same agronomic management and, for the first time, on the same clonal rootstock, thus maximizing the genotype effect on the chestnut composition. The analysis included antioxidant activity, phytochemical fingerprinting (sugars, total polyphenolic content, cinnamic acids, benzoic acids, catechins, flavonols, tannins, monoterpenes, organic acids, vitamin C) and sensory analysis of fruits of 20 chestnut cultivars of different species. The high diversity observed among the analyzed cultivars could be strictly be associated to the genotype effect and underlines the large variability of the genus *Castanea*, and therefore the importance of in farm and *ex situ* conservation of local germplasm as part of a global strategy.

Keywords: *C. sativa*, eurojapanese hybrids, phytochemical fingerprinting, sensory profiles, local germplasm



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EVALUATION OF ANTIOXIDANT PROPERTIES OF CHESTNUT HONEY FROM SCIENTIFIC STUDIES

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Abstract

Honey is a viscous-sweet product occurred at the end of a process like as: nectar which in flowers of plants and the sweet materials secreted by living parts of the plants and some insects living on plants was collected by honey bees and composition of the collected materials was changed in bodies of bees and the altered materials stored and matured in the honeycomb cells. The use of honey which has about 200 compounds in its biochemical structure (sugar, minerals, proteins, vitamins, organic acids, flavonoids, phenolic acids, enzymes, other components such as phytochemicals) in traditional medicine as a source of healing has been increased recently. Besides this, there are two kinds of honey such as flower and honeydew according to source which from obtained. Honeydew and flower honeys are obtained from secretion of plants and some insects and nectar of flowers such as chestnut, linden, cotton, clover and citrus, respectively. Chestnut honey obtained from the trees belonging to the genus *Castanea* of the Fagaceae family is one of the flower honeys. The honey, which has been used in ethnic medicine since the first years of man, has recently been discovered by many researchers that honey disinfect wounds due to antimicrobial and antifungal effects, prevent the development of bacteria and fungi and have a treatment role on burns, digestive disorders, asthma, infection and chronic wounds and other eye disorders. These therapeutic properties of honey have been reported to be due to antioxidant capacity. It has also been proven in many studies that honey, an antioxidant source, is effective against the formation of foodborne pathogens and against oxidative reactions caused by heat, light and certain metals, such as lipid oxidation in meat and enzymatic browning in fruit vegetables. In this work we have prepared, the information about chestnut honey, the importance of antioxidant activity and antioxidant properties of chestnut honey will be given.

Keywords: Honey bee, Chestnut honey, Antioxidant

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Poter Session - 4

Breeding





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EVALUATION OF CHESTNUT GENOTYPES GROWN IN DÜZCE VICINITY, TURKEY

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Abstract

This study was conducted to evaluate some chestnut genotypes according to some morphological characteristics. Number of fruits/kg, the percentage of kernel, diameter, width, height and weight of fruits were determined. The testa entering the seed, shell thickness and testa peeling in fruits were observed. Average of fruit weights were ranged from 4.32g to 8.53g. Percentages of kernels were changed between 83, 47 and 91, 63 %. The chestnut fruits grown in Düzce according to the diameter classification, width, height and weight of fruits, were located in small fruit group.

Keywords: Chestnut, fruit quality, *Castanea sativa* Mill.



CONSERVATION OF THE FRUIT CHARACTERISTICS AND GENOTYPES OF IMPORTANT CHESTNUT SPECIES IN MARMARA REGION

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Abstract

The first scientific studies regarding selection of chestnuts in Turkey, was launched in 1975 in the Marmara Region by Atatürk Horticultural Central Research Institute, Yalova. In 1981, a research orchard was established with a group of 24 genotypes selected from the first studies and as a second step cultivars and genotypes that should be proposed to the producers have been defined. Hacıibis and Karamehmet are the earliest cultivars harvested in the first week of September. Mahmutmolla and Hacıomer are the most suitable for chestnut paste, and Osmanoglu for chestnut candy. Sariaslama (around 12-16 gr inshell) and Vakit (around 14-16 gr inshell) have the largest nuts. A major part of these genotypes has been selected by the Institute and has been registered for cultivars protection [eg: 51101(Osmanoglu), 51111(Sariaslama), 62305 (Hacıibis), 52112 (Vakit), 62309 (Firdola), 51112 (Mahmutmolla) and from Egean Region; 2719, 2706, 2665, 2649, 2629, 2730, 2710, 2669, 2650 genotypes, foreign cultivars: Maravel CA-74 and Marigoule CA-15]. Unfortunately the orchard has been severely affected from chestnut cancer (*Cryphonectria parasitica*) and exposed to a significant loss. Meanwhile, studies on selection of new genotypes from natural populations and adaptation of foreign cultivars and their rootstock characteristics have been conducted within the Institute. Consequently the Institute has decided to re-establish a research orchard planted by all of genotypes as well as domestic and foreign cultivars, including hybrid cultivars developed by INRA in France (Marigoule 15, Maraval 74, Bouche de Betizac) Osmanoglu, Sariaslama, Hacıomer, Mahmutmolla, Alimolla, Dursun Chestnut, Yellow Chestnut, Vaccine Chestnut, Kara Mehmet, Firdola, Hacıibis, Seyrekdiken, local cultivars and genotypes planted in a research orchard in the Marmara Region for the first time(Öküzgözü, Kadir Hoca, Kızılcık, Derekızık) and some selected varieties from the Black Sea Region: Erfelek, Ersinop Unal, Serdar, and from the Aegean Region: Nazilli 2-5, Nazilli 7-3, Nazilli 23-1 variations are located in the garden.

Keywords: Chestnut, Research Orchard, Genotypes, Selection, Yalova



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PERSPECTIVE CHESTNUT ELITES OBTAINED AT UCV-SCDP VÂLCEA

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Abstract

Introduction: Selection work into the local sweet chestnut (*Castanea sativa* Mill.) populations from Romania has been carried out by SCDP Vâlcea since 1992. As result, two cultivars ('Romval' and 'Casval') have been named. Due to *Cryphonectria parasitica* pathogen attack most of the sweet chestnut orchards and individual trees have been severely affected. Objective of the study: Obtaining resistant and adapted to the environment chestnut genotypes through interspecific breeding program. Methodology: The plant material for breeding consisted in cultivars and selections of different origins belonging to *Castanea sativa* Mill., *Castanea mollissima* Blume, *Castanea crenata* x *C. sativa* and *C. sativa* x *C. crenata* hybrids. New hybrids have been obtained and were planted in the selection field. Evaluation of those hybrids has been carried out regarding adaptability to given ecological conditions, precocity of coming into bearing fruits, productivity, ripening period, fruit quality and tolerance/resistance to main diseases, including chestnut blight. Results and conclusion: A number of 12 elites have been selected during 3 years. Fruit size varies from 13.0 (H 3-25-04) to 29.2 grams (H 3-13-04). 8 of the elites have transverse broad ellipsoidal fruits, while 4 have globose shaped fruits (H 1-1-04, H 1-7-04, H 7-7-08 and H 7-9-04). Fruit ripening time occurred in the second half of September for most of the elites, only 3 of them are ripening in the first half of October (H 7-5-08, H 7-7-08 and H 7-9-08). Scions from these elites were harvested and grafted on interspecific seedlings in order to introduce them in testing trial for further evaluation.

Keywords: *Castanea*, interspecific hybrids, breeding



THE EASTERN BLACKSEA REGION NATURAL CHESTNUT (*CASTANEA SATIVA* MILL.) POPULATIONS AND STATUS OF THE POPULATION

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Abstract

Chestnut (*Castanea sativa* Mill.) is a valuable and important tree in terms of wood and fruit. Chestnut forests in the world are endangered by pathogenic and virulent factors in the areas they are exposed to. Similarly, chestnut forests in our country are under the influence of chestnut branch disease. But Eastern Black Sea Region Natural chestnut forests are able to heal themselves by forming hypovirulent against the disease (Trabzon-Vakfikebir, Trabzon-Araklı, Rize-Çayeli, Rize-Ardeşen, Artvin-Arhavi, Giresun-Görele, Giresun-Espiye, Ordu-Yoroz-Kent Ormanı, Ordu-Perşembe, Samsun-Salıpazarı). Within the framework of the "Chestnut Action Plan" initiated by OGM in 2013, it was aimed to increase the production of wood and seeds with disease resistant chestnut trees. This study includes the observations of the area studies of the project named "Chestnut (*Castanea sativa* Mill.) Breeding Studies in the Forests of Trabzon Regional Directorate of Forestry" from the project work of the Directorate of Forestry Research Institute of Eastern Black Sea. In this study, seeds distributed in the Eastern Black Sea Region can be collected and 10 chestnut stands capable of carrying superior wood quality have been determined. Observations we made in the natural chestnut forests from the province of Samsun to the province of Artvin were observed to be more intense and widespread in the Eastern Black Sea Region as we traveled from east to west. It has been observed that the natural chestnut forests are largely neglected, dense, covered, transposed, planted and diseased individuals are left in the stands. However, it has been observed that the locally chestnut stands of Ordu-Perşembe and Samsun-Salıpazarı districts are dominated by forest villagers and the partially maintained stands benefiting from the fruits are relatively healthier and phenotypically superior. Within the scope of the study, it was evaluated that the stands which are in the best condition for chestnut branch cancer disease are in Rize-Ardeşen, Ordu-Perşembe, Giresun-Görele, Samsun-Salıpazarı regions. Rize-Ardeşen, Ordu-Perşembe and Samsun-Salıpazarı Regions are thought to be benefiting from the breeding works to be done in the natural chestnut forests of the Eastern Black Sea Region. Chestnut stands are recommended to perform controlled care against diseases and pests.

Keywords: Chestnut, *Castanea sativa* Mill., Chestnut population, Natural chestnut



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SELECTION OF CHESTNUT (*CASTANEA SATIVA* MILL.) GENOTYPES IN İNEGÖL COUNTY (BURSA PROVINCE, TURKEY)

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Abstract

This research was carried out during 2010 and 2011 years in İnegöl County (Bursa province, Turkey). As the result of preliminary studies Mesruriye, Maden and Hamidiye villages, 28 genotypes were identified and evaluated, which presented good sanitary status and produced regularly nuts of high-quality. Fruit samples were taken from the selected genotypes during 2010 and 2011 to evaluate the pomological traits. Weighted-rankit method was used in the evaluation of genotypes with regard to suitability for fresh consumption (earliness and seasonable) and processed product. In the all evaluations, fruit bearing, nut number per burr, shell color, shell brightness, shell thickness, number of nuts per kg, kernel color, testa peeling, testa entering the seed, precocity and taste traits were investigated. The collected data were evaluated using the weighted-rankit method, with total points determined for 28 genotypes. The results showed that genotype 16.05.027 had the highest total points, followed by the genotypes 16.05.024, 16.05.003, 16.05.018 and 16.05.004, respectively. The performance of the selected genotypes that showed the highest performance in this study will be determined within similar growing conditions in subsequent trials. As a result of the study, the best genotypes for fresh consumption and processed product were identified and they are being recommended to be protected and reproduced further studies.

Keywords: İnegöl, chestnut, *Castanea sativa*, selection, quality, weighted-rankit method,



PRINCIPLE COMPONENT ANALYSIS AND CLUSTER ANALYSIS FOR CLASSIFICATION OF CHESTNUT GENOTYPES (*CASTANEA SATIVA* MILL.)

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Abstract

The aim of this study was classified on 28 chestnut genotypes grown in İnegöl County (Bursa province, Turkey) with regard to pomological traits of the nut size, nut weight, shell thickness, number of nuts per kg, nut number per burr, leaf petiole length, leaf petiole thickness, leaf length, leaf width, teeth length, teeth width, and distance between the teethes. Correlation analysis showed some relationships among the nut and leaf characteristics of chestnut genotypes. The relation nut weight and nut size have been found positive and significant ($P<0.01$), number of nuts per kg and nut size negative and significant, number of nuts per kg and nut weight negative and significant ($P<0.01$), teeth width and shell thickness negative and significant ($P<0.05$), and teeth width and leaf petiole length positive and significant ($P<0.01$). The other all relations have been found nonsignificant. In order to find the main origins of variation among nut and leaf traits, principal component analysis (PCA) was performed on average values by using SPSS for Windows. Four factors were extracted by principal component analysis, which explains 68.94% of the total variation. The group components consist of the following characteristics; the first component (PCA1: 25.350 %); nut size, number of nuts per kg, nut weight; the second component (PCA2: 19.110 %); teeth width, leaf petiole length, shell thickness; the third component (PCA3:13.129 %); leaf petiole thickness, teeth length, nut number per burr; the fourth component (PCA4: 11.353 %); distance between the teethes, leaf width, leaf length. These results will be useful in breeding studies because we could differentiate 28 chestnut genotypes using hierarchical cluster analysis in terms of PCA parameters.

Keywords: Chestnut, *Castanea sativa*, pomological traits, classification, PCA, cluster analysis



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Poster Session - 5

Genetics, Propagation and Orchard Management





CASTANEA SPP. BIODIVERSITY CONSERVATION STRATEGIES: COLLECTION AND CHARACTERIZATION OF THE GENETIC DIVERSITY OF AN ENDANGERED SPECIES

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Abstract

Co-evolution between *Castanea* spp. biodiversity and human populations has resulted in a wide genetic biodiversity in the world. The high pedoclimatic adaptability and the wide genetic variability of the species determined the spread of many different ecotypes and varieties in the wild. These different genotypes were vegetatively propagated by grafting, for many applications as fresh consumption, flour and timber production, animal nutrition, contributing to the conservation of the natural species biodiversity. Currently the species is critically endangered and hundreds of genotypes are at risk of being lost due to an high number of phytosanitary problems (canker blight, ink disease, gall wasp). The aim of the research was to collect, identify, describe and *ex situ* preserve the germplasm of *Castanea* spp. in order to provide additional strategies to complement current efforts to protect the species. Leaves, flowers and nuts of analyzed cultivars were sampled *in situ* and *ex situ* in the collection field. Through direct observation, or published information, when available, phenological and morphological traits were used to characterize the genotypes. Moreover, the accessions were genetically characterized by multiplex analysis of seven microsatellite loci isolated in *Castanea sativa* and *Quercus petraea*. The results obtained in the set of accessions showed that microsatellite loci identified considerable polymorphism and confirmed that these markers are suitable for fingerprinting chestnut cultivars: the combined profiles across the 7 SSR loci showed the presence of a total of 105 different genotypes. In the past, the high horticultural value of many *Castanea* spp. genotypes allowed the biodiversity of the species to be maintained by the human populations, while today their genetic variability is critically endangered: the creation of the arboretum and similar initiatives, as genotype characterization and conservation, carried out by other international Institutes, could represent the first step in stopping the loss of biodiversity.

Keywords: Chestnut, *ex situ* conservation, germplasm, biodiversity



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MOLECULAR STUDIES CONDUCTED IN CHESTNUT

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Abstract

Chestnut which is *Castanea* genus in *Fagaceae* family and usually spreads to different regions of the northern hemisphere. Known 13 species of the genus have been an important place in human nutrition field since ancient times. Major distribution areas of these species are China, Korea, Japan, Turkey, Southern Europe and North America. *Castanea sativa* which contains also Anatolian chestnut is native species of the Mediterranean basin. Although the center of spread is definitely unknown, it has been reported that *Castanea sativa* is cultured from Anatolia and spread to Europe. According to the latest data (FAO 2013), total world chestnut production quantity is 2.009.487 tonnes and leading country is China (1.650.000 tonnes) followed by Korea (67.902 tonnes), Turkey (60.019 tonnes), Bolivia (58.666 tonnes) and Italy (49.459 tonnes). Chestnut species take place as an important point in genetic diversity but chestnut production is adversely affected in almost all countries caused by primarily chestnut blight (*Cryphonectria (endothia) parasitica*) and chestnut ink disease (*Phytophthora cambivora*) and significant threats such as incorrect forestry practices, adversely changing environmental conditions which have recently the increasing importance. These factors still continue to threat the world cultivated chestnut areas and natural population. So that, overcoming the problems about chestnut cultivation, conservating genetic variabilities of chestnut *in situ* and *ex situ* conditions and investigating the changes are required. Some of the conventional methods used in the studies which have been conducted for this purpose take a long time. Molecular studies are required with the aim of identification the responsible genes of fruit composition and determination of some chestnut diseases. Also molecular studies are needed for generating gene maps which provide to identify the gene regions that control the other significant features. Selection of these significant plant features that can be used in breeding studies will be facilitated by markers. Many studies have been conducted on chestnut such as genetic mapping, determining genetic relationships, genotype identifying, resistance to chestnut ink disease (*Phytophthora combivora*), molecular identification of effective genes on fruit composition and primer development. In this study, general profiles of molecular studies on chestnut in the world and present situations have been evaluated.

Keywords: Chestnut, *Castanea sativa*, molecular genetic

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MORPHOLOGICAL CHARACTERISTICS OF AUTOCHTHONOUS EUROPEAN CHESTNUT (*CASTANEA SATIVA* MILL) POPULATIONS IN THE GREEK AREAS OF KOZANI-VOIO AND VOLOS-PELION

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Abstract

In Greece there are not varieties of sweet chestnut (*Castanea sativa* Mill.) but six distinctive populations, which are mainly identified by their geographical distribution rather than genetic differences. These populations have not been studied and adequately evaluated for their morphological characteristics, and not certified. The aim of the present study was to evaluate the morphological characteristics of two of the six Greek autochthonous populations, in the areas of Kozani-Voio and Volos-Pelion. Twenty-three and twenty-seven autochthonous chestnut populations were randomly selected in the area of Kozani-Voio and Volos-Pelion, respectively and were examined for their morphological characteristic. Moreover, infection from pathogens *Cryphonectria parasitica* and *Phytophthora cambivora*, was recorded. Chestnut populations in the area of Voio-Kozani were found at an altitude of 921-1136 meters. Trees examined had an average age of 260.87±102.20 years, 15.91±4.01 m average height, 4.33±1.93 m average trunk circumference, 1.78±1.66 m² trunk cross sectional area, 5.39±1.42 m crown radial, 33.83±8.90 m crown diameter, 14.17±3.66 m crown height, 1423.40±841.90 m³ crown volume area. Most of the trees were considered of low to medium robustness. A positive correlation (R=0.936) was found between tree age and trunk circumference. *Cryphonectria parasitica* infection was about at 26.09%, where as *Phytophthora cambivora* at a rate of 4.35%. Chestnut populations in the area of Volos-Pelion were found at an altitude of 379-868 meters. Trees examined had an average age of 261.11±88.07 years, 20.66±5.67 m average height, 3.47 ± 0.98 m average trunk circumference, 1.03±0.63 m² trunk cross sectional area, 6.33±1.86 m crown radial, 39.75±11.66 m crown diameter, 18.74±5.60 m crown height, 2743.24±1837.98 m³ crown volume area. Most of the trees were considered of medium to high robustness. A positive correlation (R = 0.851) was found between tree age and trunk circumference. *Cryphonectria parasitica* infection was found at 18.52%, while no infection was observed by the pathogen *Phytophthora cambivora*.

Keywords: *Castanea*, morphological characteristics, autochthonous populations



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EFFECTS OF DIFFERENT MEDIA ON THE GERMINATION AND GROWTH PERFORMANCE OF CHESTNUT NURSERY TREES

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Abstract

It takes rather a long time to disappear of the dormancy of seeds and to growth of the chestnut nursery trees. However, there are problems in the homogenous growth and coming into the extend of being able to be budded at the end of the year that is needed in the nursery. For this reason, this research was carried out to determine the effects of different media on the germination rate and growth of chestnut nursery trees. The chestnut seeds were sown into pots filled with seven different media. Seven growth media based on perlite, peat, vermiculite, pumice (coarse), clinoptilolite, sand (fine) and soil were tested. Plants were grown in pot culture from the day of sowing seeds to the budding stage of chestnut nursery trees, during eight months, and they were not transplanted into another medium during the growing period. Chestnut nursery trees were nourished with Hoagland's nutrient solution formulations and to observe the effects of different media on nursery chestnut trees, some morphological characteristics were determined. It was concluded that the use of peat led to increased germination rate and growth performance of nursery chestnut trees.

Keywords: Chestnut, stratification, propagation, nursery



THE IMPORTANCE OF THE SPROUT PART (TERMINAL, BASAL) FOR SUBSEQUENT ROOTING SUCCESS OF LEAFY CUTTINGS IN CHESTNUT

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Abstract

Chestnut is a species dominantly used for timber production in forestry industry and for fruit production in fruit growing industry. It is also very interesting species for nursery management due to its demands needed for successful propagation. Chestnut is generally recognised as a very difficult-to-root species which is propagated by grafting; leafy cuttings serve a very useful alternative. An experiment with two different hybrid cultivars (*Castanea crenata* × *Castanea sativa*) ‘Marsol’ and ‘Maraval’ was set in 2015 to study differences in rooting success between different sprout parts used for cutting preparation. Chestnut sprouts were cut into leafy cuttings of approx. 12 cm length, whereby they were divided into terminal cuttings (cuttings with a sprout tip) and basal cuttings (cuttings without the sprout tip). Cuttings were inserted in the substrate mixture of peat and sand in 1:1 ratio in three repetitions with 27 cuttings (23 for root evaluation and 4 for hormone analyses) in each repetition. Before setting in the substrate, the cuttings were treated with 0.5% IBA (powder on talcum basis). During the first two days after setting the cuttings in the substrate the IAA concentration and the concentration of some its metabolites was measuring in cutting bases. The rooting success was evaluated in November 2015. Terminal cuttings rooted generally with 15.2% significantly better than basal ones with only 6.6%, whereby ‘Marsol’ terminal cuttings rooted worse than basal cuttings of the same cultivar. Terminal cuttings developed with 7.5 more main roots and with 18.9 cm longer root bushes compared with basal cuttings (2.7 and 10.5 cm) in both cultivars. Additionally, we could measure also different accumulation intensities of IAA, IAA-Asp, oxIAA and indole-3-methanol in terminal and basal cuttings. Based on our results the sprout part is very important in chestnut due to its significantly effect on different rooting parameters.

Keywords: Vegetative propagation, chestnut hybrid cultivars, Fog system, auxin metabolism



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EARLY GRAFTING OF CHESTNUT BY GREEN GRAFTING AND MINI HARD WOOD GRAFTING

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Abstract

Traditional fruit varieties are ontogenically very old, and therefore difficult to root. That is why grafting is normally the only way to produce fruit chestnut trees of these varieties. Nurseries usually graft onto bare root or potted *Phytophthora* resistant hybrid rootstocks, produced by vegetative means (stooling, rooted cuttings or micropropagation). Producing a grafted plant takes two or three years, the first one or two, depending on the method, to produce the rootstock, and the last one to perform the grafting. The success rate ranges between 50-80% so there is a percentage of lost plant after three years that cannot be re-used because of deformations due to grafting process. Mini grafting and green grafting can help to reduce the time needed to obtain grafted plants. Also green grafting obtains higher success rate as rootstocks are very juvenile, and allows a second use of the plant in case of grafting failure due to the small size of the rootstocks. In this work, eight traditional priority Galician varieties were either mini grafted or green grafted onto a mixture of hybrid rootstocks of in vitro origin. For mini grafting small hard wood scions were grafted onto hardened rootstocks and for green grafting small herbaceous scions were grafted onto herbaceous rootstocks under mist atmosphere. Mini grafting success rate was very low and plants took a long time to resume growth. However green grafting success rate was high, and plants resume growth within 15 days looking vigorous and healthy. Failure grafts were pruned and recovered for rootstock production with no apparent deformity.

This research has been partially supported by FEDER INNTERCONECTA program 2013/2014 (INTEGRACASTANEA EXP00064828/ITC-20133040).

Keywords: Chestnut, green grafting; mini grafting; traditional fruit varieties



MICROPROPAGATING CHESTNUT DWARFING ROOTSTOCKS: DEFINITION OF A ROUTINE PROTOCOL

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Abstract

The interest in the utilization of chestnut dwarfing rootstocks is ever more growing in the high density plantations. Hybrid dwarfing rootstocks, selected for their resistance to ink disease and canker blight too, are actually mainly propagated by layering. However, the improvement of various *in vitro* procedures in the last 20 years has opened the possibility of an effective micropropagation of a number of woody species, including chestnut. The aim of this research was to develop an easy and efficient micropropagation protocol for chestnut rootstocks, suitable for a routine application in commercial nurseries. Rootstocks mother plants produced by layering at three different juvenility stages were used as starter material. The experimental protocol involved four stages: 1) initiation (*in vitro* shoot growth of primary explants); 2) shoot proliferation; 3) shoot rooting; and 4) plantlet acclimatization (hardening). The final aim of the research, developed in collaboration with the Regional Chestnut Centre of Piemonte, is to transfer the know-how to the nurseries in order to foster a more competitive development of chestnut industry.

Keywords: *Castanea sativa* x *crenata*, nursery techniques, juvenility, *in vitro* micropropagation



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EFFECT OF GRAFTING METHOD ON GRAFTING SUCCESS IN CHESTNUT (*CASTANEA SATIVA* MILL.)

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Abstract

Chestnut is a fast growing broadleaved tree species and becoming increasingly important in the European and Turkish forestry due to its valuable nut and wood. Despite its great economic, ecological and social importance, it is less studied in Turkish forestry. Chestnut (*Castanea sativa* Mill.) has a wide distribution in the Black Sea, Marmara, and Aegean regions in Turkey. It forms pure stands and also has mixed stands with other broadleaved species in these regions. In addition, small populations of chestnut exist in the western Mediterranean region of Turkey. In this study, the success of four grafting methods (cleft, tongue, triangular and budding) were compared and assessed. One-year old potted seedlings were used as rootstock. Seeds for rootstock were collected from natural chestnut populations in Akçakoca-Düzce in the fall of 2013 and stored in the refrigerator. The seeds were pre-germinated in the laboratory and then sowed in February 2014. Growing media in pots contained forest soil, peat and perlite in 1:1:1 volume rate. Scions were collected from trees in Erfelek-Sinop. The one-year old seedlings were grafted in March 2015 and then placed in a polyethylene tunnel. After four months, the grafted seedlings were checked and the percent graft success was determined. The highest grafting success was found in bud grafting (65.6%), followed by tongue grafting (54.4%), cleft grafting (43.5%), and triangular grafting (12.8%).

Keywords: Chestnut, *Castanea sativa*, grafting

Poster Session - 6

Pests





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STUDIES ON RELEASE METHODS OF *TORYMUS SINENSIS* (HYMENOPTERA: TORYMIDAE), PARASITOID OF *DRYOCOSMUS KURIPHILUS* YASUMATSU), FROM ITALY TO TURKEY

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Abstract

The Asian Chestnut Gall Wasp (ACGW), *Dryocosmus kuriphilus* Yasumatsu (Hymenoptera: Cynipidae), is a major pest of *Castanea* spp. in Asia, the U.S. and Europe. Based on a successful biological control of the ACGW in Japan using *Torymus sinensis* Kamijo, which was seen as a sustainable approach for controlling the pest in the U.S., and in Italy. In Turkey the ACGW was found in Yalova, Gemlik, Bursa in 2014, and in 2017 ACGW has reached from Yalova and Gemlik to new areas in the Marmara region (Fig. 4): Orhangazi, Yıldırım, İzmit, Mudanya, İnegöl, Center of Bursa; Tepeköy, Kartepe, Kocaeli (İzmit); Samanlı Mountains, Pamukova, Sakarya; Şile, İstanbul and Ödemiş, İzmir. By following those results, the release of *T. sinensis* from Italy to Turkey was started in May, 2014. For obtaining some experiences, a Turkish group visited to parasitoids growing and releasing sites of the Podova University, Italy. After coming back to Turkey, in Gacik, Yalova (1) a laboratory was built with some growing shelves for keeping of rearing boxes in the periods of parasitoids hatched from galls of ACGW in Winter, (2) some parts of a chestnut tree were screened by fine cloth for developing a tenth (5x10x5 m) during release of the adults in the beginning of Spring, 2015, (3) about 250 saplings were placed under chestnut trees for oviposition by ACGW in Summer, 2014 and develop many galls in the beginning of Spring, 2015 for preparing of releasing site for *T. sinensis*, (4) planned to develop some greenhouses for keeping the saplings in order to develop galls on saplings at proper time and sizes for egg laying of *T. sinensis*, to be released in March or April. At the end of March, 2015, adults of *T. sinensis* and about 2000 galls of ACGW were brought to Yalova. The adults were fed on honey-drops, and released to sites having newly developed buds with galls of ACGW. The galls were put into entomological boxes, placed on shelves for rearing the adults of *T. sinensis*. In April, 2015 after hatching the parasitoid adults were fed on honey-drops, and kept in growing-chamber at 10⁰ C for about 5-10 days for finding good releasing sites in Yalova. Due to cold weathers in April, good releasing sites could not found, but the hatched adults of *T. sinensis* were released on trees having newly developed buds with small galls. In October, 2015 about 300 galls were collected from the releasing sites for checking presences of larvae of *T. sinensis*. The galls were dissected, but in 2015 any larva of *T. sinensis* could not found. The greenhouse could not build, due to this reason the saplings were not developed properly, and not used in releasing studies. At the end of April, 2016, some galls of ACGW were also brought to Yalova again, and the hatching parasitoid adults were released on trees having newly developed buds. In September, 2016 about 500 galls were collected from the releasing sites for checking presences of larvae of *T. sinensis*. The galls were dissected and only one larva was found. In August, 2017 130 galls of ACGW were collected from the releasing sites for checking presences of larvae of *T. sinensis*. The galls were dissected and from the galls about 16% *T. sinensis* larvae were obtained around Gacik village, Yalova. Some of the future works, should be done for control of ACGW, were given.

Keywords: *Dryocosmus kuriphilus*, distribution, release methods, current situation, Turkey



A PEST SPECIES, *LACHNUS ROBORIS* (L.) (HEMIPTERA : APHIDIDAE) ON CHESTNUT TREES IN SAMSUN, TURKEY

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Abstract

Lachnus roboris (Linnaeus) (Hemiptera : Aphididae) is known as a pest of oak and chestnut trees in some countries. This aphid species is monoecious, especially feeds on small branches and twigs of host plants instead of leaves. Despite of that this aphid were recorded on various plants such as oak, chestnut and pine trees in Turkey, biological and morphological studies about this pest are quite limited. *L. roboris* was seen having high populations on chestnut trees in 2014, in Samsun. Various biological stages of *L. roboris* on the chestnut trees were observed in field, samples were taken and morphological measurements were made in laboratories. In addition; eggs, nymphs, corniculus, cauda, antenna and adults were photographed under stereo binocular microscope. *L. roboris* overwintered on the chestnut branches in egg stage. Nymphs started to move on the younger suckers and twigs to feed and become adults there during summer. Nymphs and adults prefer to feed on young twigs and branches. Aphid population increased after October. In autumn, in the second week of November, eggs and adults are seen together on the chestnut trees. *L. roboris* adults laid their eggs together by smearing them on the branches and the suckers. The eggs are shiny black, 1.70 mm in length and 0.742 mm in width as average. The average length of the apterous viviparous adults was measured as 4.66 mm and width as 2.78 mm. Viviparous adult is brown-black color. Also, during summer some ants and ladybird species were observed by feeding on eggs and nymphs.

Keywords: Insect, Pest, Aphid, Aphididae, Chestnut, Morphology, Biology,



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CHESTNUT ERIOPHYOID MITES (ACARI: PROSTIGMATA: ERIOPHYOIDEA), INCLUDING A NEW RECORD FOR TURKEY

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Abstract

Species of the superfamily Eriophyoidea damage many crops worldwide. The chestnut group (*Castanea* spp.) is native to temperate regions of the Northern Hemisphere and includes thirteen species of deciduous trees and shrubs belonging to the beech family, Fagaceae. The sixteen eriophyoid species known to feed on chestnut belong to the genera *Acaricalus*, *Aceria*, *Aculus*, *Brachendus*, *Cecidophyes*, *Coptophylla*, *Phaulacus*, *Phyllocoptes* (Eriophyidae); and *Diptacus* and *Rhyncaphytoptus* (Diptilomiopidae). Injury caused by these mites is normally limited to minor damage to the leaf surface and does not affect crop production. However, *Brachendus pumilae* Keifer, which was found in chestnut plantations (*Castanea sativa* Mill.) in Bursa and Yalova provinces of Turkey, causes substantial damage on some cultivars/genotypes of *C. sativa*. It feeds on bud scales and causes bud drying and drop, and therefore affects yield directly; the buds are also an important source of grafting materials. This mite is a new record for Turkey and *C. sativa* is a new host.

Keywords: Chestnut, *Castanea sativa*, eriophyid, *Brachendus pumilae*, Turkey



MECHANICAL HARVESTING OF SWEET CHESTNUT PRUNING RESIDUES: PROPOSAL OF A SUSTAINABLE METHOD PROMOTING THE ESTABLISHMENT OF *TORYMUS SINENSIS*

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Abstract

Severe infestations of the Asian chestnut gall wasp (ACGW) are affecting sweet chestnut orchards across Italy, drastically impacting nut yield. The pest causes bud alteration and the formation of galls, preventing normal shoot growth and causing flower abortion. ACGW management in infested orchards is difficult, chemical suppression is ineffective against larvae within the gall. Control through cultural practices involves pruning out galled shoots, eliminating the residue from the orchard by burning. A feasible biological control strategy utilizes the parasitic wasp *Torymus sinensis*. The parasitic larvae feed on the gall wasp developing in green galls, but adults emerge from the woody galls the following spring. To promote the establishment of this natural enemy in chestnut orchards, the galled pruning residue should be kept on the field and not destroyed. This paper describes an innovative agro-mechanical practice, used for cleaning up the orchard floor, removing prunings and preparing the field for mechanical harvesting of chestnuts. The trials, carried out in the "Monti Cimini" area in the Province of Viterbo, involved the use of an innovative tractor-pulled, one-process mechanical system for picking-up, shredding and accumulating the pruned material simultaneously. In the field tests the machine shredded the residue effectively, accumulating the fragments in the trailed container, with an average gross operative capacity of 1.19 ha h⁻¹, extracting 3.48 t h⁻¹ of shredded residue from the orchard aisles. Once full, the container was dumped along the edge of the field, forming piles of shredded residue distributed in the orchard. The analysis of representative samples of the shredded residue collected from the piles showed that the impact of the mechanical process did not compromise the integrity of the galls for the development of the parasitic wasp.

Keywords: *Dryocosmus kuriphilus*; *Castanea*; galls; prunings; flail shredder.



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Diseases



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EVALUATION OF GRADED BLIGHT RESISTANCE IN CHESTNUTS OF DIFFERENT TAXONOMIC ORIGIN

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Abstract

Five chestnut trees (*Castanea sativa*, *C. crenata* and three hybrids *C. sativa* x *C. crenata*) with different level of blight resistance were subjected to the screening by two virulent and one hypovirulent strains of *Cryphonectria parasitica* in order to examine reliability of tests with excised stem and bark-and wood assays to reveal different level of blight resistance in chestnuts. Cut-stem 30cm in length and bark- and wood-tissue sections 5cm long were inoculated with the *C. parasitica* strains two times a year (early April and end of September) and incubated in the dark at 25°C with 95% humidity, cut-stem sections for 4 weeks and bark- and wood sections for 4 day respectively. In cut-stem sections, superficial cankers were mostly indistinct, so staining of bark and stromata production formed around the inoculating holes were evaluated. Out of these two characteristics it was occurrence of stromata which reflected better a different level of blight resistance of studied trees and different pathogenicity of employed strains. Size of necrotic area observed in stem-sections after bark peeling as well as on bark- and wood-tissue sections was significantly larger in more susceptible trees but only in trials carried out in spring time. The highest positive correlation between different level of blight resistance and size of necrotic area formed on wood tissue of bark- and wood sections was observed. Different pathogenicity of employed fungal strains was proved by significantly different size of necrotic areas formed in both excised stem and bar- and wood sections. It was observed that physiological state of collected branches resulted from the age of tree may affect lesion formation. In case that branch sections are collected under equal conditions, testing blight resistance on bark- and wood-tissue sections can be considered a rapid, convenient and reproducible method.

Keywords: *Castanea sativa*, *C. crenata*, *C. sativa* x *C. crenata*, *Cryphonectria parasitica*, virulent and hypovirulent strains



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ISOLATION FREQUENCIES OF *CRYPHONECTRIA PARASITICA* (MURRILL) AND OTHER FUNGI FROM SYMPTOMS OF CHESTNUT BLIGHT IN THE CHESTNUT FORESTS OF ARTVİN PROVINCE IN TURKEY

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Abstract

A laboratory was established by Regional Directorate of Forestry of Artvin in 2014 to make biological control of *Cryphonectria parasitica* which damage chestnut forests in East Black Sea region. Isolates collected from wounded tissue with the symptoms of *C. parasitica* in areas where biological control protocols will be applied was brought to laboratory in 2014-2015. Isolates were grown on PDA medium and isolates of *C. parasitica* with white colored (hypovirulent) and with orange colored (virulent) and other fungi were examined in terms of morphological characters. A total of 1794 parts with the symptoms of the disease in 329 petri plates The plant were planted. Among these isolated, 710 (%40.3) of them were developed as orange colored *C. parasitica*, 459 (%26) of them developed as white colored *C. parasitica*, 297 (%16.8) of them developed as *Penicillium* spp, 29 (%1.6) of them developed as *Fusarium* spp, 56 (%3.2) of them developed as *Macrophomina* spp. and 213 (%12.1) of them developed as *Trichoderma* spp. According to Petri plates, 37 (%11.3) of 329 petri plates were orange colored *C. parasitica*, 29 (%8.8) petri plates were white colored *C. parasitica*, 7 (%2.1) petri plates were *Trichoderma* spp. and 257 (%78.1) petri plates were mixture of different fungi (orange colored *C. parasitica*, white colored *C. parasitica*, *Trichoderma* spp, *Fusarium* spp, *Penicillium* sp, *Macrophomina* spp, *Chaetomium* spp.). The most frequent isolates per petri plates with 40 petries (%12.2) was mixture of orange colored *C. parasitica*, white colored *C. parasitica* and *Penicillium* spp., and followed by mixture of orange colored *C. parasitica* and white colored *C. parasitica* with 37 petries (%11.3) and mixture of orange colored *C. parasitica* and *Trichoderma* spp. with 29 petri plates (%8.8). According to the field observation, although *Trichoderma* spp. were limited the proliferation of chestnut blight, it did not eradicate disease completely. However, isolates of white colored *C. parasitica* cured better the infections of orange colored *C. parasitica*.

Keywords: *Cryphonectria parasitica*, Chestnut Blight, Artvin



EFFECT OF SiK® FERTILIZATION'S CHESTNUT IN THE INCREASING OF THEIR TOLERANCE AGAINST BLIGHT DISEASE (*CRYPHONECTRIA PARASITICA*)

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Abstract

Silicon (Si) is the second most abundant element in the earth's crust and an important mineral nutrient for many plants. It is referred as a promotor of the tolerance to abiotic (dry and salinity) and biotic stresses (fungi and pests). Concerning the last stresses, Si is absorbed in soluble form and accumulates in the different root, stem and leaf cells, providing a mechanical barrier protection against the attacks. On fertilized plants, there was observed an increase in water regulation and photosynthetic rate and modifications in the leaf architecture. Finally crop productivity is also benefited. The aim of this study was to evaluate the effect of potassium silicate (SiK®) fertilization (5, 7.5 and 10 mM SiK®) on inoculated chestnut plants with *Cryphonectria parasitica*. On SiK® treated plants, more than 80% (for 7.5 and 10 mM SiK® treatments) of plants didn't show any necrosis on stems, while in control plants only 30% were free from symptoms. Besides that, the extent of lesions on the remaining 20% of affected plants from 7.5 and 10 mM SiK blocks, was also lower than that in control ones. Si fertilization increased the metabolic activity, as photosynthetic rate (A) values suggest, and decreased the transpiration rate (E). Concomitantly, at the level of leaf biochemistry, there was obtained higher content of photosynthetic pigments and phenolic compounds. The content of the last one was higher in inoculated than in non-inoculated plants. The histology study revealed deposition of phytoliths in SiK® in the stems of the treated plants. These structures are also known by their enhancement of resistance mechanisms against the pathogenic agent invasion. First results suggest that this nutrient might have a beneficial effect on the chestnut blight resistance, as was already found in previous studies with *Phytophthora cinamomi* in chestnut and in accordance with results obtained by other researchers for other species.

Keywords: *Castanea sativa* Mill., *Cryphonectria parasitica*, phytoliths and silicon.



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VEGETATIVE COMPATIBILITY AND MATING TYPES OF *CRYPHONECTRIA PARASITICA* ISOLATES COLLECTED FROM İZMİR, MANİSA AND DENİZLİ PROVINCES

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Abstract

The objective of this study, characterization of the populations of *Cryphonectria parasitica* in Izmir, Denizli and Manisa provinces of the Aegean Region in terms of vegetative compatibility (vc) and mating types. A total of 268 *C. parasitica* isolates were collected from 19 chestnut producing-villages. Vc types of all isolates were determined by pairing them with European vc tester isolates. A total of 136 isolates were subjected to mating type test by using multiplex-PCR with specific primers. According to the results, three vc types, EU-1 (% 58.6), EU-12 (% 32.5) and EU-2 (% 8.9), were found. This is the first report that EU-2 was found in the Aegean Region. Both mating types, MAT-1 and MAT-2, were found in all three provinces. MAT-1 isolates were dominant in all populations and accounted for 83% of all of the isolates. MAT-2 isolates were found in seven of eight populations but comprised only 17% of all of the isolates. MAT-1:MAT-2 ratio skewed significantly from the ratio 1:1 that may be the indication of the lack of sexual reproduction. Genotyping based on combination of vc and mating type data revealed the following four genotypes: EU-1/MAT-1, EU-1/MAT-2, EU-12/MAT-1, EU-2/MAT-1. EU-1/MAT-2 has special case in terms of population dynamics of *C. parasitica* since sexual cross of this genotype with either EU-12/MAT-1 or EU-2/MAT-1 has potential to generate new vc types. The results of this study indicated that the vc diversity of *C. parasitica* is low in the region. However, presence of both mating types in the same populations creates a high risk of increase in vc-type diversity.

Keywords: Chestnut blight, *Cryphonectria parasitica*, vegetative compatibility, mating types

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