# S06

# MEDFRUITS & NUTS: PLANT MATERIAL AND CROPPING ISSUES OF MEDITERRANEAN FRUITS AND NUTS FOR SUSTAINABLE PRODUCTION

## S06.001

### Pomegranate Biodiversity and Horticultural Management

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The pomegranate, native to Persia, had its first domestication in Iran about 2000 B.C. The name, pomegranate, owes its origin to Latin; "pome" meaning apple, and "granate" meaning many seeded and it was, initially called *Malum granatum*, meaning seeded apple. From the place of its origin, the pomegranate spread to nearby areas, such as the Mediterranean and subsequently reached eastern countries like India and China. Presently, it is cultivated in India, Iran, Turkey, China, Spain, USA, Morocco, Egypt, Israel, Afghanistan, Pakistan, Greece, Azerbaijan, Yemen, Jordan, Portugal, Cyprus, Italy, Saudi Arabia, Argentina, northern parts of Chile, and to a lesser extent, in Burma, and Japan. It is thought as exotic fruit in European countries, as paradise fruit in Arabic countries. Generally, the fruit is used for eating fresh and decorative purposes. The fruit will keep many weeks at room temperature and longer in cold storage. The rind shrinks and became thinner and tougher in storage, improving the eating quality. Also, it is very important fruit in terms of human healthy. The family *Punicaceae* contains a single genus *Punica* L. of two species, *Punica granatum* L. and *Punica protopunica* Balf.f., syn. Socotria protopunica. Wild pomegranates are found in the Near-East Transcacasia, Dagestan, Central Asia (Kopet-Dag, Pamiro-Alaj) and also in Asia Minor, Iran and Afghanistan. In the Kopet-Dag wild forms show a wide range of variation probably still untouched by breeders. The cultivation of the pomegranate is mainly confined to tropics and subtropics and it grows well in arid and semi-arid climates. Favorable growth takes place where winters are cool and summers are hot. It is evergreen in the tropics and deciduous in the subtropics. It has the ability to withstand frosty conditions, bud below -12 °C the hardiness is poor.

## S06.002

### SSR and EST-SSR Markers for *Opuntia* spp. Fingerprinting and Genetic Diversity Evaluation

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*Opuntia* spp. belong to the *Cactaceae* family and are native to Central America. The most economically important species is *Opuntia ficus-indica*, cultivated both for fruits and cladodes. The genus includes other important edible species (from diploid to octoploid) which are widespread as wild or domesticated in many arid or semiarid regions worldwide (including the Mediterranean area). Several accessions are cultivated in the different growing area but little is known about their ancestry and the level of genetic diversity. The cultivated genotypes were selected by farmers mainly for the absence of thorns and for fleshy fruits. Although these common features, a polyphyletic origin of the most diffused cultivated genotypes has been hypothesized. In fact, cross-hybridization is well documented in *Opuntia* spp., so that the widespread cultivars likely arose from different parental species. With the main aim of investigating the level of intraspecific genetic diversity and fingerprinting the most diffused varieties, a molecular analysis based on SSR markers was carried out at Catania University. In particular, 5 SSRs previously isolated from *O. echios* and 2 new EST-SSRs isolated from *O. streptacantha* were used to analyze 61 wild and cultivated genotypes belonging to 13 *Opuntia* species, coming from plantings throughout the world and now collected at the experimental station of Catania University. SSR amplifications produced from one to eight alleles per *locus*, confirming the high ploidy level of most of the genotypes. The analysis revealed a high level of genetic diversity, especially in the Mexican germplasm. However, the analysed *loci* were monomorphyc in most of the Italian genotypes ('Bianca', 'Rossa', 'Gialla' and the "trunzare" accessions) indicating that these cultivars were probably the results of somatic mutations. The analysis added new information to better understand the ancestry of the cultivated varieties and the variation among *Opuntia* species and cultivated varieties.

## S06.003

### Genetic Diversity and Relationships among Some Iranian Cultivated Almond Genotypes and Related Wild Species Using RAPD Markers

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Iran is one of the main growing regions for commercial and wild almonds due to its suitable climatic conditions. In this study, we characterized genetic diversity and relationships among 62 almond genotypes, including eight species (*P. dulcis*, *P. scoparia*, *P. arabica*, *P.eburnea*, *P. eriоclada*, *P. lycioides*, *P. orientalis* and *P. communis*). 16 RAPD primers (TIBMOLBIOL Co., Germany) produced 260 bands, of which 250 were polymorphic (96.15%). Total resolving power (Rp) was 121.83, ranging from a minimum of 4.25 for TIBMBB-16 and a maximum of 11.64 for TIBMBD-05. Jaccard similarity coefficient was calculated and was used to construct a UPGMA dendrogram. Similarity values among the studied genotypes ranged between 0.28 and 0.79 with an average of 0.53. Cluster analysis and principle coordinate analysis (PCoA), partially discriminated the studied plant material regarding their geographical origin. At the similarity of 0.52 in the dendrogram, the genotypes were divided into four sub-clusters. Our results indicated an extensive genetic diversity at molecular level, for almond germplasm in Iran.

## S06.004

### On Adana Conditions Some Fig Genotypes Quality Specification with Determine as Parthenocarp from Selected the Mediterranean and South-East Anatolian Region

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In this work, the fruit bearing dates, phenological, pomological and morphological characteristics of fig genotypes selected from Mediterranean and South East Anatolia Region were determined and the entrance dates of *Blastophaga psenes* in fruit were examined. Fruit samples were taken during the development period and kept in deep freezer at -20 °C. Then by examining these samples under the stereo microscope, the bearing dates of the flowers in a year were determined. In pomological analysis, the average fruit weight was ranged between 21,17-69,25 g, fruit width was between 31,91-50,88 mm, Brix value was between (%)16,0-28,0. In this study, 01-İN-48, 01-İN-51, 01-İN-52, 01-İN-53, 01-İN-54, 01-İN-55, 01-İN-56, 01-İN-57, 01-İN-58, 31-İN-01, 31-İN-05, 31-İN-06, 31-İN-07, 31-İN-11, 31-İN-12, 31-İN-13, 31-İN-16, 31-İN-17, 31-İN-19, 31-İN-24, 31-İM-02, 31-İM-10, 31-İM-15 genotypes and Küçük Kuyruklu Sarı, Yerli Beyaz (Suruç), Siyah Güzlük (Bozova Merkez), Kuyruklu Yeşil, Mut, Sultani (Halfeti), Yerli Beyaz (Akçakale), Alakuşu varieties were determined as parthenocarp.

## S06.005

### Investigation of Quantitative Morphological Traits among Native Populations of Persian Walnut (*Juglans regia* L.)

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The main aim of the current research work was identification of genetic diversity among walnut species in Golestan province of Iran. Thirty quantitative morphological traits used as an approach to evaluate 96 trees belonged to the five wild walnut populations. All morphological characters of leaf, flower and nut were recorded. Variance analysis of traits showed significant differences ($p<0.01$) among all traits. This diversity went through, except, thickness of husk, number, length and wide of leaflet that showed high diversity among native walnut traits in Golestan province. Difference of traits among locations used means comparison and Duncan test and gained correlations coefficients. There are positive and significant correlation between husk nut weight on kernel weight ($p<0.01$) and negative correlation between husk nut weight on kernel percentage ($p<0.05$). Further results indicated a negative correlation between increasing up the altitude with protogeny and percent of oil of kernels. Reversely there was a positive correlation between altitude and protein content of the kernels. For genetic distance identification and populations grouping, used cluster analysis that Put on 2 clusters. These Genotypes was studied based on quantitative data and UPGMA algorithm. Populations grouping with quantitative data not matched with those grouping based on geographical locations.

## S06.006

### Selection of Superior Genotypes of Walnut (*Juglans regia* L.) within the Authochtonous Germplasm of Aspromonte and Etna Foothills

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In Aspromonte and Etna mountains, located in South Italy, walnut has been an important tree specie mostly propagated by seed, a propagation method that produced a large autochthonous germoplsm, whose horticultural traits never have been studied. Used since ancient time for both timber and fruit production, due to its high timber value, in the last century trees have been intensively cut off, contributing to the reduction of biodiversity and, in turn, to the supply of tasty fruits to the local markets. Aim of the research was the selection of outstanding genotypes on the basis of tree carpological traits. In a preliminary phase, many of these genotypes were excluded for their sensitivity to either symptoms of walnut blight or of anthracnose or low productivity. About 100 accessions were chosen and studied in situ. A morphological characterization of fruits was done referring to the UPOV and IPGRI descriptors list. After three years of observations have been selected 33 superior genotypes, 13 in Etna and 20 in Aspromonte area, having big fruit size, medium-high shelling yield, light color of the kernel and peculiar taste. The ripening period for most individuals fell in the October. The average weight of the nuts varied between a maximum of 15 to a minimum of 10 g. Kernel weight varied between 38 and 52 % of the fruit weight. Large part of the genotypes showed vigor trees with spreading-type canopy; none of them presented fruiting habits on laterals shoots. The accession selected were analysed, as well, at the molecular level using five SSR primer pairs and were compared with European and Asiatic cultivars. Molecular genetic analysis showed a moderate variability, in spite of the scant number of adopted primers.

## S06.007

### New Promising High Quality, Sharka Resistant Apricot Cultivars from CEBAS-CSIC (Murcia, Spain) Breeding Programme

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An apricot breeding programme is being developed at CEBAS-CSIC (Murcia, Spain) since the early nineties. High-quality apricots and Sharka resistance cultivars are two of the main objectives in the new released cultivars. In the last years, Sharka disease (Plum Pox Virus) has spread out in most apricot growing areas in the world, especially in Europe, with disastrous consequences for apricot production. Therefore, apricot breeding programmes must emphasize the aim of Sharka resistant cultivars. As a result of CEBAS-CSIC apricot breeding programme, a set of new cultivars and advanced selections have been released in the last seven years which fill an extended period of maturity, from end of April to end of June: extra early-ripening ('CEBAS 8-14)', early-ripening ('Rojo Pasión'), mid-season ripening ('Murciana', 'Valorange') and late ripening ('CEBAS 10-1', 'CEBAS 11-1'). This group of new releases constitutes an apricot line with homogeneous attractive characteristics (orange ground colour, intense red blush, orange and juicy flesh, high organoleptic quality, resistance to manipulation, good conservation aptitude). In addition, these new apricot cultivars have shown resistance to Sharka. These positive characteristics mean that these new apricot cultivars will play an important role in the varietal renewal process which is currently underway in apricot species in order to satisfy consumer and industry demands.

## S06.008

### Advances in Hazelnut Research in North America

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Interest in growing sustainable crops for food and bio-energy has lead to a significant increase in hazelnut (*Corylus* spp.) research and breeding in North America. For decades, the only hazelnut research was centered at Oregon State Univ. in the Willamette Valley of Oregon where 99% of the U.S. crop is produced. Currently, there is work also being done at Rutgers Univ. in New Jersey, the Univ. of Nebraska, Lincoln, the Univ. of Minnesota, the Univ. of Guelph, Ontario, Canada and at the not-for-profit organization the National Arbor Day Foundation. Several of these institutions have teamed up to capitalize on previous investments, germplasm collections and research, to develop the Hybrid Hazelnut Consortium, whose major emphasis is developing high-yielding hazelnuts adapted to colder regions that are resistant to the disease eastern filbert blight, caused by *Anisogramma anomala*. In additional to conventional breeding efforts, the genomes of *C. avellana* and *A. anomala* are being sequenced to better understand genetic diversity and population structure of the species, and to elucidate host-pathogen relationships. A description of the objectives, goals and challenges of this work will be provided, as well as its implications towards enhancing hazelnut production worldwide.

## S06.009

### *Ex-situ* Management of Fig, *Ficus carica* L., Genetic Resources: Towards the Establishment of the Mediterranean Reference Collection

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To test whether a germplasm collection is representative of the genetic diversity, a genetic study has to be conducted, comparing fig accessions to Mediterranean cultivated fig but also to wild fig populations. Recent investigations in traditional agro-

ecosystems indicate that fig variety names are involved in a dynamic process. Indeed we have identified numerous cases of synonymy and homonymy (Achtak *et al.*, 2010). Therefore, defining a variety is more complex than a simple one name – one variety or a one genotype – one variety relationship. I present here results on pomological and molecular characterization of the fig collection maintained in the Island of Porquerolles (France). A total of 318 SSR profiles was identified and classified into 269 genotypes which were distinguished by at least 4 alleles and 49 closely related genotypes (distinguished only by 1 to 3 alleles). Based on Bayesian model clustering analysis of Mediterranean cultivated and wild fig, I show that the collection is largely representative of Mediterranean genetic diversity. Comparing the defined genotypes of this collection to accessions considered as references of main varieties by Baud (http://www.fig-baud.com) based on pomological traits and SSR *loci*, I examine the complexity of defining reference material for fig varieties. This study constitutes a framework for the establishment of the Mediterranean reference collection of fig varieties.

## S06.010
## Genetic Analysis of Persian Walnut Populations (*Juglans regia* L.), Using 11 SSR Markers

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Genetic diversity among five populations of Persian Walnut (*Juglans regia* L.) in Golestan Province of Northern Iran was investigated using simple sequence repeats (SSR) markers. The genetic diversity was high percentage of polymorphic bands, P = 100%; average expected heterozygosity of HE = 0.71±0.126; Shannon's information index, I = 1.48±0.364; Nei's genetic heterozigosity, HPOP= 0.71±125. An overall value of mean estimated number of gene flow (Nm = 2.45) indicated that there was high gene flow among the sampled populations. There was no correlation between genetic and geographic distance among the populations. The individuals within close populations were placed in different clusters. The results of UPGMA dendrogram among populations based on Nei's genetic distance indicated these populations classified into two groups. The highest genetic distance belonged to KO and AF populations (0.30). The lowest distance was related to GL and CH populations (0.12). This event indicated high diversity among these populations.

## S06.011
## Peach Breeding Programme IRTA-ASF: Aiming for High Fruit Quality

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A peach scion breeding programme to obtain new varieties well adapted to the Spanish growing conditions was started in 2004 jointly by IRTA and ASF. Several fruit types (peach, nectarine, flat peaches and flat nectarines) combining with yellow or white flesh and firm flesh texture are aimed. In addition, a number of outstanding agronomic traits to produce high quality and tasteful fruits with a good sugar-acid balance, juicy and long shelf life are also bred. During the three first crossing years (2004, 2005 and 2006) the main objectives were: yellow flesh nectarines with red skin, yellow flesh peach, white flesh nectarines with red skin, white flesh peach, pavia, flat peach and nectarine. Regarding harvesting time families raised were: 68% mid season (July-August), 18% early (June) and 14% late (September). Crosses made included varied cross combinations. Populations have been raised mainly from ASF breeding stock (yellow flesh nectarines of the NECTAPOMTM and NECTAREGALTM ranges and white flesh nectarines of the NECTASWEETTM and NECTADELICETM range). In addition, peaches used in several cross combinations were from the TONICSUNTM and REGALSUNTM yellow fleshed ranges and from the TONICSWEETTM and REGALSNOWTM white fleshed ranges. Flat white peaches and nectarines from the REGALCAKETM and NECTACAKETM ranges were also included as parents. Also some yellow flesh clingstone local Spanish cultivars were used for crossing. Some 10.261 seedlings were raised during the three first crossing years and were grown in three selection plots of aproximately 1 ha each at 3,5 m x 1 m of spacing for the seedling planted in 2005 and 3,5 m x 0,8 m for the seedlings planted in 2006 and 2007. Selection plots are placed at Gimenells close to the main peach producing area in Lleida. Fruit bearing, in almost 100% of the seedlings, occurs during the third leaf year. First time flowering seedlings were observed twice in each spring to assess flowering intensity and fruit set. The selection process for the 10.261 seedlings raised, based on fruit quality assessment during 2007, 2008 and 2009 resulted on 127 promising preselections which were budded onto one year old 'Cadaman' rootstock and placed at 5m x 3m of spacing for further trial (3 replicates per preselection) in two sites: Gimenells (Lleida) and La Tallada (Girona).

## S06.012
## Study on Insect-Resistance of Different Chestnut Varieties

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Study on insect-resistance of Different chestnut varieties Shuchai Su, Hengjiu Lei (The Key Laboratory for Silviculture and Conservation of Ministry of Education, Beijing Forestry University Bejing 100083) To integrate management of pests and quality of nuts and breed high resistant variety, we studied the resistance of chestnut to insects and its mechanism. The injury index of leaves, *Oligonychus ununguis* population density, morphological characters, structure of leaves, rate of bored shell by *Dichocrocis punctiferalis* Guenee, and morphological characters of shells are studied using 6 chestnut varieties（Zunda Tafeng Zunyu Donglingmingzhu Zipo Zunhuaduanci）. The results showed that there are significant differences in the resistance of chestnut varieties to *Oligonychus ununguis* (Jacobi) and *Dichocrocis punctiferalis* Guenee. The up–epidermis thickness, hair length and density of down–epidermis have significant correlation with mite–resistance; the thickness of spongy tissue and down–epidermis, as well as stoma density of down–epidermis have little correlation with mite–resistance. The rate of clustered shell, and shell volume correlate significantly with borer resistance, while the length and density of thorn, thickness of shell bottom, and length of stalk have little correlation with mite–resistance. Studying the identification and mechanism of resistance of main Chinese chestnut cultivars in Zunhua to *Oligonychus ununguis* (Jacobi) and *Dichocrocis punctiferalis* Guenee, it comes to the conculsion that: zundali beiyu2 have high resistance to the mite, zundali and tafeng have high resistance to the borer. The up-epidermis thickness, hair length and density of down-epidermis have significant correlation with mite-resistance; the phenol, flavonoids and malondialdehyde content, the enzyme activity of SOD, POD, PPO, PAL have close relationship to the mite-resistance. The rate of clustered shell, shell volume have significant correlation with borer-resistance, the phenol, flavonoids content of shell and peel have close relationship to the borer-resistance.

## S06.013
## Breeding Goals for Peach Cultivars and Rootstocks in Mediterranean Temperate Climate

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Peach is the second most important temperate tree fruit species after apple. Peaches are mainly used as fresh fruit and for canning industry. Main production areas in

Europe and USA have a Mediterranean temperate climate, with mild-cold winters and hot dry summers. Most peach breeding programs have emphasized the development of melting flesh fruits for fresh market, although several programs have focused on non-melting cultivars due to specific consumer preferences or canning purposes. General objectives have included fruit quality, productivity and early to late ripening. Currently, competition for agricultural commodities has created the need for alternative research strategies. Thus, new research programs aim to develop cultivars with additional values, such as those improving the health and nutritional quality of foods, new colours for fruit flesh and skin, appetizing aroma or enhanced flavour for fruits. Tolerance to pests and diseases and postharvest disorders, such as brown rot and chilling injury, is also included. In the case of rootstocks, most breeding programs have used natural or artificial crosses within the subgenus Amygdalus (*P. persica*, *P. amygdalus* and *P. davidiana*) to generate clonal rootstocks for peach in southern Europe and California. Plums and more complex interspecific hybrids between peaches and plums aim to control tree-size, good adaptation for heavy and calcareous soils, and resistance to nematodes, bacteria, fungal and other replanting disorders. Genetic analysis throughout the localization of QTLs and candidate genes is being used both for peach cultivars (chilling injury, sugar/acidity metabolism) and Prunus rootstocks (iron-chlorosis, root asphyxia). Segregant progenies and germplasm diversity are available for breeding and for the development of marker-assisted breeding tools. Development of molecular markers and a better understanding of the genetic control of fruit quality and rootstock tolerance traits will allow early selection of progenies bearing desirable traits and improve breeding strategy for quantitative traits.

## S06.014
## The Role of Mediterranean Fruit Tree Orchards and Vineyards in Mantaining the Traditional Rural Landscape

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The Mediterranean area represents one of the most suitable environment for horticultural crops. In Italy, fruit crops have been in the past introduced and expanded in different environments depending on the species and adaptability to the physiographic characteristics of the places. The mite climate, the specificity of soils, the plasticity of the nature, have allowed a tight relationship between land and farmers. Some polycultural ecosystems have acquired the traits of cultivated gardens. Since the past centuries olive and fruit orchards, vineyards and Citrus plantations represent the typicity of rural landscape. The physionomy of tree cropping systems has been changed rapidly starting from half of the past century owing to the introduction of new genetic resources, the change in the quality meaning, the industrialization of the agronomical techniques, resulting in loss of environmental and biological diversity. Nonetheless, some historic fruit orchards and vineyards, have survived. The research is focused on the recognition of the most representative traditional landscapes of fruit crops in the Mediterranean area, the identification of their typological traits, the definition of their environmental and technical sustainability. Through a multicriterial analysis it was possible to recognize and measure the sustainability of these cropping models and their ecological function, turning into preservation of environmental resources, environmental quality and quality life. The study also underlined their crucial role in the maintenance of local identity, history and economy. Traditional farming, by representing a cultural heritage, need to be therefore preserved and valorised.

## S06.015
## Genetic Variation in Some Selected Siahe Mashhad (*Prunus avium* L.) Clones in Iran

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In this study, 13 selected Siahe Mashhad sweet cherry clones grown in Iran, are investigated in terms of pomologic and morphologic characteristic. This research was conducted using on randomized completed block with three replication during 2007- 2009, in Khorasan Razavi Natural Resource and Agriculture Research Center, Mashhad-Iran. The main objective of this research, investigation of genetic diversity of 13 selected Siahe Mashhad sweet cherry (*Prunus avium* L.) clones that it is the most important Iranian cherry cultivars on account of its excellent fruit quality. A wide variation was found for most of pomologic characters (fruit weight, stone weight, fruit weight to stone weight ratio, soluble solid content, pH, total acid content) and morphologic characters (crown volume, trunk circumference, current season) traits ($P \leq 0.01$) and a low or no significant difference was determined for blooming phenology , ripening time and other pomological characteristics. The fruit shape of all clones was kidney. Clone NO. SH7 had the highest fruit weight (9.27 g), while SH1 had the lowest fruit and stone weight (4.51 g, 0.38 g) respectively. Clone SH4 (0.57 g) showed the greatest stone fruit. Crown volume ranged between 16.53 ($m^3$) and 32.67 ($m^3$) in Siahe Mashhad sweet cherry clones, being SH23 with lowest and SH13 with larger crown volume. Current season vegetative growth in determined between 45.66 up to 58 cm. Trunk circumference showed SH21 with 93.65 ($mm^2$) and SH20 with 161.99 ($mm^2$) clone had lowest and highest trunk circumference, respectively. Key words: Sweet cherry (*Prunus avium*), pomologic, phenologic, morphologic.

## S06.016
## Response of 11 Walnut Cultivars and Genotypes to *Gnomonia leptostyla*

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Anthracnose, caused by *Gnomonia leptostyla* (Fr.) Ces.& de Not.( imperfect state: *Marssonina juglandis* ( Lib.) Magn.), is the most serious disease of walnut. This research is designed to determine relative resistance to *Gnomonia leptostyla* of 11 varieties based on factoriel design on the basis of Completely Randomized. After grafting of walnut genotypes and cultivars, grafted plants were inoculated by a 105 spore per ml suspension.The results showed that germination of spores was higher on the upper side of the leaves. The first symptoms of infection were seen on Z60 and Hartley 4 days after inoculation. The acervuli were produced first on K72 genotype about 27 days after inoculation. Two months after inoculation, evaluation was done in each plants by determination of the number and the mean diameter of spots.There were a significant differences among the genotypes and cultivars in susceptibility. The average infection percent on the Z60, K72 and Hartley was higher, Vina and Round de Montignac showed the least infection.

## S06.017
## Fig Genetic Resources, Breeding and Horticulture

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The figs (*Ficus* spp., *Moraceae*) compose a large angiosperm genus with approximately 750 tree species, which can be found in tropical and subtropical regions worldwide. All members of the genus share a distinctive closed inflorescence (syconium), which is the site of an intricate mutualism with pollinating fig wasps for over 60 million years. The wild forms of the common fig (*Ficus carica* L.) are found in Mediterranean region, Iran, Asia Minor as well as in Central Asia. The common fig is morphologically gynodioecious but functionally dioecious. It is an ancient important fruit crop. Hundreds of cultivars are known and are probably the results of ancient selections maintained by vegetative propagation. Nowadays, several descriptors, including molecular markers were successfully used for fig variety identification and germplasm description. Several fig collections are found in Mediterranean countries. Some of the diversity found in these collections was used for the fig breeding program in Israel, which aims to develop new high quality cultivars for fresh consumption. Fig fruits are consumed either fresh or processed. For centuries, dried figs were the major fig product available because of the extreme perishability of the fresh figs. However, current markets are characterized by an

increasing demand for fresh figs. Fig is a climacteric fruit producing high ethylene levels during ripening. The worldwide trade in fresh fig market is possible, mainly due to the development of new fruit varieties as well as because of the accumulation of knowledge and technological developments of postharvest fruit preservation. Controlling physiological processes and molecular approaches of delaying fruit ripening by manipulating the ethylene pathway and ethylene controlling genes using fig transformation will be discussed. Extensive fig culture is still traditionally common in many regions around the world. Recently, modern orchards of fig cultivars with high productivity and better storageability have been planted for production of fresh fig fruit in various countries. To assure commercially successful production fig cultivars hardy to various climatic regions were selected and new horticultural practices such as tree shaping, pruning and pest control were developed. The combined efforts of innovative fig varieties development, novel postharvest fruit preservation technologies, new horticultural practices and pest control will increase the global fresh fig production and distribution to new markets around the world.

## S06.018

### Vegetative and Reproductive Phenology of the Fig Cultivar 'Bourjasotte Noire' and its Response to Pruning

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The European Fig cv. Bourjasotte Noire was recently introduced to Western Cape Province of South Africa. Producers struggle to implement effective commercial practices that will optimise yield of quality fruit. A phenological study was conducted to establish the optimum one-year-old shoot length to maximise yield and optimise fruit size. The number of fruit, bud break and shoot growth on one-year-old shoots (N shoots) comprising four different length categories. In 'Bourjasotte Noire', all four categories seem to be suited for reproduction and should also produce a fair yield the following season. Various pruning methods are described in fig production literature, depending on cultivar, crop of interest and climate. Two experiments to establish pruning methods that will optimise yield was conducted Experiment 1 comprised four treatments consisting of an unpruned control (T1), removal of either one-third (T2) or one half (T3) of one-year-old (N) shoots, or cutting shoots back to three nodes (T4). Treatments were applied to the whole tree, on 9 August 2008. Experiment 2 comprised six treatments: an unpruned control and five pruning dates ((30 June 2008 (Date 1), 21 July 2008 (Date 2), 11 August 2008 (Date 3), 1 September 2008 (Date 4) or 22 September 2008 (Date 5)) where one third of the shoot was removed by heading. One treatment was applied per tree, to three selected one-year-old shoots. In experiment 1 it was established that in 'Bourjasotte Noire', removal of one third of N shoots by heading should ensure the development of fair length shoots for sustainable production, without a negative effect on yield. Data from experiment 2 suggests that N shoots of 'Bourjasotte Noire' should be pruned on the 21st of July (Southern hemisphere) to produce long N+1 shoots for sustainable production, without having a negative effect on yield in the current season.

## S06.019

### Effect of Girdling, Crop Load, Zinc Sulfate and Carbohydrate Spray on Inflorescence Bud Abscission and Nut Quality of Pistachio cv. 'Ohadi'

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The effects of shoot girdling, fruit thinning, zinc and sucrose treatments on inflorescence bud abscission and nut characteristics of pistachio (*Pistacia vera* L. cv. 'Ohadi') were investigated in two consecutive years in Kerman province. The treatments were applied in two different stages of fruit growth and development including: 1-During initiation of rapid growth of seed endosperm and 2- Endosperm completion and initiation of rapid seed embryo growth. According to the results, all treatments decreased the inflorescence bud abscission and increased its dry weight durin 'ON' year. The lowest inflorescence bud abscission and the highest bud dry weight were resulted by girdling treatment. The results of inflorescence bud retention in different time intervals during summer showed that the highest rate and the percentage of bud abscission was between 6th July till 6th August during 'ON' year and all the treatments reduced the inflorescence bud abscission rates as well as bud abscission percentage during this period. It was also shown that sucrose and zinc treatments had positive effects on the percentage of dehiscence, blankness, early splitting, misshaping and kernel weight of nuts, so that in most treatments the differences between the treatments and untreated control trees were significant. Meanwhile, Zn treatment (1.1 %) decreased the number of nuts per ounce. Girdling didn't have significant effects on the nut characteristics.

## S06.020

### Annual Changes of Leaf Nutrient Concentrations in 'Fuyu Persimmon' Grown in Thailand

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Recommended fertilizer application from countries that grow persimmon has been adopted for persimmon growing in Thailand for decades. However, because of different climate conditions growth period of persimmon in Thailand is longer than in other countries. Fertilizer application will achieve best result when we know nutrient status of tree before applying fertilizer and nutrient sufficiency range of persimmons grown in Thailand has not been established yet. Therefore, appropriate leaf sampling time and leaf nutrient analysis of healthy persimmon trees are prerequisite. In this study annual changes of nitrogen (N), phosphorus (P), potassium (K), calcium (Ca) and boron (B) concentrations in 'Fuyu' persimmon leaves from 19-20 years old trees at Angkhang Royal Research station (ARRS) and Inthanon Royal Research station (IRRS), Chiang Mai province were monitored. Leaves at age of 1 month and 4-7 months were sampled in 2005 and leaves at age of 3-7 months were sampled in 2006. Collected leaves were the 5th leaf from the shoot tips. Leaf N, P and K concentrations decreased with leaf age. Concentrations of five elements were relatively stable when leaves were 5-6 months old (July-August) the appropriate samples for leaf nutrient analysis. At this period leaf N, P, K, Ca and B concentrations were between 2.42-2.54%, 0.25-0.28%, 1.40-1.59%, 1.47-1.93% and 33.09-39.81 mg/kg, respectively at ARRS. At IRRS, leaf N, P, K, Ca and B concentrations were between 2.31-2.47%, 0.26-0.29%, 1.25-1.52%, 1.06-1.38% and 29.78-39.02 mg/kg, respectively. From this study, the optimum leaf N, P, K, Ca and B concentration range of healthy bearing 'Fuyu' persimmon trees grown in Thailand is proposed as followed: 2.38-2.49%, 0.26-0.28%, 1.35-1.48%, 1.31-1.61% and 32.58-38.27 mg/kg respectively. It also showed that nutrient concentrations in persimmon leaves in Thailand had similar range as leaf standard nutrient concentrations reported in other countries.

## S06.021

### Effect of Abiotic and Biotic Factors on Pomegranate Cultivation in West Bengal

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Pomegranate (*Punica granatum* L.) is one of the favourite table fruits in the world for its nutritional and medicinal properties. There are many untapped areas in India like laterite zone of West Bengal and its adjoining states where pomegranate cultivation to be explored for its commercial feasibility. To produce good quality fruits in larger quantity, a series of experiments were conducted. Results from crop regulation investigation revealed that November cropping was the best to

obtain highest yield of quality marketable fruits. Study on nutrient management indicated that FYM was better than Vermicompost and FYM (20 kg/plant) along with N 400 P 100 K 300 g (per plant /year) resulted better plant growth, highest yield with quality fruits which was associated with the foliar N/K ratio of 1.1. The fruits from organic sources of nutrients showed maximum storage life with less P.L.W. To harness the beneficial effect of bio-regulators, the results indicated that 3 sprays of NAA at 25 ppm were the best in all aspects. For colour development, pre-harvest spraying of fruits with KH2PO4 @ 1g/L resulted attractive reddish colour both in skin and aril followed by newspaper wrapping of fruits. To control fruit borer and thrips, spinosad (organic pesticide) at 7ml / 15 L was the best closely followed by acephate (Asataf) at 0.75 g / L. To control the spot and rot diseases of fruits, combined spraying of fungicides with Coper Oxychloride at 2g / L + mancozeb at 2g / L and Carbendazim at 1g / L + mancozeb at 2g / L were the most effective. Residue analysis of the above insecticides and fungicides revealed that the residue level of all these insecticides and fungicides were found well below the MRL values.

## S06.022

## Nutrient-Uptake Efficiency of Pistachio (*Pistacia vera* L.) Rootstocks under Soil Water Deficit

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Selection of a tolerant rootstock to drought stress conditions may be associated with its nutrient uptake efficiency. There are more than 440,000 ha of pistachio (*Pistacia vera* L.) bearing orchards in Iran, most of them faced with soil water scarcity. Under these conditions, uptake and translocation of nutrients to leaves are restricted due to high osmotic pressure of the soil water. In this study, the influences of three widespread pistachio rootstocks in Iran, 'Badami', 'Qazvini' and 'Sarakhs', on leaf nutrient concentrations were investigated under different levels of soil water depletion (SWD) in a greenhouse experiment. Therefore, 18-month pistachio seedling rootstocks were subjected to three levels of soil water deficit including 40, 60 and 80% of total available water (TAW), and nutrients concentrations measured on the leaves which were sampled in mid-summer. Based on the results, 'Badami' seedlings showed a higher efficiency to uptake zink (Zn), potassium (K) and phosphorus (P) under soil water deficit, while 'Qazvini' seedlings showed more uptake for calcium (Ca), magnesium (Mg) and manganese (Mn). Nevertheless, rootstocks showed no significant differences for boron (B) uptake. Since K and Zn play a significant well-known role in plant tolerance to abiotic stresses especially in increasing drought-tolerance of plants, 'Badami' can be introduced as a suitable rootstock for soils with water scarcity.

## S06.023

## Do Orchard Floor Weeds Affect Water Status of Mature Pecan Trees?

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Pecan orchard weed management practices vary widely in the Mesilla Valley, New Mexico, USA. Pecan growers are advised to control weeds when establishing new orchards but there is not a set recommendation for weed control in mature orchards as it is unknown if weeds on the orchard floor compete with mature trees for resources such as water and nutrients. The objective of our study is to measure the level to which orchard floor weeds compete for water with mature pecan trees. Beginning Spring 2009 in an established commercial 'Western' pecan orchard with Harkey-loam soil, four treatments were maintained throughout the growing season: 1) completely weedy orchard floor, 2) completely weed-free orchard floor (maintained with herbicides), 3) a weed-free area maintained only directly under the tree canopy (6.1m x 6.1m), and 4) weed-free only outside the 6.1m x 6.1m area under the canopy. Soil moisture and tree midday stem water potential were measured during irrigation cycles to evaluate development of water stress in the pecan trees. Initial data analyses for soil moisture data showed the weedy areas were significantly drier than weed-free areas in the orchard floor. For example, in June, at the end of an irrigation dry-down cycle, the volumetric soil moisture content was 16.3% for the weed-free treatment compared to 13.3% for the weedy treatment. However, this did not translate to differences in tree water stress as indicated by midday stem water potential. This study is unique in its focus on mature pecan trees and may lead to new recommendations on weed management practices in established pecan orchards in the Mesilla Valley.

## S06.024

## Ethephon as a Tool for Managing Nut Harvesting in the 'Beaumont' Macadamia Cultivar in South Africa

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The South African macadamia industry is based primarily on imported Hawaiian and Australian cultivars. Of these, the hybrid cultivar 'Beaumont' comprises about 60% of all plantings. 'Beaumont' is favoured for its excellent yields and precociousness but is not without its drawbacks, one being the failure of mature nuts to abscise. While the crop matures in mid-February, less than 10% of nuts abscise by the time flowering commences in August. This has severe repercussions, with crop quality and shelf life being progressively compromised as time between kernel maturity and processing increases. A further repercussion is that nuts have to be picked by hand, which is time consuming and expensive in terms of labour. It has been shown in Australia, Hawaii and Israel that macadamias respond well to ethephon applications, with significant nut abscission occurring in many cultivars. However, 'Beaumont' has never formed part of these trials. Given the scope of the harvesting problem in South Africa, it was necessary to test the response of this cultivar and to determine optimal rates for commercial applications. Initial trials at rates of up to 800ppm active ingredient achieved abscission of up to 65% of the crop within three weeks of application. Increasing the rate to 2000ppm active ingredient resulted in up to 85% abscission. It was also shown that addition of urea and/or potassium phosphate to the spray mixture increased the total abscission achieved and reduced the time between application and abscission. Considerable leaf abscission occurred in response to ethephon applications. It has been determined that only older leaves abscise and that the resulting reduction in canopy leaf area has no effect on yield in subsequent years. Additionally, application rates of up to 2000ppm active ingredient leave no detectable residues in the kernel.

## S06.025

## Machines for Shell Fruits Harvesting: Technical and Economic Aspects

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The evolution and the state of the art of the mechanical harvesting of shell fruits are described in the paper (hazelnuts, walnuts and also chestnuts). In Italy since the 1980s, mechanical harvesting has gradually replaced the manual harvesting for hazelnuts and walnuts which was previously executed by picking the nuts from the plant or by piling and gathering the fallen fruits. In this period, their innovations have been concerned not only with technical and economic performance (such as a reduction of operating time and costs) but also with the operator's safety and health and, in general, with the improvement of the quality of the working environment and the control of some ergonomic aspects (dust, noise, posture) (Monarca *et al.*

2001, 2005 and 2009). The same machines more recently have been modified also for chestnuts harvesting, not a typical shell fruit, to limit the damages of the fruits and the influence of mechanical harvesting on their quality (Monarca *et al.* 2003, and 2005). After a description of the main technical aspects of the machines (with particular reference to the self-propelled harvesters), the authors discuss the results of experimental tests carried out in the last years. The tests show remarkable harvesting performances for the different types of harvesters (pulled vacuum harvesters, with and without side-picker and trailer, self-propelled aspirating or picking harvesters with a trailer), which vary from about 0.2-0.4 ha/h for pulled machines to 0.35-0.5 ha/h for self-propelled ones. The introduction of even more efficient and reliable machines allows the integral mechanization of the harvesting yards. Reduced costs (from € 5,000 for the smaller towed vacuum harvesters to € 30,000 for the self-propelled) and the lack of seasonal workers has improved their spread even in smaller farms (2-3 ha).

## S06.026
## Potential Yield of Macadamia

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The macadamia is a nut indigenous to Australia. It is relatively underdeveloped in its research and development compared with other commercial tree crops. The economic success and sustainability of the macadamia industry depends on identifying and working towards the achievement of the crop's production potential. Theoretical upper limits of production are determined by the efficiency of conversion of photosynthetically active radiation into carbohydrates and the subsequent partitioning of this energy into the economic portion of the crop, the nut (Harvest Index). There is enormous scope to develop superior genetics of both rootstock and scion to optimise tree architecture and the many complex physiological and phenological processes underpinning yield. At present, the annual energy captured in macadamia kernel is less than a third of that in an orange crop. The improvement in potential macadamia productivity is considerable. We suggest that an achieveable yield target of 5 t kernel·ha$^{-1}$ should be set for macadamia, a big increase from the current industry average of 1 t ha$^{-1}$ and best practice yields of 2.5 ha$^{-}$1 in Australia. Ultimately, achieving potential macadamia yields depends on the continued, determined, long-term investment in their genetic development, combined with optimum environment and management, particularly canopy management. The greatest advances in productivity are likely when all these elements are optimised. New functional-structural modelling methodology is likely to speed up this process of optimisation.

## S06.027
## Effect of Garlic Extract and Mineral Oil Spray as Natural Breaking Dormancy Materials on Flowering, Yield and Fruit Quality of 'Canino' Apricot Trees under Warm Winter Area Conditions

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'Canino' apricot trees were sprayed once at dormant bud stage after the winter pruning (mid-January) with 4 %(v/v) garlic extract and 1 & 2% mineral oil alone or in a combination as a natural breaking dormancy treatments for areas which have a warm winter climate. Treatments were conducted on seven years-old trees grown in a sandy soil orchard located at Cairo-Alexandria Desert Road km 74, Egypt (30º 13' N, 30º 34' E) during two successive seasons. The influence of breaking dormancy treatments with garlic extract and mineral oil spray on full bloom time, harvest date, yield and fruit quality have been studied. All treatments advanced full bloom time as well as harvest date than the control about 7-10 days. Fruit weight, volume, diameter, firmness and percentage of seed/fruit weight as well as flesh/fruit weight affected by the treatments. Furthermore, total soluble solids (TSS) increased but the titratable acidity (TA) reduced by all treatments.

## S06.028
## Effects of Scion Genotype, Rootstock Age and Time of Grafting on Success of Soft Grafting Method in Walnut

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To increase the amount of walnut (*Juglans regia* L.) exportation, we have to produce high quality and uniform yield. Nowadays, grafting and budding of walnut seedlings with scion of superior high quality cultivars are best and shortest way to produce uniform walnut plant material. Walnut grafting and budding encounter difficulties resulted in low success rate. To overcome those problems, new techniques have been developed which one of those is soft grafting. In this research work, effects of rootstock age, genotype and date of grafting were studied on soft grafting success. Two selected genotypes i. e. "Ziaabady" and "Jahad" were grafted onto potted rootstocks of 7 or 12 months old in 11$^{th}$ of May, 11$^{th}$ of June, 11$^{th}$ of July and 11$^{th}$ of August as a factorial in Complete Randomized Block Design with three replications of 10 plants plot. The result showed that genotype and date of grafting had highly significant effect on grafting success in a way that genotype of "Jahad" and date of 11$^{th}$ of August got highest success. Age of rootstock had no effect on grafting success. In general, the highest success (100%) was obtained by grafting younger rootstock by genotype of "Jahad" 1 in 11$^{th}$ of July. According to these results, soft grafting could be one of the best methods for walnut propagation in Iran.

## S06.029
## Effect of Antioxidant, Explant and Sampling Season on the Growth and Establishment of Persian Walnut (*Juglans regia* L.) *in vitro*

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Type and sampling season of explants are the most important factors affecting micro-propagation of many woody plants. Phenolic compounds have also remained a major obstacle to achieving success in walnut micro-propagation systems. Antioxidant containing compounds are usually used to overcome phenolic barriers in the culture media. In this study, the effect of four explant types (apical meristem, single node, petiole and leaf), five sampling seasons (April, May, June, July and August) and six antioxidant compounds (ascorbic acid, citric acid, cysteine amino acid, asparagine, polyvenylpyrolidone and Phloroglucinol) on the growth and establishment of two Persian walnut genotypes (Z60 and Z63) in *in vitro* condition was studied. A separate experiment set for each genotype. Factorial experiments based on completely randomized design were conducted with three replications. DKW culture medium supplemented with 0.2 mg/L IBA was used as the basic medium. Culture media containing 100 mg/L polyvenylpyrolidone and Phloroglucinol showed the best explant establishment, inhibiting browning and increasing fresh callus weight and diameter in Z63 genotype six week after culture. The same significant result were achieved in culture media containing Z60 explant when 100 mg/L cysteine was used, but no significant differences were observed between the calli diameters. Apical meristem and single node cuttings collected on April and May showed the better explant growth and establishment in both genotypes. The other treatments showed no significant differences in these genotypes.

## S06.030
## Differential Response to Irrigation in Two Differents cv. of Japanese Plum Trees

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Physiological functions of irrigated fruit trees have been frequently described, but differences between cultivars have recieved little attention. As it is known, vegetative and reproductive growth of trees is controlled by assimilated production. Mainly depending on light intercepted by the canopy and leaf functions, both interacted with environmental conditions. Furthermore, it is highly cultivar depended as it observed in this study. Two Japanese Plum cultivars belonging to different length crop cycles were studied: 'Red Beaut' (short season) and 'Angeleno' (long season), both grafted on Mariana 2629 rootstock. Leaf stomatal conductance (gs), net $CO_2$ assimilation rate (An), canopy temperature (Tc), ground cover percent (%GC), trunk growth rate (TGR) and yield (Y) were measured in 4 years-old trees beneath well-watered and semi-arid conditions in the southwest of Spain. Measurements were taken during the first productive year of the orchard. At branch scale, gas exchange results showed higher values of A and gs in the long season cultivar ´Angeleno´, for the same applied water. Also canopy temperature confirmed the stomatal closure of individual leaves in ´Red beaut´, having higher temperatures than ´Angeleno´. The less assimilation rate in ´Red beaut´, had bigger tree growth parameters while the yield was lower. These results highlighted the different behaviour of two cultivars of Japanese plum trees in water use and suggest an approach towards cultivar-specific irrigation scheduling.

## S06.031

### Assessment for Wind Velocity Reduction of Wind Breaking Nets and its Impacts on Shoot Growth and Fruit Performance in Kiwifruit

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Conventionally used nets for kiwifruit vine protection from wind in Korea were compared with other alternative materials for its effect on wind speed reduction, vine growth and productivity. The effect of wind velocity reduction of wind breaking net material increased the higher as the size, thickness and porosity of net get smaller. The maximum wind velocity reduction effect of the minute net and sun shade net was kept 40%, 95% of the normal wind speed. The sun shade net reduced wind speed sharply but showed less uniform wind velocity distribution than other net materials behind the net. The sun shade net had good wind breaking potential but it prohibited kiwifruit vines from sunlight too much so the fruiting of kiwifruit vine has decreased to 50% of the control in the following year. Besides, the kiwifruit vines with higher level of shading degree had overgrown and provided the ideal conditions for the scales' reproduction. However, the minute net did affect the acceptable yield reduction and fewer occurrences of scales on kiwifruit vines. To be able to produce environmentally-friendly kiwifruit in Korea, current sun-shade net should be replaced with minute net, for example.

## S06.032

### Traditional Knowledge on Nuts, the Precious Heritage from Our Ancestors

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The nuts accompanied Man during his evolutionary history and, often are found in archaeological remains. Also in recent times, nuts and their linked traditions were brought to the New World along the paths of human migrations. In Australia, for example, the Asiatic families used to roast chestnuts on hot sand, while the families of European origin roast them in braziers. In some cases the nuts influence the language as well. In China, during a wedding party, people give jujubes and chestnuts to the bride, as good wish for her to become mother soon; this is expressed in the words 'ZaoLiZi', the joint name of jujube and chestnut. In Azerbaijan, the almond often occurs in sentences and proverbs or local sayings; a suitor, for example, may say to a woman: "Your lips are sweet like honey and your tongue is sweet like an almond". Nuts are often mentioned on many legends. The Celts believed that young shoots of Hazelnuts, adjusted over the window during a storm, would protect them from thunderbolt. For the ancient Greeks the husk represented the scalp, the shell the skull and the kernel the brain; therefore, they gave walnuts to pregnant woman to eat, in order to stimulate their future child's intelligence. To the pistachio, someone, said that eating 20 fruits per day should be enough to keep up sexual power…). Nuts are undoubtedly also very appreciated for their manifold uses in the kitchen and to prepare several recipes, some of which are well known since ancient times. Furthermore, nuts have always been the basis of many medicinal preparation. For example the raw extract from the walnut husk was used against worms on the stomach; the resin extracted from the lentiscus of Chios island show to be effective to control the Helicobacter pylori on the stomach.

## S06.033

### The Effect of Good Agricultural Practices (GAP) in Dried Fig Production on Aflatoxin Incidence and Fruit Quality

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Aflatoxins are toxic metabolites of fungi namely *Aspergillus flavus* and *A. parasiticus*. Dried fruit and nuts are known to be susceptible to aflatoxin formation. Aflatoxins pose a major threat in the world dried fig trade since late 1980s. Codex Alimentarius Committee on Contaminants issued a code of practice is issued in 2008 for prevention and reduction of aflatoxins in dried figs. The paper presents the first year result of the research designed to test the effect of GAP proposed by this code on aflatoxin incidence and dried fruit quality. GAPs were applied in ten orchards as 3 replicates each replicate composing of 5 trees. Major practices applied were fertilization based on soil analysis, caprification with clean male figs and further removal, minimum soil cultivation, frequent harvest, sun-drying on trays and transportation and storage of dried fruit in boxes. Farmers received training on each topic. Control plots were identified from neighboring orchards where the farmer himself decided on the management practices. Temperature and relative humidity data were recorded in each orchard by data loggers. Leaf samples were taken during the first week of August for primary and secondary nutrient analysis. Fruit were sampled at fresh, partially and fully dried fruit stages. Aflatoxin incidence is determined at three stages, in partially and fully dried fruit samples. Skin color, firmness, water content and activity, total soluble solids, total phenolic content and antioxidant capacity are analyzed in mature, partially dried and fully dried fig samples. Defects as sun scald, ostiole-end split, darkening of the neck color and bird damage were also determined. Results showed that aflatoxin incidence is almost similar in both management systems and high levels are related more to the orchard specific conditions. GAP lowered the ratio of defects. The research is on-going and similar activities will be carried out in 2010.

## S06.034

### The Effect of Testa on Reduction of *Aspergillus flavus* Growth and Aflatoxin B1 Production in Pistachio Kernels of Different Cultivars

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In order to evaluate the effect of testa on reduction of fungal growth and aflatoxin B1 producthon, ten cultivars of pistachio were collected from different parts of pistachio belt i-e Rafsanjan, Damghan and Ghazvin of Iran.A section of testa and one mm of endosperm were scraped. 20 gr of wounded kernels and 20 gr of unwounded kernels were surface sterilized and then placed petri dishes separately (completely randomized design in 3 replication). One ml of the spore suspension of aflatoxigenic *Aspergillus flavus* was added to each petri dishes.(spore suspension

was adjusted to contain 2×106 spore per ml ). The plates were placed over water in plastic boxes and these were then placed in incubator at 26 °C. 2.5, 5 and 8 days after inoculation, growth rate and colonization of *A. flavus* on wounded and unwounded pistachio kernels in different cultivars were measured. Also aflatoxin content of inoculated kernels was extracted by BF method and estimated by TLC and densitometer. Average of *A. flavus* growth percentage on surface of wounded and unwounded kernels was compared with t-student test. The results of this research indicated a significant difference in fungus growth rate and aflatoxin B1 production between wounded and unwounded kernels of pistachio cultivars. In other words, testa in unwounded kernels could be considered as a resistant barrier against the fungus penetration into kernels and reduce A. flavus growth and aflatoxin B1 production as compared with wounded kernels.

## S06.035
## Investigations on Pomegranate Fruit Cracking and Bagging Cultivation in Shandong, China

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Pomegranate (*Punica granatum* L.) is one of the most important deciduous fruit tree in Shandong, China. The cultivated area is 10,000 Ha. But fruit-cracking is a severe issue in pomegranate production. We used the statistical analysis method to carry out the preliminary studies on the relationship of fruit cracking and different cultivars, different tree ages, different cultivation measures in the main pomegranate cultivars in Yicheng, Zaozhuang, Shandong Province in 2009. The results showed that the difference of fruit cracking severity was significant in different pomegranate cultivars. The fruit cracking severity of Daqingpitian, Dahongpitian, Sanbaitian and Xiehuatian was serious, in which fruit cracking rate was 45.9%, 32.6%, 30.0%, 27.6% respectively and higher than other cultivars. The fruit cracking rate of Gangliu, Zhuyeqing, Houpitian and Qingpidazi were 2.3%, 1.9%, 1.7%, 1.5% respectively which were good fruit resistant-cracking cultivars. It indicated that pomegranate fruit cracking is related in the factor of inheritance. So it is a most important to screen new resistant-cracking cultivars for improving fruit quality in pomegranate industry. A remarkable difference exists in the fruit cracking rate in the different age pomegranate trees. The fruit cracking rate obviously increased along with the tree age. The fruit cracking rate of Daqingpitian in bagging cultivation was 4.1% compared to 46% in control. Bagging technique could remarkably reduce fruit cracking rate and is an effective cultivation measure to prevent pomegranate fruit-cracking.

## S06.036
## Effects of Wheat Starch Edible Films on Rancidity and Moisture Uptake of Pistachio Kernels as a New Package

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Wheat starch- based films were formulated by dispersing 4gr starch in distilled water, and plasticized with Gly and PEG in different levels (Gly = 2 and 3 ml/100ml and PEG = 0.0, 0.2, 0.3 and 0.4 ml/100ml). The emulsion films were evaluated for mechanical properties, water vapor transmission rate (WVTR). Pistachio kernels so packed in Wheat starch- based films as well as unpacked ones were placed in the experimental apparatus. Unpacked pistachio kernels were maintained as controls. Peroxide value (PV) and moisture uptake of control (unpacked) and packed pistachio kernels were evaluated for 56 days during storage in ambient temperature (25 °C). Increasing Gly content of films led to slight increase in Elongation (EL). Increasing the PEG ratio further resulted in an increase in EL for all films. No significant difference in WVTR was observed between films made from mixtures of various proportions of Gly with increasing PEG (addition) at all levels of plasticizer. Maximum moisture uptake was found (6.83± 0.08percent) in unpacked (control) pistachio kernels but packaging pistachios in wheat starch films led to minimize moisture uptake. Wheat starch bags reduced the rate of oxidation in pistachio kernels. Incorporation of Gly and PEG in wheat starch films had no significant effect on the PV of packed pistachios. These results suggest that a wheat starch based films is a viable alternative packaging process for pistachio kernels and improvement of shelf life.

## S06.037
## Fruit Nutraceutical Value in Ancient Apple Cultivars Grown in Piedmont (Northern Italy)

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The conservation and study of the regional fruit germplasm represent important cultural strategies to valorize the biological resources strictly linked to the natural environment. The aim of this research was to study the nutraceutical value of the fruit of ancient apple cultivars suitable to be reintroduced in culture to expand the typical produce supply and satisfy the ever growing consumer's quality requests. The following parameters were studied: total polyphenolic content, according to the spectrophotometric method proposed by Slinkard and Singleton (1977), antioxidant activity, according to the spectrophotometric method of Pellegrini *et al.* (2003), and the content in vitamin C, analyzed according to the high prestation liquid cromatografic methods coupled with a diode array detector of Sanchez *et al.* (2003) and Gil *et al.* (1999). Compared with the reference commercial apple cv. 'Golden Delicious', the ancient cultivars shown, in general, higher values of total polyphenolic compounds and a stronger anti-oxidant activity. Also the content in vitamin C (ascorbic acid plus dehydroascorbic acid) differed from Golden Delicious, even if these parameters may however vary depending on the environmental conditions and agrotechnique. The nutraceutical content of the fruit of the ancient cultivars can become an important tool to distinguish the value of these cultivars in order to obtain label certification. Moreover, high quality local productions represent a low carbon footprint resource, the best way to become environmentally friendly.

## S06.038
## Effect of Cold and Ambient Storage Conditions on Quality of Dried Fig Fruit and Fig Paste

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Turkey has a significant share in the world dried fig (*Ficus carica* cv. 'Sarılop') trade. Dried fig is generally exported as semi-processed intact (natural) fruit or specially shaped (e.g. Lerida, layer, garland) fruit and to a lesser extent as fig paste for industrial use. The main marketing season is between October and beginning of December. Marketing period is extended to the whole year during the last few years. Fig paste is produced and exported generally after the main marketing period. The study was carried out in 2006-2007 to assess quality changes during storage of sun-dried fig fruits and fig paste at controlled cold and uncontrolled ambient conditions. Dried fig fruit (natural, vacuum packed) and fig paste samples (in carton boxes lined with cellophane) were stored under cold (3±0.5 °C, 55-65% relative humidity) and ambient storage conditions for 12 months. Dried fig fruit samples were taken at 2 months intervals and fig paste monthly to monitor quality changes including sensory properties. Microbial load was assessed at 2 months intervals to determine spoilage due to microbial growth. Under ambient storage conditions, quality losses started after 8 months of storage in dried fig fruit and after 6 months in fig paste due to higher temperatures and lower relative humidity in the spring. Major impact appeared as increased sugaring and hardening of the flesh. On the other hand, cold storage conditions maintained the initial quality till the end of 12 month storage in both intact dried fig fruit and in fig paste. The results show that under hot regions or periods with higher temperatures the length of the storage period must be shortened under uncontrolled conditions.

## S06.039

### Investigation of Compositional Changes during Development of Two Co mmercial Pomegranate Cultivars of Iran

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Pomegranate is an important source of bioactive compounds and has been used extensively in the folk medicine of many centuries. Although, data about the importance of pomegranate in human nutrition has increased extensively in the last years, the chemical composition and antioxidant activity of the pomegranate fruit during fruit development have not yet been studied in detail. Thus, the aim of the present study was to evaluate changes in the major chemical and antioxidant properties in juices of two commercial pomegranate cultivars, 'Rabbab-e-Fars' and 'Shahvar' in three different stages from fruit set to ripening. These properties included pH, total soluble solids, titrable acidity, total sugars, total anthocyanins, ascorbic acid, total phenolics and antioxidant activity of the pomegranate fruit juice. This study showed that there are significant differences ($p < 0.05$) in among different stages as all measured parameters as concerned. Ripe fruits of the both cultivars which had a low titrable acidity showed a correspondingly high pH. More increase in contents of total soluble solids and total sugars in the juices were recorded during fruit ripening of the two cultivars. The results also showed that the ascorbic acid concentration decreased in both cultivars while the level of total anthocyanins increased with advance maturity. In both cultivars, the levels of total phenolics and antioxidant activity reduced during development. The 'Rabbab-e-Fars' had higher levels of total soluble solids, titrable acidity, total anthocyanins, total phenolics and antioxidant activity than the 'Shahvar'. This data could help to establish the optimum harvest date ensuring that the best quality of pomegranate for final consumer.

## S06.040

### Characterization of Biological Properties and Toxicity of *Quercus* Extracts

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The acorn, the fruit of several cultivars of the gender *Quercus*, is part of the tradition from the regions where these species are found. Acorns of *Quercus* are rich in polyphenols, which are compounds with proven antioxidant activity. Since there is reduced information about the properties of acorn extracts, the purpose of this work was to characterize the antioxidant activity, antimicrobial and antimutagenic properties and to prove the absence of genotoxic activities of several acorn extracts from *Q. suber* e *Q. ilex*. Firstly, aqueous and ethanolic extracts from roasted and fresh acorn cotyledons and shells were produced, and total antioxidant capacity and total phenolic compounds were evaluated. The results showed that antioxidant capacity of the extracts ranged between 0.630 ± 0.060 and 6.224 ± 0.217 g/L of ascorbic acid equivalent and the phenolic content varied from 0.487 ± 0.178 to 3.602 ± 0.266 g/L of gallic acid equivalent. *Q. suber* extracts were, in most cases, the richest in total phenolic compounds and showed the highest antioxidant capacity. Thermal treatment affects the total phenolic compounds and antioxidant capacity from cotyledon and shell in different ways. Shell extracts and aqueous extracts from roasted acorn cotyledons from *Q. suber* and *Q. ilex* acorns protect DNA from oxidation, revealing to be the most promising samples at the biological level. All acorn extracts, except aqueous extracts from roasted acorn cotyledons, possess antimicrobial activity against all Gram positive microorganisms tested and *Yarrowia lipolytica*. *Q. suber* roasted cotyledon, *Q. suber* dried roasted cotyledone and *Q. ilex* dried roasted cotyledone showed slight antimutagenic properties. The Ames assay suggested that no acorn extracts are genotoxic. Although preliminary, our characterization of acorn extracts showed that they may be used in the development of functional foods, since they could have beneficial properties for the consumer mainly attributed to their antioxidant capacity.

## S06.041

### Determination of Low-Temperature Development Threshold and Forecasting of Harvesting Time by Degree-Day in Pistachio

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In order to determination of low-temperature development threshold and forecasting of harvesting time by degree-hour on Ohadi cultivar this research was did in Iran's pistachio research institute. First cuttings of Ohadi cultivar were taken in January and for overcoming chilling requirement they kept in 4 °C for 900 hours. Then cuttings divided to five groups and each group was put in different incubators with 13, 16, 19, 22 and 25 °C respectively. Growth ratio was calculated by time of swollen to bud opening (50%), then low-temperature development threshold was determined by regression analyzing. For determining of fruit ripening time, sampling were did every two days from 5th August and ripening percentage (hull removing and percent of open shell) measured and determined best harvesting time when 50% of fruits ripped. Based on low-temperature development threshold, effective degree-hours were calculated from March. Model of harvest time forecasting was determined by study on temperature of 9 years (1992 to 1997 and 2006 t0 2008) in Rafsanjan and calculating of degree-hours based on low-temperature development threshold. Results showed low-temperature development threshold in pistachio is 5.2 °C. Study on temperature data were indicated in order to 50% fruit ripening, Ohadi cultivar need 4280 degree-hours from March. All calculating based on temperature and time of ripening resulted following model: Total degree-hours= 1.01(degree-hour of March) + 0.91(degree-hour of April) + 5.06 (degree-hour of May) +1.49 (mean temperature of March) – 0.772 (mean temperature of April)

## S06.042

### Chilling Requirements of Apricot Cultivars. Comparison among Different Mediterranean Climatic Conditions (Italy, South Africa and Spain)

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Chilling requirements (CR) for dormancy breaking were studied during, at least, two consecutive years, in five different climatic conditions of Mediterranean climate distributed in Europe and South Africa. The locations were Tuscany in Italy; Cieza in south-eastern part of Spain; and Ceres, Villiersdorp and Ladismith in the Western Cape of South Africa. A group of apricot cultivars which covered the range of the CR of the apricot species grown in each country was evaluated. The winter climatic conditions determined a dissimilar chill unit accumulation as well as an important effect of the year in the three areas. Minor differences were found regarding the CR of the same cultivars studied in Tuscany (Italy) and Murcia (Spain). Besides, the year-by-year variation for 'Currot' and 'Goldrich' in Tuscany was higher than the variation between locations. However, marked differences of CR for the same cultivar were observed when a moderately cold area and a very warm area were compared. This is the case of 'Canino' which cultivated in Ladismith (South Africa) registered only 304 CU compared to the 1048 CU obtained in Cieza (Spain). The range of CR of the commercial apricot cultivars was significantly different among locations. Our results indicate that the chilling requirements could be highly dependant of the locations, especially under marginal winter conditions.

## S06.043

### Effects of Different Irrigation Treatments on Gas Exchange Processes, Productivity and Alternate Bearing in Pistachio (*Pistacia vera* L.).

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It is well known that irrigation is one of the most important factor in order to increase orchard productivity. However, due to the scarcity of water in Sicily, the use of this resource must be carefully considered in relation to its efficiency, economic convenience and possible cultural alternatives. With the aim of improving and optimising irrigation system management in Pistachio orchards, in this work the effects of different watering regimes on eco-physiological parameters, productivity and alternate bearing of Pistachio trees in Sicily were evaluated. Trials were carried out in 2009 in a commercial orchard on 20 year-old Pistachio trees of cv. 'Bianca' grafted onto P. terebinthus, planted at 5m X 6 m, selected for their uniformity. Water was applied by drip irrigation to produce two different watering treatments: 500 $m^3$/ha and 1000 $m^3$/ha in comparison with a rainfed control treatment. The following measurements of eco-physiological characteristics of the trees were carried out during the entire growing season: stem water potential (swp), from dawn to dusk, Maximum net Assimilation rate (Amax), leaf transpiration (E) and stomatal conductance (gs). Four branches per tree were tagged for non-destructive biometrical weekly measurements (shoot length and diameter; no. of leaves; no. of infructescences; no. of fruits per infructescence; number of flower buds). At the same time, on branchlets sampled for destructive analysis, leaf area, fresh and dry weight of vegetative and reproductive organs were determined. The seasonal evolution of flower bud abscission was also observed. At harvest, the fruits were de-hulled and the nuts, as usual in Sicily, were sun-dried for a 5 day period. Soon after the drying process, samples of nuts were analyzed for fruit splitting, blank percentage and chlorophyll content. The observed differences in the productive and eco-physiological parameters are reported and commented as related to the different water regime.

## S06.044

### Incoming Energy Management and Photoinactivation as a Function of Light Interception in Peach Leaves

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Orchard yields are a function of the light intercepted, although this linear relation is less tight when greater than 50% of available light is intercepted. Above this level, light becomes excessive for photosynthesis requirements and can expose leaves to photoinhibition. The "asymmetric" peach orchard was designed and planted to obtain in the field six different light intensities at any time of the day and three daily light interception profiles: low (C), middle (E) and high (W). This paper reports on how incoming light energy is managed in attached leaves subjected to several radiative regimes along the day. Combined measurements of gas exchange and chlorophyll fluorescence (quenching analysis) were performed during the day to quantify the absorbed energy used for net photosynthesis and that dissipated by the photoprotective mechanisms. In addition, the amount of inactive PSII after one day of irradiation was calculated via chlorophyll fluorescence determination. Net photosynthesis was linearly related to irradiance up to a saturating point of 1000-1200 µmol photon·$m^{-2}$·$s^{-1}$. Non-photochemical quenching (NPQ) played the most important role in photoprotection, but its activity was reduced at low irradiance, possibly due to a sub-optimal trans-thylakoid ΔpH. The non-net carboxylative mechanisms (NC) were the main photoprotective mechanisms at middle-low irradiance levels and probably facilitated the establishment of the trans-thylakoid ΔpH needed for full activation of NPQ. At the end of the photosynthetic period the amount of inactive PSII was the highest in W followed by E and C samples. In addition, daily carbon accumulation did not reflect the light interception ranking, with E having the highest, and W the lowest. These findings support the conclusion that under irradiances exceeding the photosynthetic requirements, photoprotection and photoinactivation biochemistries divert energy in the form of carbohydrates and reducing power from tree growth and productivity. The amounts of these losses can be significant.

## S06.045

### Phenological Modeling of Peach and Sweet Cherry: Start Dates and Threshold Temperatures for Each Phenophase

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Modeling fruit tree phenological behavior allows an appropriate selection of cultivars for a particular area, and a better scheduling of cultural techniques. In peach and sweet cherry, yield and fruit quality traits of most cultivars are usually well described, but information concerning tree phenology and heat requirements is generally scarce. For this reason, introducing new cultivars into regions with different climatic conditions than those of the area where they were originated may lead to problems due to lack of adaptation. However, since series of phenological data ranging over a time-span suitable for climatological analyses are scarce, empirical models are needed to simulate phenophase dates. Furthermore, these models could be used to model crop behavior under different climate change scenarios. As bud development depends mainly on temperature, degree-days or hours (GDD or GDH) are widely used as basis for building phenology models. These methods take into account start dates that mark when GDD or GDH begin to accumulate, and threshold values below which temperature contribution is not effective. The objective of this study is to determine the best-performing start dates and temperature thresholds for each peach and sweet cherry phenophase, in order to model accurately bud development under the climatic conditions of different growing areas. Three years of phenological data were collected in adult commercial orchards at the main peach and sweet cherry growing areas in Ebro and Guadiana Valleys (Spain). For each phenophase, heat requirement was calculated as the number of GDHs accumulated between each starting date evaluated and the date of occurrence for the phenophase. The evaluated start dates ranged from Jan 1 to Feb, 15$^{th}$, at weekly intervals, whereas temperature thresholds did from 0 to 10ºC, at 0.5ºC intervals. The start dates and thresholds giving the least coefficient of variation (CV) among orchards for each phenophase were selected.

## S06.046

### Field Evaluation of Saudi Arabian Date Palm Varieties ('Ajwa' and 'Safavi') at Khairpur, Pakistan

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The most of the varieties of Khairpur are sensitive to monsoon rains which synchronize with the ripening season. Urgent and rapid demand is being required for the high quality varieties resistant to monsoon rains. Offshoots of two well known date palm varieties Ajwa and Safavi from Madinah, Kingdom of Saudi Arabia were brought and cultivated in 2006 to study the adaptability of these varieties at the climatic conditions of Khairpur, Sindh, Pakistan. It is worth to mention that there is no evidence for these two cultivars in Pakistan and particularly Ajwa is restricted to climatic conditions of Madinah, Saudi. The long, hot and dry summers with low relative humidity and very low annual rainfall make Madinah and Khairpur an ideal location for date Palm cultivation. The Sites were selected after comprehensive study of official records to find common climatic conditions in Khairpur and Madinah. The reading included minimum and maximum temperatures and

relative humidity. An appropriate performa was designed to drop the scientific and commonly used properties such as: Fruit length, fruit diameter, Flesh weight, stone weight, pH and Total Soluble Solids (TSS). New crop obtained in 2009. Previous data were recorded for 3 sequential seasons. The general features of date palm culture in Madinah, Saudi are not much different from those in Khairpur, especially when climate, cultivation and utilization is concerned. The data indicated that Khairpur is a suitable place for the introduction of similar Saudi date palm varieties. It was concluded from the study that the climatic conditions of Khairpur are very much suitable for planting of alien varieties of dates like Ajwa and Safavi.

## S06.047

### Investigation of Frost Damage Resistance of Three Iranian Commercial Pistachios by Rates of Electrolyte Leakage, Proline, Soluble Sugar and Nutrition Element Content

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In a field experiment on 30 years old Pistachio cultivars including Kelle-ghouchi, Ahmadaghaie and Ouhadi grafted on Badami-zarand (*Pistachio vera* cv. 'Badami-zarand') rootstock, the samples were prepared at three different growth stage involving bud break, flowering and fruit set and kept at five different temperatures (4 °C, 0 °C, -2 °C, -4 °C, - 6 °C) for 3 hrs. after transferring to lab. After that, 3 gr sub-samples were weighed and added to 30 ml double distilled water and put on shaker for 24 hrs and after that, the electrical conductivity of samples were measured and again every 24 hrs. for one week. Based on the results, Ahmadaghaie and Ouhadi were the most and least cold resistant respectively. Flowering stage was also recorded as most susceptible stage while bud break stage found to be the most resistant in this regard. Increase in electrical conductivity had a linear relation with decrease in applied temperatures during first two days but afterward, a slight increase was observed but the differences were not significant statistically. However, we don't find any correlation in resistance to frost damage and proline, total soluble carbohydrates and pH leakage. Results also revealed that between the nutrient elements, $K^+$ had most leakage in compare to other elements.

## S06.048

### False Codling Moth, *Thaumatotibia leucotreta*, (Meyrick) (*Lepidoptera*: *Tortricidae*) Management on Pomegranates, *Punica granatum* (*Lythraceae*), with Two Formulations of *Cryptophlebia leucotreta* Granulovirus (CrleGV)

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*Cryptophlebia leucotreta* granulovirus (CrleGV) has been formulated and successfully applied for false codling moth (*Thaumatotibia leucotreta*) control on citrus and avocadoes. During a recent pest and disease survey false codling moth (FCM) was found to attack pomegranate (*Punica granatum*) fruits in the field, causing serious pre-harvest losses of up to 100% if left uncontrolled. As no chemical insecticides are registered for local use under the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) on pomegranates, three randomized block field trials in geographically distinct areas of the Western Cape Province of South Africa were initiated against this pest. Two formulations of CrleGV under the registered trade names of Cryptogran and Cryptex were applied five times on a monthly interval during the growing season. Additional to CrleGV application, Isomate mating disruption pheromone dispensers were hung on the treated trees. The control treatment received no CrleGV applications, but Isomate mating disruption was hung. Before each application twenty fruit per plot where visually inspected for external presence of FCM eggs, larval penetration and exit holes or larval frass protruding from fruit. After the final application fifty fruit per plot were destructively inspected for FCM infestation and damage.

## S06.049

### Determination of Some Traits and Assessment of Pathogenicity in *Gnomonia leptostyla* Isolates, Casual Agent of Walnut Anthracnose in Iran

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Anthracnose caused by *Gnomonia leptostyla* (Fr.) Ces & de Not. is the most serious foliar disease of walnut. In this disease, premature leaf drop is one of the major causes of poor kernel fill. During summer and fall 2005-2007, samples of walnut tissues with symptoms of black spot collected from East and West Azarbaijan, Ardebil, Zanjan, Qazvin, Mazandaran, Hamedan and Tehran provinces. Forty five isolates of *Gnomonia leptostyla* (anamorph: *Marssonina juglandis* (were isolated using Oat Meal Agar and Corn Meal Agar media. Acervular conidiomata were produced by all isolates at 21ºC, under photoperiod 16:0 (h light: h darkness) after 18-21 days. All isolates were heterotallic. Fertile perithecia with asci and ascospores were produced *in vitro* after 75-90 days at 4 ºC in darkness. In pathogenicity experiments, a conidial suspension (105 spore/ml) was atomized onto mature, fully expanded leaflets. After 16 days, macroscopic brown spots were observed under leaves. 24 days after inoculation, acervuli were produced on surface of spots. There were significant differences among the isolates for pathogenicity. The results indicated that there was a significant positive correlation between the number of spots and the leaflet specific fresh weight (LSFW), so the upper leaflets on the leaves, and especially the terminal ones, with the highest LSFW were the most susceptible ones to the disease.

## S06.200

### Effects of IBA and GA3 Hormone Treatments on Increasing the Efficiency of Patch Budding in Some Persian Walnut Cultivars

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Persian walnut is one of the most important nut crops in Iran. Now the majority of orchards are seedling with a great diversity. For establishing uniform orchards and increase the quantity and quality of yield, patch budding as the most suitable propagation methods, have still technical and practical problems in the country. In spite of high percent of primary success in patch budding but the final success is very low. In this study, the effects of Indole-3- butryic acid (IBA) and gibberellic acid (GA3) were evaluated on five walnut cultivars to increase bud growth and graft success. The results showed that there were significant differences among the different levels of both the hormone treatments and the walnut cultivars. Mean comparisons showed that GA3 100 ppm with %55.89 in comparison with control with %25.87 had the highest effect on bud growth. Meanwhile the other hormone treatments increased the bud growth at least %22 comparing with control. Among the cultivars, the highest and lowest bud growth was belong to Chandler (%50.96) and Z63 (26.4). The interaction between hormone treatments and cultivars on bud growth showed that Chandler had the highest response to GA3 100ppm and IBA 50 ppm, pedro to IBA50, while for Z63 IBA 100 had the best effect. This study showed that suitable hormone treatment could overcome a part of problems relating to low level of graft success in walnut.

## S06.201

### Rosita – a New Early Sweet Cherry Cultivar

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The breeding programme of the Fruit-Growing Institute in Bulgaria started in 1987. Taking into account the short season of sweet cherry ripening, one of the ma-

jor aims of that programme was extending the calendar period of fruit ripening by developing early sweet cherry cultivars bearing large-sized fruit. The first successful breeding achievements of the programme for sweet cherry cultivar improvement are already available. In 2009 the new Rosita cultivar, which is the second early ripening cultivar resulting from the breeding programme, was officially acknowledged in Bulgaria in 2009. Rosita was selected from a hybrid population obtained by open pollination of Bigarreau Burlat cultivar established *in vitro*. Fruit of Rosita ripen very early – a week before those of Bigarreau Burlat. Keeping in mind the early period of ripening, they are very large, the size being 21.7 x 24.6 x 21.2 mm, and the mean weight – 7.5 g. Fruit is kidney-shaped, fruit skin is basically pale yellow in color with light red tint covering up to 50 % of the surface. Fruit flesh is pale yellow, very juicy, with a pleasant sour-sweet taste. The stone is small representing 5.02 % of the fruit weight. The tree is moderate in growth with a medium thick crown spherical in shape and highly productive. It has a good compatibility with the rootstocks Gizela-5, *Prunus avium* and *Prunus mahaleb*. Flowering is early. The cultivars Rivan, Nalina and Bigarreau Burlat are good pollinators.

## S06.202
## 'Laskava' – a New Peach Cultivar Resistant to Powdery Mildew Disease (*Sphaerotheca pannosa* (Wallr.:Fr.) Lév.)

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The new peach breeding programme in Bulgaria started at the Fruit-Growing Institute in Plovdiv in 1989. One of the major aims set in the programme was the establishment of cultivars resistant to powdery mildew disease (*Sphaerotheca pannosa* (Wallr.:Fr.) Lév.) in peach and bearing fruits of a very good sensory profile. The new cultivar 'Laskava' as another product resulting from the breeding programme was formally acknowledged in Bulgaria in February 2009. 'Laskava' was established by interspecific hybridization with the participation of the species *Prunus persica* (L.) Batsch and *Prunus ferganensis* (Kost. & Rjab.) Kov. & Kost., from the concrete parent combination of J.H.Hale x (Elberta x Fergan skiy zholtiy). Fruits of 'Laskava' ripen at the beginning of August, a week after those of Redhaven. They are very large, 73,58 x 75,81 x 77,17 mm in size, their mean weight being 230 g. The shape is almost spherical with a well outlined tip. The suture is well defined, the pedicel cavity is narrow and deep. Fruit skin is moderately fuzzy and 70-80% of the surface is covered with brightly carmine blush. Fruit flesh is intensive yellow in colour with a slight redness close to the stone. It has a gentle texture; it is very juicy with a balanced sweet-sour taste and a good aroma. The mean weight of the stone is 8,92 g representing 3,88 percent share of the total fruit. It detaches easily from the fruit flesh. The tree is of a moderate to vigorous growth. The flowers are bell-shaped and the leaf glands are kidney-shaped. 'Laskava' cultivar shows obvious resistance under field conditions to the causative agent of the major disease in peaches (*Sphaerotheca pannosa* (Wallr.:Fr.) Lév.).

## S06.203
## Progress on Peach Breeding in China

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Peaches, as one of the oldest species for economic cultivation, have a long history of over 3,000 years in China. It originated from the areas of Yellow River basin and the Loess Plateau in northwestern China. Eastern Tibet, western Sichuan province and northwestern Yunnan province are the centers of its origin. Peaches can be cultivated in the north areas with latitude from 23° to 45°. After 1950s, investigation on germplasms of peaches as well as breeding task with specific targets and plans were carried out in scientific research institutions all over China. Since 1980s, three national germplasm gardens for peach collection have been established one after another, in which more than 1,500 germplasms of peaches and its wild relatives are preserved. What's more, many local varieties in main-cultivated areas of peaches are also collected and preserved. In recent years, peach breeding in China is mainly focused on selection of table varieties and processing ones. Different breeding methods were adopted by scientific research institutions all over China. As a result, lots of new varieties adapted to the local conditions were selected. They are either yellow flesh or white ones, with different maturing periods. Those varieties have been applied in large-scale production, which gains distinct social and economic benefits. Research on canning peaches, nectarines, flat peaches, ornamental peaches and *Prunus persica* Var. densa Makino in China started late, so it has enormous potential. Based on different breeding goals, different climates and consuming habits, various cultivars with different maturing periods may be selected, which can not only enrich cultivar resources of peaches in China, but also meet the demands of people.

## S06.204
## Phenotypic Diversity of Commercial and Native Spanish Peach Cultivars

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Phenotypic evaluation based on agronomical, pomological and fruit quality traits was carried out for two consecutive years on 95 peach and nectarine [*Prunus persica* (L.) Batsch] cultivars. Among them, 43 native Spanish cultivars and 52 foreign commercial cultivars mostly from USA were included. Cultivars were obtained from the peach germplasm collection of the 'Experimental Station of Aula Dei' (CSIC) located in the Ebro Valley (northern Spain, Zaragoza), and grown under a Mediterranean climate. Agronomical and biochemical parameters [vigour, tree yield (kg/tree), fruit weight (g), flesh firmness (N), soluble solids content (SSC, ºBrix), titratable acidity (TA) and ripening index (RI, SSC/TA)] as well as pomological traits (flower and fruit type, date of bloom and maturation, flesh and skin colour, endocarp staining, stone adherence, etc) were evaluated. In addition, fruit flesh composition is being evaluated for sugar profile and antioxidant properties. Significant variability has been observed for most qualitative and quantitative traits. Harvest date ranged from June to October. Fruit weight and flesh firmness varied among cultivars from 70 to 277 g and 12.5 to 62.9 N, respectively. Regarding SSC, TA and RI the values oscillated from 11.3 to 20.6 ºBrix, 0.26 to 0.92 g malic acid/100g$^{-1}$FW and 16.5 to 65.9, respectively. Correlations between the physical-biochemical parameters and pomological traits were found. Regarding fruit quality, significant coefficients were found between flesh firmness and both SSC and TA, between fruit weight and RI, as well as between SSC and harvest date. Germplasm variability could be used as a source of fruit quality traits available for breeding goals and for the creation of new varieties.

## S06.205
## Genetic Diversity of Greek Wild and Cultivated Pomegranate (*Punica granatum* L.) Genotypes and Cultivars Using Molecular Markers

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Pomegranate (*Punica granatum* L.) is widely cultivated throughout Iran, India, South Africa, Europe, China and America. In Greece pomegranate is cultivated in many different parts of the country. Lately, pomegranate became known to the international market for its antioxidant qualities and nutrition, which is considered beneficial to human health. Due to the increased demand for pomegranates and the increased pomegranate cultivation, it is important to study and preserve the Greek native genotypes. In this study, different pomegranate genotypes and cultivars were discriminated and identified using the Random Amplified Polymorphic DNA (RAPD) and the Inter Simple Sequence Repeats (ISSR) molecular markers. Twenty one pomegranate genotypes were sampled from a collection at the Institute of Pomology of Naoussa, seventeen samples of five different genotypes were collected from the agricultural area of Pella and two cultivars of pomegranate were collected from the Pomology Station of Poros. Genomic DNA was extracted from young leaves using the CTAB method. Thirty five decamer RAPD primers and

fifteen ISSR primers were tested from which ten RAPD primers and ten ISSR primers, which gave us the polymorphic bands, were used. Amplified products of PCR were separated by electrophoresis in 3% (w/v) and 5% (w/v) agarose gel equivalent. NTSYS software, version 2.02, was used to estimate genetic similarities using Jaccard's algorithm while the dendrogram was constructed by UPGMA and Neighbor Joining methods. High genetic similarity between the samples collected from the agricultural area of Pella and the samples collected from the Institute of Pomology of Naoussa (>0,70), concludes that they might be clones of cultivars. The Greek cultivar "Ermioni" showed high genetic similarity (95%) with cultivar "Wonderful" (95%). RAPD and ISSR molecular markers were useful for studying the genetic relationships between pomegranate genotypes and cultivars, with the ISSR markers genarating more polymorphic bands.

## S06.206

## Pomegranate Molecular Characterization through AFLP and Newly Identified SSR Markers

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Among minor fruit tree species, pomegranate (*Punica granatum* L.) is undergoing through a re-exploitation of its potential and is more considered under an agronomic, commercial and scientific point of view. The origin of the species is supposed to be in central Asia but nowadays it is diffused in several areas with different environmental and climatic conditions (Middle East, Asia, Mediterranean countries, USA, South and Central America). In Italy pomegranate has been spread and used since centuries; for this reason several local varieties have been originated and sometime selected. Anyway little information is available about genetic diversity degree of autochthonous germplasm and relationships among different gene pools. Molecular markers are considered useful tools to analyze the intraspecific variability level of autochthonous germplasm, to ascertain the origin of the most diffused varieties and to investigate its relationships with foreign gene pools. With this general aim, 33 genotypes coming from Italy, Spain and Turkey and cultivated in the collection fields of Catania University in Sicily (Italy) and Cukurova University in Adana (Turkey) were analyzed through AFLP technique using 7 EcoRI/MseI primer combinations. The analysis resulted in 121 polymorphic markers which unequivocally discriminated all the tested genotypes. The subsequent UPGMA analysis revealed a high level of genetic diversity among the genotypes; those found in Sicily showed a high heterogeneity since some of them clustered with the Spanish ones, while others (such as the most diffused Italian variety 'Dente di cavallo' and a promising selection named 'Primosole') appeared to be nearest to the Turkish germplasm. Moreover, in order to clarify some of the relationships among the analyzed genotypes, a new set of codominant SSR markers were identified through Microsatellite–AFLP (M-AFLP) technique. Twenty-eight SSR-containing sequences were identified, and 8 SSRs revealed polymorphisms among the tested genotypes.

## S06.207

## Morphological and Technological Characterization of Carob Varieties in Sicily

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Carob (*Ceratonia siliqua* L.), is a legume tree species diffused in marginal dry areas of Mediterranean basin; carob tree has been long considered a neglected and underutilized species, but the crop is gaining popularity, since the flour extracted from the seeds (Locust Bean Gum, LBG) is used in food industry as thickening agent classified in the European Codex (E410). Nowadays several varieties are cultivated in various Mediterranean countries showing high variability of morphological and technological properties of their fruits. Pods and seeds characterization appears to be important for the improvement of the business generated by carob products. For this reason 5 female varieties (Ibla, Latinissima, Pasta, Racemosa, Ruta) and 3 hermaphrodite varieties (Ramillete, Sangimignana, Tantillo) of different origin have been characterized. Fruits collected from mature plants have been used for morphological characterization and pulp/seed ratio and seed number and weight by fruit were determined; seeds have been extracted and evaluated in terms of yield, rheological properties, and sugar composition of the endosperm also in comparison with seeds coming from abroad. The viscosity of 1% LBG aqueous solutions was measured at different shear rates at pH 4.5 and 25 °C. Results gave remarkable indications for some varieties concerning seed number, weight and yield. LBG analysis of the samples showed statistically differences between the varieties: the seeds of the Italian varieties Ibla and Racemosa and those coming from Morocco showed the best yield, the latter standing out also for its high technological potential. The results confirm the high level of intraspecific variability in terms of seed yield, of sugar composition of the endosperm and of thickening properties, too.

## S06.208

## Synthetical Evaluation of the Fruit Quality of Dongzao (*Zizyphus jujuba* Mill.) Advanced Selections Using Analytic Hierarchy Process and Grey Relational Grade Analysis

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Dongzao is a fresh-eat variety of Chinese jujube (*Zizyphus jujuba* Mill.), there are some genetic variation among the resources. From 2006 to 2007, we collected the advanced selections of Dongzao resource and established an evaluation orchard. The objective of this study is to establish an applicable synthetical evaluation method to evaluate Dongzao advanced selections. 20 Dongzao advanced selections and one control were measured for synthetical evaluation, including 20 characteristics of three quality aspects such as fruit nutrition, texture and appearance. Based on these traits, a synthetical evaluation hiberarchy model of Dongzao fruit quality was designed, containing aim layer, rule layer and index layer. Then one matrix of the rule layer and three matrixes of the index layer were established by using Yaahp 0.5.0 software which could integrate the opinions of many jujube experts and the calculation method of the analytic hierarchy process (AHP). The weight values of different indexes for synthetically evaluating the fruit quality of Dongzao were obtained as the output results of the software. The maximal value of ten indexes (soluble sugar, SSC, Vc, TA, edible ratio, water content, flesh chroma, pericarp break force, pericarp brittleness and single fruit weight) and the minimal value of ten indexes (pericarp break distance, pericarp toughness, maximal flesh firmness, mean flesh firmness, fruit shape index, pericarp chroma, coefficient variation of fruit weigh, fruit shape index, pericarp chroma and flesh chroma) from the data matrix of Dongzao fruit quality were defined as the "reference variety" of grey relational grade analysis system (GRGA). The synthetical evaluation value of the Dongzao advanced selections were calculated with the following formula. The results showed that No.16 was the best advanced selection, No.22, 15, 17 and 18 should be regarded as candidates in the further selection, and the others should be eliminated from the group.

## S06.209

## Characterization of Pomegranate Germplasm in North India

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A study was conducted on characterization of pomegranate germplasms for two consecutive years. Twenty four genotypes characterized based on 31 characters on 8-10 year old fruiting trees maintained at the Indian Agricultural Research Institute, New Delhi, India. The numerical taxonomic approach of unweighted pair

group method using arithmetic average (UPGMA) in one of SAHN (sequential, agglomerative, hierachical and non-overlapping) techniques of clustering methods, has resulted in five clusters amongst the 24 genotypes. Cluster No. V had the maximum six genotypes, while three clusters possessed five genotypes, each and one had three. The perusal of the clusters showed to broad categories, i.e. evergreen and deciduous types. Clusters I, II, and III (total 13) were in evergreen types, while those in clusters IV and V (total 11) were the Russian and Afghani temperate types. The first group had Alandi, Ganesh & G-137, which show considerable similarity (0.80). The second cluster was of Muscat types, where P-23, P-26 Khog and Kandhari were found to be close to each other (0.50). The third cluster showed the closeness of Dholka and Jyoti (0.50). Fourth cluster was of typical of Russian introductions (0.40), while the fifth had the genotypes originated in Afghanistan and adjoining regions (0.25). The first three clusters were found to be different and might have evolved for several years to behave as evergreen, thus can be designated as a new adapted sub-tropical race.

## S06.210
## Development of Walnut Breeding in Pomology Institute of Shanxi Academy of Agricultural Sciences

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China is one of the world walnut original centers, and is the biggest walnut production country all over the world. Walnut production and export of Shanxi province occupies a leading position in China. Walnut breeding work in Shanxi Pomology Institute (SPI) started in 1985. About 40 walnut cultivars were introduced from home and abroad during the past 24 years, among which 18 were foreign cultivars. The walnut research group in SPI uses conventional breeding method for walnut breeding, a superior series of walnut named 'Jinboxiang' and a new cultivar 'Jinbofeng No. 1'have been selected which have good comprehensive characters, such as early bearing, thin shell, good quality, high shelling percentage, high yield and strong resistance. These new cultivars have been spread in the province as well as the whole country. The group also does study on walnut hybridization, observation and record of fine strains in walnut seedling nursery, research on walnut tissue culture and industrial seedling-rising, as well as walnut cultivation techniques. A complete set of walnut cultural techniques suitable in Shanxi province and in other areas with similar climatic conditions is created.

## S06.211
## Sino-Romanian Collaboration for Walnut Breeding

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According to Scientific Research Programs started in 1995 and continued in 2009, approved by the Commission for Scientific and Technological Collaboration between Romania and the People`s Republic of China, some important collaboration themes were established. Identification, breeding and propagation of walnut for the tolerance at biotic and non-biotic stress factors, germplasm exchanges of walnut, testing the biological material in different ecological condition of the two countries, study of the quality parameters of nuts and establish post-harvest technologies were the main topics of the Sino-Romanian collaboration. Within the agreement, seven Romanian walnut varieties (scions) were sent in China and were grafted for studying the various types of growth habits and cultivation techniques. Five fruit varieties, Sibisel precoce, Sibisel 44, Orastie, Geoagiu 65 and Germisara were planted in three different locations in Shanxi Province: Fenyang, Yangqu and Xinzhou. The other two varieties were studied for wood production. The results show that Orastie had the best rate of grafting survival. The grafting compatibility was good in general excepting Geoagiu 65, which had too big scions diameter. All Romanian varieties begin to leaf and blossom later than the Chinese Jin-Long 2, control variety. Those varieties are extremely advantageous for China for breading new late-flowering varieties resistant to late spring frosts. Geoagiu 65 proved to have a significant higher vigor, being recommended for intercropping or for slope plantation. All the Romanian varieties proved to have a higher yield in the first ten years than the Jin-Long 2 and meet the requirements of the walnut nut quality standard GB/T 20398-2006. Even so, there were some postharvest problems regarding the fruit aspect, in some years, fruit kernels becoming blackish. The common experience will continue by testing new walnut varieties.

## S06.212
## Evaluation on Cold Resistance of the Selections of Hybrid Hazelnuts (*C. heterophylla* x *C. avellana*)

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This paper is purposed to evaluate the cold resistance of selections of hybrid hazelnuts (*C .heterophylla* x *C. avellana*). One-year-old shoots of 18 advanced selections were taken before sprout at early spring and the shoots were cut into slips of 20-25 cm with 4-6 buds. The slips were treated at different temperature of 0 °C, -6 °C, -10 °C, -14 °C, -18 °C and -22 °C. The temperature was reduced sequentially, start from 0 °C, reduced 2 °C per hour and kept for 2 hours when reduced to the designed treatment temperature, and then sequentially up at 2 °C per hour to 0 °C. The treated slips were kept for 8 hours at 0 °C and moved to the incubator of 23 °C for sprouting. Eight biology and physiology factors of -22 °C treated shoot were measured, and soluble sugar, soluble protein, electric conductivity, LT50, and ABA were chosen as the 5 indicators for the cold resistance assessment by correlation analysis. The 5 indicators were converted into an integrated index by principle component analysis, and their weight was determined to establish the assessment system. The integrated index value of cold resistance of each advanced selection, based on its weight and function value, was obtained. According to the integrated index value, the cold resistance order of 18 advanced selections was 84-349>81-23>85-127>B-3>84-69>84-545>81-9>83-33>84-1>84-72>84-254>84-48>84-402>84-237>82-11>84-226>B-21>84-572. The advanced selection of hybrid hazelnut could be divided into 4 groups by cluster analysis. 84-349, 81-23 and 85-127 had the most strong cold resistance; B-3, 84-69, 84-545, 81-9, 83-33 and 84-1 had better cold resistance; 84-72, 84-254, 84-48, 84-402, 84-237, 82-11, 84-226 and B-21 had weaker cold resistance and 84-572 had the most bad cold resistance.

## S06.213
## Studies on Hazelnut Hybridization Breeding of *C. heterophylla* x *C. avellana* in China

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As a wild native resource *Corylus heterophylla* Fisch covers a very large area in northern China where the lowest temperature is -35 °C in winter. In order to obtain hazelnut cultivars adapt to grow in the frigid zone, the crossing breeding of interspecies of *C.heterophylla* Fisch. × *C.avellana* L. was initiated in the 1980s in China. The first group of cultivars or advanced selections was released after nearly 20 years of research work (1980-1999). In the procedure of breeding, 60 advanced lines were obtained and trials were conducted in different climatic zones in the northern part of China. of these advanced lines, the hardiest cultivars and advanced selections (resistant to the low temperature of -35 °C at the dormancy stage) are Dawei, Pingou226, Pingou1110. The hardier advanced lines (resistant to the low temperature of -30 °C at the dormancy stage) are Pingou33, Pingou237. The hardy advanced lines (resistant to the low temperature of -25 °C at the dormancy stage) are Pingou48, Pingou349. The common characteristics of these cultivars include: (1) larger size of nut, nut weight of 2.6～3g; (2) kernel is glabrous and full filling, kernel percentage varies between 38.9～47.5%. (3) very precocious and high yield, these cultivars begin their

bearing 2～3 years after establishment. The yield in the 5th, 7th and 10th year after establishment is 660～1110 kg/ha, 2220～2553 kg/ha and 2325～3000 kg/ha respectively; (4) very hardy, resisting the low temperatures of -25～-35 ℃ at the dormancy stage. Good adaptability to soil and possible good growth in the soil of pH value 5.5-8.0. The successes of the hazelnut breeding program in China changed the hazelnut growing from the collection of wild nuts to modern horticulture.

## S06.214

### The Almond Diversity in Sicily: Observations on Phenological and Pomological Traits and Strategies of Conservation

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On 1997 a wide collection of the Sicilian almond germplasm has been realized in a unique orchard located in the Temple Valley (Agrigento). More than 300 cultivar and/or accession has been grafted onto GF677 by using a sufficient number of trees useful to operate a series of observations aimed to their characterization. Phenological and pomological traits have been evaluated for 5 years after plant maturity and a characterization through main descriptor list has been processed in relation to define strategies of new diffusion. In addition, different studies have been carried out in order to define a protocol for *in vitro* conservation of some accession which evidenced a high risk of erosion. Results of this study shown a really high variability and did particularly evidence the need of an upgrade for descriptor list for almond since many characters resulting so much descriptive are not considered useful in all the list today available. Through statistical analysis of the data collected it has been possible to express a high percentage of the diversity. In few cases (< 15 %) it is necessary a deeper evaluation in order to evidence specific characters of the accessions. It is interesting to note that some accessions have shown interesting traits in comparison with well known and highly diffused cultivars for the Italian almond industry. This observation could open new interesting perspectives in the near future.

## S06.215

### Toward the Valorization of Superior Genotypes of Chestnuts: (*Castanea sativa* Mill) Native in South Italy: Phenological, Morphological and Molecular Characterization

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A survey has been carried out in the Aspromonte foothills territories (Calabria, South Italy) to the native germplasm of chestnut to select superior genotypes for tree productivity and fruit quality traits. After a preliminary screening within the area object of study, based on tree health and productivity, individual trees, with interesting fruit characteristics were selected and geo-referenced as well. The morphological and horticultural characteristics of those accessions were described using U.P.O.V. descriptors. By the integration of the morphological data and molecular fingerprinting, carried out on tissues samples taken from the above mentioned accessions, using SSRs markers, among the mass of accessions studied, have been selected 60 "superior" genotypes that evidenced a considerable rate of variability in phonological, morphological and horticultural traits. Particularly, the sixty genotypes, on the whole, had a ripening period extending from the end of September to the beginning of November; referring to fruits characteristics, some genotypes evidenced high commercial value: single fruit/husk, episperm easy to remove; seed coat that doesn't penetrate to the inner part of the kernel; single embryo. To improve knowledge on the horticultural performance of the genotypes selected a comparative study to the international cultivars has been planned, to be carried out, under the same prevailing conditions, to select new cultivars to establish a chestnut industry, based on native cultivars, in Calabria.

## S06.216

### Xylem Characteristics in Some Cultivars of *Corylus avellana* L.

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Xylematic tissues are at the base of some water and nutrient transport processes. The aim of this study was to study xylem characteristics such as vessel density and vessel dimension in order to provide preliminary data for future physiological studies. In other species it was demonstrated that xylem was at the base of hydraulic equilibrium and tree vigor. In this study the three most important Italian cultivars were investigated: 'Tonda Gentile delle Langhe' (TGL), 'Tonda Romana' (TR) and 'Tonda di Giffoni' (TG). Number of vessels per $mm^2$ and vessels diameter were measured. TGL had larger vessels than TG and TR respectively. Differences were found also in vessel number per $mm^2$ of xylem tissue. The three more important Italian hazelnut cvs showed significant differences in xylem vessels characteristics. These differences might be the cause for some different vegetative and productive behavior of these three cultivars.

## S06.217

### Seed Emergency of Genotypes of Dwarf Cashew Cultivated in Salinity Conditions

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The significant presence of the kernel of cashew nut in the export of northeastern Brazil coupled with the high number of jobs resulting this agribusiness makes this culture very important. However, most of the cashew orchards in Brazil are located in arid conditions, under the action of abiotic stresses, especially, the water and salt stress. Currently, the propagation of cashew is vegetative, from elite trees, one of the main factors responsible for increased competitiveness of cashew agribusiness. The nurseries also are located in areas with water and salt stress. An alternative to mitigate the first stress is the use of water of inferior quality, increasing the second problem. Then, the supply of seedlings and plants of high productivity and stress tolerance are extremely important. So, this study aimed evaluate the salinity effect on the percentage and index of emergence speed of seeds of dwarf cashew cultivated in a greenhouse at Embrapa Tropical Agroindustry, Fortaleza, Ceará, Brazil. The CCP 06, BRS 189, BRS 226 and BRS 265 clones were sown in tubes with vermiculite and irrigated with saline solutions with electrical conductivities (EC) of 0, 3, 6, 9 and 12 $dS \cdot m^{-1}$. The experiment was a completely randomized design (4x5), with four replicates of five seeds per plot. Salinity did not affect the percentage and significantly reducing the index of emergence speed of all clones, with the CCP 06 clone presenting the highest values this parameter in normal and stress conditions.

## S06.218

### 'Concettina': a New Italian Flat Nectarine Variety

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Lately, in Italy, have been introduced various varieties of flat fruit peaches, this as a response of the increased consumer's interest to their high fruit quality (sweetness, low acidity, high flavor) and more easy eating shape. The few varieties that cover the Italian cultivation of flat peaches are the ones that belongs to the UFO series, the cv. 'Sweet Cap® Maillarflat*', the old cv. 'Stark® Saturn' and few accessions from local germplasm (e.g. 'Tabacchiere' in Sicily). As flat nectarines, only the new 'Platinet' series developed by CRA-Rome in National Breeding Program and some varieties obtained and proposed by private company, have been recently diffused on the market. 'Concettina', the new flat nectarine variety we have recently released, differs from all the other flat nectarines because derived from stable mutation of

'Stark® Saturn' and it maintains almost all the important trait of the parent (white flesh color, low acidity, good quality and disease tolerance), but with nectarine skin. Following a short description of its main characteristics. Origin: natural mutation of 'Stark® Saturn'; Università Politecnica delle Marche –SAPROV (Italy) by B. Mezzetti, F. Capocasa and S. Concetti. EU PVR applied for (Application date: 19/12/2007; File number: 20072925) Tree: semi-upright; moderately vigorous, medium-large; medium dense; very productive; Blooming: medium (2-3 day after "Redhaven"), high entity; flowers showy, palepink; leaf glands small, reniform. Ripening season: 7 July in middle-Italy, 4 day after "Redhaven". Fruit: flat, round, symmetric; uniform; large (fruit weight 100-110 g; circumference 200 210 mm); glossy red covers 90% to 100% of surface over white-green ground color; flesh firm, juicy; high flavor, sweet (SSC: 14,2 °Brix) and low acid (52,5 meqNaOH/l); Agronomic evaluation: the fruit rarely shows wound in apical zone even whit low yield and low peduncolar injuries during harvesting. High yield in plants grafted whit GF677.

## S06.219

### Evaluation of Pollination Compatibility in Some of the Mahalab (*Prunus mahaleb*) Trees

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Mahaleb trees are commonly used as rootstock in grafting cherries. Study on genetic and molecular aspect as well as pollination behavior of mahaleb trees is relatively scarce. Information on the pollination type of this tree is a prerequisite for designing of breeding programs for obtaining new rootstocks. Objective of present study was the evaluation of pollination compatibility in mahaleb trees. For this purpose, pollen samples were collected from four mahaleb mother trees and applied as self and cross-pollinations on emasculated flowers. Examination had 3 replications and 30 flowers were emasculated for each replication in a randomized complete design. Fruit status was evaluated four and eight weeks after pollination. Comparing means of final fruit set showed that these mahaleb trees were self-incompatible and the highest level of fruit set was 30% for cross-pollination among the studied genotypes. Regarding to the gametophyte nature of incompatibility in *Prunus* genus, which is controlled by S alleles, complementary studies are needed to identify the corresponding alleles in mahaleb.

## S06.220

### Study on Tree Structure Index for High Yield Orchards of *Ziziphus jujuba* Mill. 'Pozao'

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The tree structure indexes for high yield 'Pozao' orchard and low yield 'Pozao' orchard were compared to serve pruning and tree shape designing. The results showed that in high yield jujube orchards, average tree height was a little bit smaller than distance between rows. and, canopy covered 95% of the orchard with no space between trees and certain distance between rows. In high yield jujube orchards, opening system or leader system was profitable and main branches per hector was about 7050 with angle from the trunk of 50°. More than 840 thousands high quality mother bearing shoots, combining with fertilizer management and irrigation, disease and pest control, was necessary to produce 19.5 tonnes of jujube fruits per hector.

## S06.221

### Changes in Endogenous Gibberellin (GA3) during Fruit Growth and Maturation of *Ficus carica* L. cv. 'Beyaz Orak'

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The fig is widely grown in the temperate, subtropical and tropical zones, however Mediterranean climate provides the most suitable conditions for quality fruit production. Turkey is one of the leading countries for fig production as well as main exporter of dried fig. Costal sides of Turkey enjoying the Mediterranean climates are more suitable for table fig production. The Beyaz Orak is a standard table and the earliest grown fig cultivar in Mediterranean region of Turkey. As it known, endogenous plant hormones play a major role in growth and development of fruits. The gibberellins are plant hormones that play important regulatory role during growth and development of fruits. In this study, the levels of endogenous free Gibberellin (GA3) was examined in fig fruit (*Ficus carica* L. cv. Beyaz Orak). The fruits were harvested at different maturity stages and every month from fruit setting to maturity and the GA3 contents were analysed with HPLC. The GA3 levels varied according to growing stage of fruits and fruit maturity.

## S06.222

### The Effect of AM Fungi and Drought Stress on Growth of Two Pistachio Cultivars (*Pistachio vera* cv. 'Badami- Riz- Zarandi', *Pistachio vera* cv. 'Qazvini')

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Arbuscular mycorrhizal fungi (AMF) living symbiotically with host plants enhance plant growth by improving the acquisition of mineral nutrients and water relations. In this experiment, the seed of two most popular pistachio rootstock, *Pistachio vera* cv. 'Badami Riz Zarandi' and *Pistachio vera* cv. 'Ghazvini', were sown in a low P soil mixture under green house condition and inoculated with *Glomus mosseae* and *Glomus intraradices* immediately. The pot plants were irrigated with Hogland Solution daily up to field capacity for3 months. When the root sampling showed an acceptable level of colonization percentage, the plants were subjected to four level of water stress (100% FC, 75% FC, 50% FC and 25% FC). Three month after the commencement of drought treatment, results revealed that vegetative growth indices such as plant height, leaf number, height diameter, leaf, stem and root fresh weight and dry were reduced as the effect of drought stress although mycorrhizal treatment could ameliorate the adverse effect of drought. Ghazvini cultivar showed a better performance under water stress condition and *Glomus intraradices* was more effective than *Glomus mosseae*.

## S06.223

### Effect of Bearing in Photosynthesis, New Growth Shoots and Number of Leaf in 6 Iranian Pistachio Cultivars

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In this research effect of bearing in photosynthesis rates, new growth branches and number of leaf were measurement in Iranian pistachio cultivars including Ohadi, Kalleh-Ghochi, Akbari, Ahmad-Aghaii, Rezaii Zoudras and Haratii. Thus, different OFF and ON shoots in 3 replication were chose at different growth and development stages including: 1- beginning of endocarp growth; 2- pith hardening; 3- beginning of endosperm rapid growth; 4- end of embryo development; 5- ripening and harvesting times and 6- post harvest. Result showed that photosynthesis rates in cultivars Rezaii Zoudras, Ahmad-Aghaii, Akbari, and Ohadi, in ON shoots was higher than OFF shoots. But in cultivars Haratii and Kalleh-Ghochi, OFF shoots showed higher rate photosynthesis, however, there was no significant difference among other cultivars. In different stages of fruit growth in first, second and fifth stages photosynthetic rate was higher in ON shoots and in third, fifth, and sixth stages was higher in OFF shoots. In whole cultivars the new growth shoots in ON shoots was higher than OFF shoots. The highest growth difference observed in cultivars Rezaii Zoudras and Ohadi and in cultivar Kalleh-Ghochi, there was no significant difference between OFF and ON shoots. In cultivars Ohadi, Akbari, and Rezaii Zoudras number of leaf in ON shoots was higher than OFF shoots. But in cultivars Kalleh-Ghochi, Ahmad-Aghaii, and Haratii number of leaf in OFF shoots was higher. Otherwise in first and second stages number of leaf in ON shoots was higher than OFF shoots. But in sixth stage number of leaf in OFF shoots was higher than ON shoots.

## S06.224

### Relationship between Fruit Calyx Shedding and Pollinator, and IAA Content of Young Fruit in Chinese Pear 'Dangshansuli'

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Chinese pear 'Dangshansuli' was a main cultivar in China, the fruit exhibited two types, i. e. fruit with calyx and without calyx. Compared with the fruit with calyx, the fruit without calyx had smaller fruit shape index, less stone cells, higher soluble solids content, so the price of which in market was 30%~50% higher than the fruit with calyx. In practical production, the proportion of the fruit with calyx could be improved by spraying of PBO, PP333. To study the effect of different pollinators on the fruit calyx development, the flowers were pollinated with pollens from different cultivars artificially and spayed by the different exogenous growth regulators, and the rate of the fruit without calyx were investigated, at the same time, the contents of IAA, GA3, ABA and ZR in the young fruit with or without calyx, naturally and treated with exogenous growth substances GA3, PBO, and PP333, were measured by method of ELISA (Enzyme-Linked Immunosorbent Assay). The results showed that these were no positive differences betweem the calyx shedding of young fruit and pollination by different cultivar pollens. The IAA content of fruit without calyx was lower than that of the fruit with calyx, while at level of GA3, ABA and BR, there were no differences between the fruit with calyx and fruit without calyx. The calyx shedding could significantly increased by spaying PBO, PP333 at full-blossom, but the IAA content in young fruit decreased. On the contrary, the calyx shedding could decrease by spraying GA3, and the IAA content in young fruit increased too. Therefore, it had been proved that the pollinator didn't influence fruit sepal development, and the calyx shedding was actually attributed to lower level of endogenous IAA in young fruit, which could be decreased mainly by application of PBO and PP333 in Chinese pear 'Dangshansuli'.

## S06.225

### Effect of Banzyladenine on Some Fruit Characteristics and Shoot Growth of Apricot

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The effect of different concentration of Banzyladenine (BA) on apricot cv. 'Nori' cultivar (*Prunus armenica* L.) was studied. Five different treatment of Benzyladenine (T1: 20 mg·l$^{-1}$ BA before full bloom, T2: 20 mg·l$^{-1}$ BA at full bloom, T3: 20 mgl$^{-1}$ BA before and after full bloom, T4: 40 mgl$^{-1}$ BA at full bloom, T5: 40 mgl$^{-1}$ BA before and after full bloom) along with control were compared for fruit set, fruit weight, fruit length fruit diameter, seed weight, seed length, seed diameter, yield, shoot length and Tss. Lowest shoot length was recorded in 20 mg·l$^{-1}$ BA treatments at Jun while the results did not show difference in shoot length of T4 and T5 treatment compare to control. Control treatment had maximum shoot length compare to other treatments at September. T5 treatment had higher yield than other cultivars while lowest yield was recorded for control and T2. Fruit weight, fruit length and fruit diameter, seed weight, seed length, seed diameter and Tss were not affected by treatments.

## S06.226

### Root Metabolic Response in Iron Deficient Prunus Rootstocks

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Several metabolic changes associated with iron deficiency have been reported in roots of herbaceous species. However, little is known about root metabolic changes related to iron deficiency in *Prunus* species. These changes could be used in breeding programs to evaluate the response of *Prunus* rootstocks for tolerance to iron chlorosis. The more tolerant rootstocks Adesoto (*Prunus insititia*) and GF 677 (*P. dulcis* × *P. persica*), and the more sensitive Barrier (*P. persica* × *P. davidiana*) were grown hydroponically in Fe sufficient and deficient conditions during two weeks. Sugar, organic and amino acid contents of root tips were determined after two weeks of Fe deficiency by proton nuclear magnetic resonance spectroscopy (1H-NMR) of extracts. Complementary analysis of sugars was performed by high pressure liquid chromatography (HPLC) in GF 677 plants. The major soluble sugars found were sorbitol, glucose, fructose and sucrose. The major organic acids were malate and citrate, and the most important amino acid was asparagine. Iron deficiency increased root sucrose, several organic and amino acid concentrations and phosphoenolpyruvate carboxylase (PEPC) activity. After two weeks of iron deficiency, malate, citrate and succinate concentrations increased in the three rootstocks, but no significant differences in the increase of these organic acids were found among rootstocks. The tolerant rootstock Adesoto showed higher total organic and amino acid concentrations. In contrast, the susceptible rootstock Barrier showed lower total amino acid concentration and PEPC activity values. These results suggest that the induction of this enzyme activity, as it was shown in herbaceous plants, indicates the tolerance level of rootstocks to iron deficiency. Other metabolic parameters, such as organic and amino acid concentration, could complement the evaluation of the *Prunus* rootstocks for tolerance.

## S06.227

### Using Baselines as a Support Tool in Irrigation Scheduling in Commercial Japanese Plum Orchards

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Have a process to understand and quantify the water status of trees can be a useful tool for optimizing irrigation water in orchards. The stem water potential (Yt ) has proved a good indicator of water status in different fruit, but the reference values may vary with weather conditions, mainly with air humidity. The objective was to obtain the relationship between Yt and DPV (Baseline) for Japanese plum in Vegas del Guadiana, such that relationship can be used as a reference of trees water status. During 4 years (2006, 2007, 2008, 2009) measures of Yt and DPV were taken at solar noon, at least one time per week, in 21 plots of 11 farms in 11 different varieties. In the first 2 years were established 3 irrigation levels, 50%, 100% and 150%ETc, while the remaining 2 years were irrigated at 100% ETc. Yt values in "no stress" conditions tend to decrease as the season progresses, being able to establish 2 different phonological stages, pre and post harvest, where irrigation needs differ. Baseline was obtained for each variety, year and period resulting adjustment coefficients ($R^2$) from 0,45 to 0,88 in pre-harvest, and 0,01 to 0, 72 in post-harvest. Minor adjustments post harvests due to water shortages applied by producers. A statistical covariance analysis was made. Considering the 4-year data, the same variety behaves similar at different locations and years, so once the Base Line for this variety is obtained, could be used as tool for irrigation management in commercial orchards. However, we are unable to clearly groups of varieties with similar behavior, possibly because the term Japanese plum comprises a heterogeneous group of diploid plums derived from interspecific hybridization between plum *Prunus salicina* and American diploids.

## S06.228

### Effects of Prolonged Application of Deficit Irrigation Strategies in Pear 'Ercolini' in Vegas of Guadiana (Badajoz, Spain)

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During 6 years we have used deficit irrigation strategies in an intensive pear orchard (*Pyrus communis* cv. 'Ercolini') located at Finca La Orden (Badajoz), in order to optimize water resources and labour, especially pruning. In 2003, 3 irrigation treatments were established: T1 (Control), irrigated at 100% ETc throughout the season, and 2 deficit irrigation treatments: T2 was applied to 50% ETc in 2 periods: from the beginning of the season until the beginning of rapid fruit growth, and after harvest until early September. During the rest of the season was watered as the control treatment. T3, irrigation was 50% ETc throughout the season, except 15 days before harvest when was increased up to 100% ETc. The amount of water applied in deficit treatments was lower than the control treatment with 22% and 40% for T2 and T3, respectively, averaged over 6 years. The 2 deficit irrigation strategies were effective to control tree vigour, whereas trunk section growth, intercepted radiation and weight of pruning wood was significantly higher in T1. The production did not increase with irrigation level and T2 was more productive (kg / ha) than T1 for 3 years and no significant difference the rest of the trial. The more efficient in water use was T3.

## S06.229
## Evaluation of Autochtonous Pomegranate Biotypes: Morphological and Compositional Aspects

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Pomegranate is getting an increasing attention from the Italian market for its high amount of secondary products contained into the fruit juice. Its consumption is correlated to reduced risks of coronary heart diseases, certain types of cancer and other human diseases. In Italy, pomegranate is present since ancient time and, in Latium Region (Central Italy), it exists since Roman time. In this Region ancient resources of pomegranate germplasm are still present, with several biotypes differing for pomological and organoleptic traits. Recently, collection and characterization of ancient plants has been performed, following the guidelines of the law 15/2000, emanated by the "Regione Lazio", with the aim to preserve the agricultural resources of Latium Region. Seven accessions have been propagated and cultivated in a collection field, at the University of Tuscia, for extra-situ investigations. The accessions differ for pomological traits and chemical composition of aril. Five of them belong to typology with low-medium acidity and high sugar content, while the other ones belong to typology with high acidity. Among the biotypes tested, MG2 and MG3 seem to be particularly interesting for the fruit traits and quality. Juice and peels' extract of both Tordimonte and MG1 accessions contained high amount of phenylpropanoid compounds such as punicalin and punicaligin, respectively

## S06.230
## Reproductive Compatibility of Japanese Plums Evaluated by the Pollen Tube Growth and Fruit Set

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Plants from different *Prunus salicina* Lindl. cultivars present different reproductive incompatibility degrees because of S-alleles presence. This work aims to characterize the reproductive compatibility of six cultivars of Japanese plum ('América', 'Rosa Mineira', 'Pluma 7', 'Amarelinha', 'Reubennel', and 'Santa Rosa') through the evaluation of the fruit set and pollen tube (PT) growth. A hundred and fifty flowers at the balloon stage were emasculated, pollinated, packaged for a week and used to determine the percentage of fecundation for each cross. The fruit set was determined 40 days after pollination. The compatibility degree was evaluated 120 hours after pollination through PT growth tests and given a 1 to 6 grading. The fruit set was very low for all crosses, and the highest value was observed for 'Reubennel' self-pollinated (8.41%). 'América' just presented a fruit set when pollinated with 'Rosa Mineira', 'Amarelinha', 'Santa Rosa' and 'Reubennel', and the last one presented mutual compatibility with 'América'. 'Amarelinha' and 'Rosa Mineira' showed compatibility with 'Rosa Mineira' and 'Reubennel'. In the in vivo crossings, a high percentage of germinated pollen grains was observed in the stigmatic area, ranging from 72% to 100%, except for 'Santa Rosa', at 25%. The crossings between 'América' x 'Pluma 7' and 'Rosa Mineira' x 'Santa Rosa' were completely incompatible whereas 'América' and 'Pluma 7' were self-incompatible. Some crossings that didn't present pollination in the field reached degree 6 (in the ovule) or 5 (in the ovary) in the in vivo pollination, as observed between 'Reubennel' x 'Rosa Mineira'; 'Rosa Mineira' and 'Amarelinha' x 'América'; and 'Amarelinha' and 'Pluma 7 ' and 'Santa Rosa' x 'América'.

## S06.231
## Peach x Almond Hybrids as Sweet Cherry Rootstocks

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It is known that at present are available a large number of rootstocks for growing sweet cherry cultivars (*Prunus avium* L.) whereas other stone fruit species have a far lower number. This fact has led to the idea that such a high number of rootstocks available for cherries must be connected to local soil conditions. The use of pach x almond hybrids as cherry rootstocks is possible by using myrobolan Adara as interstock to solve local soil troubles in Shouth East Spain, improving the cultivation of sweet cherries in this area.

## S06.232
## Compensatory Effects of Humic Acid on Physiological Characteristics of Pistachio Seedlings under Salinity Stress

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Low soil quality caused by low organic compounds and salinity are the major natural limitations of pistachio orchard productivity in Iran. Humic acid (HA), the major component of soil organic matter, can be of majority benefits for a soil chemistry and fertility, as well as plant growth under salinity stress. Humic acid (HA) treatments at four levels H1: 0 (control); H2: 500; H3:1000 and H4: 2000 ppm was performed on one-year-old pistachio seedlings, cultivar Badami. Salinity treatments were achieved by adding NaCl to a concentration of S1: 0 (control); S2: 25; S3: 50 and S4: 100 mM for 45 days. The results showed significantly interaction effects of HA and salinity on shoot growth, shoot/root dry weight ratio, proline and abscisic acid as well. Increasing of leaf samples proline by HA could be explained by the fact that humic acid enhances hydroxyproline formation either by a mechanism which renders more ferrous iron available for the hydroxylation of proline to hydroxyproline within the tissue, and/or a mechanism which stimulates the enzyme required for the hydroxylation process HA suppressed proline increasing under salinity. Meanwhile, the adversely effect of HA on the plant growth features at high concentration have been discussed.

## S06.233

### The Morphology of Japanese Chestnut (*Castanea crenata*) Fruit during Development

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In chestnut fruits, the edible cotyledon of the seed is surrounded by a tough, dry, leathery shell, which is derived from the pericarp (ovary wall). This study attempted to characterize the structure of the edible cotyledon in relation to cell structure throughout the fruit-growing period, with particular emphasis on the anatomy of the shell, pellicle, and locule. Female flowers had three ovaries, each with approximately ten locules. However, although each locule had two ovules, only one seed developed in each ovary since only one of the ovules was fertilized. Consequently, one to three seeds in each flower generally developed to maturity. Although enlargement of the pellicle occurred at the same time as enlargement of the locule and cotyledon, the wall and silky fibrous tissues inside each locule were displaced by cotyledon enlargement. Once the cotyledon in the seed occupied the entire locule, the pellicle formed a thin layer, with a longitudinal groove along the inside of the outer shell, which turned brown and became hard. In the final stages of development, the locule wall and spongy tissues within the locule formed pellicle. Despite being absent in the locule wall, numerous vascular bundles appeared in the shell. The vascular bundles accumulated at the uppermost portion of the ovaries, before branching into styles and ovules. The seed was initiated in early July and enlarged continuously during July. Starch accumulation in the cotyledon was initially observed in mid-July, before increasing rapidly from August to September at harvest.

## S06.234

### Response of Pistachio Rootstocks (*Pistacia vera* cv. 'Badami-e-Zarand') to Different Levels of Zinc and Sodium Chloride

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A greenhouse experiment was conducted to study the effects of soil zinc (Zn) and salinity application on chemical composition and vascular tissue in pistachio seedlings. A factorial greenhouse experiment was carried out as completely randomized design with three replications. Treatments were 4 levels of Zn (0, 5, 10 and 15 $mg{\cdot}kg^{-1}$ soil) and 5 levels of salinity (0, 800, 1600, 2400 and 3200 mg $NaCl{\cdot}kg^{-1}$ soil). Results showed that proline accumulation increased with increasing salinity levels, whereas the reverse trend was observed for reducing sugars content. Zn application increased proline concentration and sugars content. Likewise, the obtained results from the observation of the cross-section of the thin stem Indicated that the increase in salinity, results in the decrease of the parenchyma layer, amount of resin channel, thickness of the phloem rings and the increase in the lignified cells and the simple corks. In the presence of 10 $mg{\cdot}kg^{-1}$ zinc, the majority of the problems which had emanated from the salinity were resolved

## S06.235

### Effect of Crop Load and Shoot Girdling on Starch and Soluble Sugars Concentrations in Leaves and Inflorescence Buds of Pistachio cv. 'Ohadi'

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In order to evaluate the effect of crop load and shoot girdling on starch and soluble sugars concentrations in leaves and inflorescence buds of pistachio, an experiment was conducted in two consecutive years (2007 and 2008) in Pistachio Research Institute of Rafsanjan, Iran. Treatments were applied at two different stages of fruit growth and development including: 1- Initiation of rapid growth of seed endosperm and 2- Endosperm completion and initiation of rapid seed embryo growth. According to the results, girdling individual shoots at the base of the current year's shoot, thus separating inflorescence buds at the terminus of the current year's shoot from the developing fruits, and fruit thinning reduced inflorescent bud abscission by 67.7 and 17.8 respectively compared to untreated controls. Shoot girdling significantly increased starch, sucrose, glucose and fructose concentrations in leaves and inflorescence buds and it was nearly similar to "OFF" trees. Fruit thinning increased starch concentrations in leaves and inflorescence buds as well as glucose and fructose concentrations in leaves, while it didn't has any effect on sucrose concentrations in leaves and inflorescence buds. Therefore, it can be concluded that fruits inhibit carbohydrates movement from leaves to inflorescence buds and triggers inflorescence bud abscission.

## S06.236

### Effect of Paclobutrazol and Prohexadione − Ca, on Shoot Development and Pecan Nut Yield

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Evaluation of the effect promoted by the application of two growth regulators (Paclobutrazol and Prohexadione–Ca) on the vegetative and fructiferous growth of young pecan trees cv. Western Schley and Wichita. The products were sprayed to 5 year old pecan trees utilizing doses of : 0 , 2 and 4 mg liter one month after the initiation of bud burst (15th of may). The results showed a remarkable reduction of the shoot growth by 12 to 17%, on both Western and Wichita respectively whereas the pecan yield was not statistically modified by the effects of the growth regulators. The best dose of both growth regulators to attain shoot growth reduction was 2 mg litter.

## S06.237

### Evaluation of Fruiting and Vegetative Pecan Shoots and Their Relationship with Alternate Bearing

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The present study was done with the purpose of evaluating the effect of the vegetative and fructiferous shoots on alternate bearing of both Western Schley and Wichita pecan varieties. We considered three types of shoots for each variety: consecutive producer shoots (2006 and 2007), alternate bearing shoots ('ON') produced during2007 and alternate bearing shoots ('OFF') during 2007. Additionally we considered 5, 10, 15 and 20 cm. long shoots within each group. The results indicated different performance for varieties as well as for the shoot length. Higher values for leaf number, foliar surface, fruit diameter and meat weight, corresponded to the Wichita Variety and best treatment for reducing alternate bearing included 15 to 20 cm. shoots.

## S06.238

### Processed Kaolin Particle Film on Almond and the Effect on Tree Water Status, Growth, Yield, and Bud Failure

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Surround, a white clay-like processed Kaolin particle film, can easily be dissolved into suspension and sprayed onto trees. From 2002-2008 three applications of Kaolin 11.3 kg/378 L/0.4046 hectares were made each season to Carmel and Nonpareil almond trees planted in 2002 in order to exaine if Kaolin could reduce heat

stress and the onset of bud failure. The effect of kaolin on tree water status, growth, and yield was also examined. An almond orchard with Carmel and Nonpareil rows was divided into a replicated design with 8 replications. From 2003-2009 mid day leaf stem water ptential (SWP) measurements were performed once a month from June-September. Typically, June and July mid day leaf SWP were significantly less on kaolin treated trees when compared to non-treated trees, but by August and September differences were no longer significant. In 2003-2005 surround treated trees had significantly more current season shoot growth when compared to non-treated. From 2005-2009 a significant increase in trunk circumference was observed in surround treated trees. In 2007 we observed less ($P<0.09$) bud failure on the Surround treated Carmel trees, and significantly less ($P<0.02$) in 2008. From 2007-2009 the Carmel treated rows had significantly greater yield when compared to non-treated. Only in 2008 did the Nonpareil tree rows also have significantly more yield when compared to untreated. Cumulative yields from 2007-2009 have Surround treated Carmel trees averaging 544 more dry kernel kg/hectare than untreated Carmel trees, while Surround treated Nonpareil trees are averaging 316 dry kernel kg/hectare than untreated trees.

## S06.239

### The Effects of Some Amino Acid Foliar Application on the Performance and Photosynthesis of Pistachio Cultivar 'Ouhadi' and 'Kale-Ghoochi' (*Pistacia vera* L.)

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In order to investigation of effects of foliar application of some amino acids components on photosynthesis and yield of pistachio cultivar Kalleh-ghouchi and Ouhadi , this experiment was carried out in 2006 as a Split plot design with three treatments and tree replications. Two amino acid component included Kadoustim and Humi fort applied two times one in endocarp growth finishing and shell lignifications and the other in embryo growth complete and endosperm digestion time and compare with control (water spray). Some qualitative and quantitative trails included pistachio ounce, shell indehiscence percentage, blank pistachio percentage, flower bud abscission, total soluble sugar, nut fat content, total nut protein content, mineral content in leaves and nut was measured in end of experiment. Also some eco- physiological parameter such as photosynthesis rate and chlorophyll florescence in leaves measured during the experiments. Results indicated, just a bit increasing in leaf and nut nitrogen as well as nut protein. Not other measured parameter was effects by treatments. In other experiment it was found that amino acid can absorb by pistachio leaves after 4 hours by mentioned amino acids components, because the total leaf nitrogen increased 4 and 8 hours after application.

## S06.240

### The Effect of Salinity and Magnesium on Pistachio Chemical Composition in Sand Culture

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Most of pistachio orchards in Iran are near the desert. One of the remarkable problems of this area is salinity of soil and water. Magnesium amount in irrigation water in some pistachio orchards is high. Therefore, study the effect of magnesium is necessary, because decreasing of underground water and remove water from deeper depth lead to increasing magnesium amount. Present study was carried out to evaluate the effect of magnesium and various salinity levels on chemical composition of pistachio seedlings (*Pistacia vera*) in sand culture. A factorial greenhouse experiment was carried out as completely randomized design with four replications. Treatment were four levels of magnesium (0, 0.5, 1 and 2 $mM \cdot L^{-1}$ Mg) induced by $MgSo_4$ and three levels of salinity (0, 45 and 90 $mM \cdot L^{-1}$ Na) induced by NaCl. After preparing seeds, two seeds were planted in 5 lit plastic pots, in April 2008. In order to control nutrition solution and salinity treatment, perlite was selected as potting material. Modified Hogland's solution was selected as nutrient solution. It was measured effect of treatment on chemical composition such as Na, K, Ca, Mg, Fe, Zn, Mn and Cu in shoot and root. The results indicated that salinity stress caused remarkable reduction in Cu, Zn and Mg shoot concentration. for instance 90 $mM \cdot L^{-1}$ NaCl, reduced the average of Mg shoot concentration 36.5 percent. However, salinity stress increased concentration of Mn, Zn, Fe, Na in root. Application 2 $mM \cdot L^{-1}$ Mg decreased K, Zn, Fe and Cu root and shoot concentration. Application 90 $mM \cdot L^{-1}$ NaCl and 2 $mM \cdot L^{-1}$ Mg reduced Zn and Fe shoot concentration in comparison with control 25 and 14 percent respectively.

## S06.241

### The Effect of Salinity and Calcium on Nutrients Concentration in Shoot and Root of Pistachio Seedlings (cv. 'Badami-Zarandi') in Sand Culture

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Pistachio is considered as one of the exports and strategic products of Iran. According to Food and Agriculture Organization (FAO, 2004), Iran is the leader country on producing and exporting this commodity in the world. Unlike the vast area used to grow pistachio in Iran, its average amount of production is unfortunately lower than we expect. Considering salty and calcareous soils of pistachio orchards in Iran and lack of water for leaching, some harmful elements such as sodium increase in rizosphere which leads to the prevention of calcium absorption by pistachio roots (Mozafari and Malakouti, 2006). Calcium plays an important role in crop production especially in saline conditions; therefore, this study was aimed at investigating the effects of various amounts of calcium in various salinity levels on chemical characteristics of pistachio seedlings in sand culture. A factorial greenhouse experiment was carried out as completely randomized design with four replications. Treatment was included: three levels of calcium (0, 0.5 and 1 mM $CaNO_3 \cdot L^{-1}$) and four levels of salinity (0, 30, 60 and 90 mMl $NaCl \cdot L^{-1}$). It was measured effect of treatments on macronutrients and micronutrients concentration such as Fe, Mn, Cu, Zn, Na, K, Ca, Mg and P in shoot and root of pistachio seedlings. The results revealed that increasing salinity stress to 90 mmol $NaCl \cdot L^{-1}$ decreased Fe, Mn, Cu, Zn, K and Mg concentration and increased Na and P concentration in shoot. Application of 1 mM $CaNO_3 \cdot L^{-1}$causes significance increasing Fe, Cu and Zn concentration and significance decreasing K, Na, Mg and P concentration in shoot. Additionally, with the increase in salinity in root Mn, Zn, P, K and Mg concentration decreased but Cu was increased and application of 1 mM $CaNO_3 \cdot L^{-1}$ increased Fe, Cu, K, Ca and P but Mg concentration was decreased.

## S06.242

### Diagnosis of Boron Deficiency at an Early Stage in Chestnut

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The diagnosis of boron deficiency at an early stage, with a view to remedial action, is of great agricultural importance. This study aims to identify an alternative plant tissue in order to confirm B deficiency in chestnut orchards. A 15-year-old orchard with apparent B deficiency was selected, and 16 trees of Judia variety were submitted to two levels of B fertilisation: B0 (control) and B1- 100 g/tree of Granubor (14.6% of B). In the beginning of July (2008), when female flowers were in bloom the following tissues were sampled from the same shoot: expanded leaves, androgynous catkins and female flowers. Leaves were collected again in the normal period of sampling (beginning of September) and in the same position as previously. The concentrations of macro- and micronutrients in plant tissues were determined by conventional methods. Chestnut production was significantly higher with B fertilisation. There was a significant increase in B content in the several plant tissues in

both collecting periods due to B application. In September, foliar B concentrations were 8 mg·kg$^{-1}$ and 34 mg·kg$^{-1}$ respectively in B0 and B1 ($p< 0.001$). In July, the highest B content was observed in flowers in the control, but leaves had the greatest content under B application. B content in the tissues collected in July (leaves, androgynous catkins and female flowers) was positively correlated with B contents in leaves sampled in September. Foliar B concentrations, irrespective of the sampling period, were correlated with chestnut productivity (r=0.70*), while the other tissues did not correlate significantly. These results suggest that the leaves from fruiting shoots, sampled in bloom, were the most efficient tissue for the early diagnosis of B deficiency and alternative tissues being inferior for this purpose.

## S06.243
### Assessment of Boron Application in a Chestnut Orchard over Three Years

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At northeastern Portugal, boron fertilisation empirically carried out in several chestnut orchards had unequivocally positive effects on nut production. However, post-treatment evaluation has not been made to date. The objective of this trial was to quantify the effect of B application on nut yield and quality over three years. In addition, its effect on soil and foliar contents were evaluated. A fertiliser trial was established in a 15 year-old orchard in a acid soil derived from siliceous schist. The correction of soil acidity and a basal fertilisation were carried out in 16 trees and two levels of sodium tetraborate (14.6% B) were applied to eight trees: control (B0) and 100 g per tree (B1). In the beginning of September leaves were collected from five trees, and analysed for macro- and micronutrients. Soil analysis was carried out before and at the end of the experiment. The occurrence of blank fruits and nut productivity was measured per tree; some nut quality parameters, such as dry matter, nut calibre and fruit damage were evaluated in addition to the chemical composition of the kernel (soluble sugars, starch, total fiber, crude protein, and crude fat). Boron fertilisation of chestnuts significantly reduced the percentage of blank fruits (68% in B0 and 19% in B1) and the increase in nut production was nearly 100% (8.5 to 16.2 kg/tree). The differences observed in several quality parameters were not obvious and showed some variation from year to year. Foliar analyses exhibited relatively low B concentrations in the control trees (8.6 mg·kg$^{-1}$), while in the fertilised trees the foliar B concentration was on average 48.4 mg·kg$^{-1}$. In the soil surface the content of B increased from 0.44 mg·kg$^{-1}$, before the establishment of the trial, to an average value of 4 mg·kg$^{-1}$ underneath fertilised trees.

## S06.244
### The Study of Flowering and Bearing Status in Twelve Pistachio (*P. vera* L.) Cultivars in Northeastof Iran

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Iran has more 400 thousands hectares pistachio orchards and there are about 40 thousands hectares in Northeast of Iran This study was carried out in pistachio research station in Fiezabad region (Razavi Khorasan province) with 12 pistachio (*P. vera* L.) cultivars in 2006-2008. The main purpose was the selection of the best cultivar(s) for Fiezabad region. In this research, It was used 12 cultivars namely Badaim-e- sefid, Pesteh-e- gharmez, Barg-seyah, Daneshmandi, Pesteh-e-garmeh, Akbari, Kaleh-ghouchi, Owhadi, khanjari, Abasali, Shahpasand and Mumtaz. The first five cultivars were native for this region and others were non-native cultivars. This experiment was done based on a randomized complete block design (RCBD) with 1 treatment (12 cultivars) and 3 replications (consist of 36 trees). The results showed that the factors Year, Treatments (cultivars) and Year * Treatments were significant ($(p<0.01)$). The highest number of flower bud in per shoot obtained on Barg-seyah and Akbari cultivars and the lowest was on Pesteh-e-garmeh. There were significant differences between Badaim-e- sefid with 20 nuts in per cluster and Abasali cultivar with 7 nuts. The most and the lowest percentage of blank pistachio was about 24 and 7.4% on Badaim-e- sefid and Abasali, respectively. There was direct relationship between the number of nut per cluster and the blank percentage. Shahpasand cultivar (from Damghan region) showed that the most percentage early splitting in all three years. In addition, Shahpasand, khanjari and Owhadi had not suitable compatibility in this region; but Badaim-e- sefid, Akbari and Pesteh-e-garmeh showed more compatibility than other cultivars.

## S06.245
### Cover Crop and Double Harvest: Influence on the Quality and Preservation of Fresh Hazelnuts (*Corylus avellana* L.) and Economic Evaluations.

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The hazelnut (*Corylus avellana* L.) plays a very important role in the confectionery and industrial processing worldwide. Turkey, Italy, Spain and the USA are the most important world producers (Bellincontro *et al.*, 2008). The aim of this work was to determine the impact of cover crops and double harvest on the quality and preservation of hazelnuts. On one hand, the cover crop brings great advantages from an agronomic point of view, but on the other, there are still doubts concerning its effect on the quality of the hazelnuts, defined by size, water and fatty acid content, internal defects and damaged fruits (Romero *et al.*, 2008). Double harvest is a cultivation technique aimed at improving the quality of hazelnuts and motivated by the EC policy 2200/96 and it helps to prevent the development of hidden flaws or internal rot, characterized by generalized browning of the seed and associated with the appearance of an unpleasant odour and taste. Hazelnuts were grown on a naturally cover-cropped plot rather than tilled soil and then harvested either with a single or a double harvest. The fresh hazelnuts were stored for six months in order to evaluate their qualitative characteristics. The data collected showed that the double harvest technique with cover crops enhanced the quality and state of preservation of the hazelnuts. In addition, the economic validity of these operations was evaluated, taking into consideration the financial contribution provided by public bodies. The cost regarding both growing techniques was estimated and it was determined that the double harvest and single harvest had the same cost, while cover cropping was economically advantageous in comparison to tillage.

## S06.246
### Study and Biological Evaluation of Main Characteristics of Some Agroproductive Varieties of Walnut from the Carpathian Hills Area of Oltenia - Romania

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Among, many fruitgrowing species spread and grown in the Carpathian hills of Oltenia Romania, the walnut performed and still performing a great interest for the local people of the area, because is considered to be a strategic fruitgrowing species, which brings a substantial income. The studied walnut cultivars are of different geografical origins and therefore the triggering of some phenophases occur at different times. Flowering period of female flowers occurred in the second half of April and the first decade of May, and the males have flourished in the third decade of April and the first and third decades of May. Walnut fruit varieties were evaluated and fulfil the commercial biometric parameters. Carpathian area of Oltenia promotes growth and exploitation of walnut varieties with different geographical origins.

## S06.247

### Studied on the Relationship between Mineral Nutrient Change and Growth and Development of Four Early-Fruiting Walnut Cultivars

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Four cultivars of Xiangling, Luguang, Baofeng and Zhonglin were studied on the increment, production and the change of mineral nutrient such as N, P, K, Ca and Mg in Jiyuan in 2009. The result showed that: (1) the differences of total increment and production were remarkable among these four cultivars. They ranged in total incerement from Xiangling, Baofeng to Zhonglin to Luguang, while in production per year were from Xiangling, Zhonglin to Luguang to Baofeng; (2) the content of different of mineral had changed differently. The content of N, P, K, Ca and Mg were significantly. While instructing the fertilizer application with the method of leaf analysis, the period of picking leaves was the earlier period of growth season-leaves fast growing time; the content of mineral nutrition (N, P, K and Ca) at the earlier period of growth season showed significantly positive correlation with fruit number.

## S06.248

### Studies on the Grafting Height Influence on the Incompatibility Phenomenon at the Apricot Tree

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Starting from the premise that by increasing the grafting height the influence of the graft on the rootstock intensifies, in this paper we proposed to estimate the manifestation degree of the incompatibility phenomenon in the case of grafting trees at different heights. To achieve this goal, Godrich apricot varieties were grafted at a height of 10, 20 and 40 cm on 2 different rootstocks with different compatibility degree: *Prunus armeniaca* and *Prunus cerasifera*. Biometric measurements were carried out (length of the scion, grafted tree height, the scion and the rootstock diameters, number of shoots, leaves, foliar area), and also anatomical sections were made through the grafting point and determination of dry matter and the soluble carbohydrates in leaves. The determinations were made in the vegetation period during 2007-2009. The results obtained showed an earlier appearance of the anatomical and morphological symptoms characteristic to incompatibility phenomenon: low broken resistance, tissue hypertrophy and anatomical abnormalities occurring at the grafting point, in the grafted trees at heights greater than in those grafted at 10 cm. Also it has been observed differences regarding the growth and development of the grafted trees on the two rootstocks at different heights, and the variation of carbohydrate content and the dry matter in leaves during the vegetation period depending on height of grafting.

## S06.249

### Root System Evaluation of Seven Peach Rootstocks

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The objective of this study was to evaluate and compare root distribution and length using 8-year-old peach trees planted in a sandy loam of medium depth and good drainage, with drip irrigation, in Paine (Chile). The rootstocks included: Cadaman-Avimag, Viking, Atlas, GxN 15, GF 677, MRS 2/5 with Nemaguard as the control. The root systems were measured by excavating soil profile trenches of 1 m depth and 2.4 m in length, and placing a squared steel mesh over the soil profile to take the pictures. Photographs were taken of the roots found in each square and the images were then processed with SIARCS® software, which enabled the calculation of root length for a given depth within the soil profile and the further determination of total root distribution. Results were analyzed with ANOVAs and Tukey's tests at a significance level of 0.05. The rootstocks with the greatest total root length over the soil profile were GxN15 and GF677, with 7056 and 6805 cm, respectively. The Atlas, Cadaman and Nemaguard rootstocks had intermediate total root lengths (5089 to 5863 cm) although there were no statistically significant differences between them. The MRS 2/5 and Viking rootstocks had the lowest total root lengths (3819 and 3868 cm) respectively, significantly differing from GxN15 and GF677. After examining total root lengths in the A horizon (0-15 cm depth), it was observed that the rootstocks GxN15 and Viking (2411.4 and 1045.2 cm, respectively) were significantly different from the Nemaguard control (1855 cm). In the B horizon (15-30 cm depth) the GF 677, GxN 15 and Viking rootstocks (with 2370, 2271.3 and 1350.5 cm, respectively) showed a difference in total root length with regard to the Nemaguard control (2016 cm).

## S06.250

### Rooting Induction and Acclimatization of Japanese Plum, cv. 'América'

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This work studied the Japanese plum (*Prunus salicina* Lindl.) cv. 'América' rooting and acclimatization for large scale plant production. Shoots between 3 and 4 cm long were inoculated in MS medium with half the salt and vitamin concentrations, added with IAA and IBA (0; 0.25; 0.50; 0.75 and 10 mg $dm^{-3}$). After 20 days in rooting induction medium, the shoots were transferred to an intermittent nebulisation chamber (22-28ºC and 80-95% relative air humidity), inside a greenhouse, and evaluated after 30 days. At the end of the *in vitro* cultivation period, no significant interaction was observed between the factor for the number of roots per shoot and rooting percentage variables; but a significant effect was registered only for type of auxins, were the shoots grown in media added with IBA showed high values - 0.87 and 41.95%, respectively. A linear increase response from 1,45 to 5,73 cm was verified for root length from shoots cultivated in IBA medium, however no significant effect was observed for root length (0.86 cm) for shoots grown in medium added with IAA. The largest survival percentage was obtained from root-induced shoots in medium added with 1 mg dm-3 IBA and IAA (88% and 92%, respectively). Although IBA provided a larger *in vitro* rooting, most of the surviving shoots were those originated from IAA-added medium, probably because of the IBA effect in promoting longer roots, which were less appropriate to transplant and attach to the soil, as they are more easily damaged, or even because of bad root/shoot vessel system formation/connections. Taking into account the concentrations used, it was concluded that IBA promotes a quicker *in vitro* rooting of cv. 'América' shoots than IAA, and the addition of 1 mg $dm^{-3}$ IBA for no longer than 20 days probably provides better survival results during the acclimatization phase.

## S06.251

### *In Vitro* Organogenesis in Peach Rootstock Garmen (GxN15)

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The development of new varieties of peach and nectarine by classical breeding with a particular character can be unfeasible in certain situations and, in addition, a very long process. The use of genetic transformation techniques may allow to shorten the period for obtaining a new variety. Regeneration of peach plants through organogenesis and somatic embryogenesis of adult material is the main obstacle to produce transgenic plants of this species. This paper seeks to establish a protocol for *in vitro* plant regeneration of peach rootstock GxN15 (Garnem) that allows a efficient transformation. Initially, nodal segments of adult plant GxN15 was introduced *in vitro*, following the regeneration of plants by the organogenic route,

on a media containing 6-benzyladenine and α-naphthaleneacetic acid. The results obtained in the organogenic route have been encouraging, with the development of new shoots that have been rooted and acclimatized and are now in the study period.

## S06.252
### Micro-Propagation of 'Jinboxiang' Walnut (*Juglans regia* L.)

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Plantlets were achieved through *in vitro* propagation of axillary buds from 'Jinboxiang' walnut (*Juglans regia* L.) as explants. New shoots were produced on Driver and Kuniyuki Walnut (DKW) medium supplemented with 6-benzyladenine (6-BA) and indole-3-acetic acid (IBA). When subculturing, the proportion of optimum plant growth regulator was 1.0mg/L 6-BA and 0.01mg/L IBA. Shoots rooted successfully in Murashige and Skoog (MS) medium with macroelements reduced to 1/2 strength with 4.0mg/L IBA in darkness, then transferring to the same medium without IBA after 10 days. All regenerated plantlets were successfully acclimatized.

## S06.253
### Rooting of Micropropagated Transsexual *Pistacia terebinthus* L. Plants from Bulgaria

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The *Pistacia terebinthus* L. trees demonstrate exceptional drought resistance of the kind which allows cultivation in small-productive, stony and sliding (pliant to erosion) soils. Biotechnological approaches for preservation, multiplication and inclusion in selection programs of the rare transsexual *P. terebinthus* L. form found in the Rhodopes Mountain (Bulgaria) are under way. The aim of the present research is to improve the rooting of micropropagated plants of this form. The experiments for optimization of the rooting are made with plants from a single genotype, obtained from an embryo culture. The plant material is maintained on a solidified DKW nutrient medium supplemented with 2.5 μM BAP, 0.005 μM IBA and 30 g/L glucose. The nutrient media for root induction are prepared in two variants – liquid media with perlite as supporting material and solid media with agar. All media contain 50% macroelements, 100% microelements according to DKW with 20 g/L glucose and varying concentration of the auxin IBA (0μM, 10μM, 25μM), or combination of 10μM IBA and 0.054 μM NAA. The percent of rooted plants is evaluated after 25 days and all plants (rooted and none rooted) are potted in a peat-perlite mixture for acclimatization. The highest percent (40 %) of rooted plants is obtained on media with 10μM IBA following 25 days on the rooting media. After three weeks acclimatization a lot of non-rooted plants develop roots and survive the acclimatization. The best results (74% survival) demonstrate the plants previously cultured on the rooting medium supplemented with 10μM IBA and 0.054 μM NAA.

## S06.254
### Improvement of Germination Efficiency of Interspecific Hybrids of *Pistacia terebinthus* L. x *Pistacia vera* L.

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An isolated population of a rare transsexual form of *Pistacia terebinthus* L. was discovered in the Rhodopes Mountain in Bulgaria. The trees were studied by means *of in vivo* and *in vitro* methods and molecular markers which could allow preservation and use of the transsexual forms as rootstocks and eventually as a donor for monoeciousness in the pistachio hybridization programs. The aim of the present study is to evaluate the possibilities to cross transsexual forms of *P. terebinthus* and cultivars of *P. vera* L. We carried out *in vitro* experiments for obtaining plants of seeds from open pollination and purposeful crossings of monoecious forms of *P. terebinthus*. Two methods were tested - *in vitro* embryo rescue of mature and immature embryos and stratification in perlite after sterilization. The best efficiency of hybrid seed germination was achieved after stratification in perlite. Interspecific hybrids were developed. The survived plants were pricked in plastic pots and grown under black net in the open.

## S06.255
### Shoot Regeneration from Leaf and Mature Cotyledon Explants of Almond cv. 'Sahand'

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The leaves and mature cotyledons of almond cv. 'Sahand', a promising cultivar in Iran, was selected to be used as explants in shoot regeneration experiments. The effect of different treatments including darkness (control, 3 weeks for leaves and 1 week for cotyledons), casein hydrolysate (0, 100 mg/L), thidiazuron (TDZ) (2.5, 5 mg/L) and indol butyric acid (0, 0.1 mg/) was evaluated. Leaf explants were prepared from *in vitro* shoots previously grown on MS culture medium supplemented with BAP (1 mg/L) and IBA (0.2 mg/L). Moreover, the influence of AP medium supplemented with different treatments of TDZ (0.5, 1, 1.5 and 2 mg/L) and naphthalene acetic acid (0.18 and 0.36 mg/L) was assessed. We could obtain shoot regeneration from mature cotyledons in all but one treatment. However, none of the treatments could evoke any response in leaf explants. Further investigations are underway to get better results from leaf explants.

## S06.256
### Optimum Time for Shoot Tip Minigrafting in Persian Walnut

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Vegetative propagation of walnut still is a main problem in Iran climate condition. In this experiment, walnut seeds germinated in pots and minigrafted at two stages of growth (3- and 5-leaves). Minigrafting was carried out in June, using cleft miniscions of 1-2 cm in length. After grafting, seedlings were maintained under greenhouse conditions at high humidity. The highest percentage of successful minigrafts was observed from the 5-leaves stage (40%) compared with the 3-leaves stage (32%). Microscion growth was further in 5-leaves than 3-leaves stage (respectively 4.2 and 3.7 cm) but the minigraft's healing in 3-leaves was taken place in shorter time than 5-leaves ones (respectively 13.7 and 15.2 days). With comparison of all minigrafts in 3-leaves stage this was determined that thickness means of miniscions were further in success grafts than loss ones. Carbohydrate concentration in the miniscion is an important factor in terms of improving successful minigrafting, and miniscions with a larger diameter have higher carbohydrate reserves. The higher percentage of minigraft took using seedlings at the 5-leaves stage may be due to the larger size and, therefore, higher carbohydrate concentration in both rootstocks and miniscions. Minigrafting is a useful procedure for walnut vegetative propagation but it is necessary to find it appropriate time. In this investigation, it was determined that the 5-leaf stage is optimal. This stage occurs approximately 20 days after rootstock seed germination.

## S06.257
### Growth Trigger by Gibberelline and Sucrose in Potted Persian Walnut Seedlings

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In potted walnut (*Juglans regia*) seedlings growth will be halted when promotion of roots are in restriction. In this experiment, Persian walnut seeds after disinfection

and stratification were cultured in 13cm and 9cm height and diameter respectively pots that were filled by equal ration of sand and perlite. After germination they were irrigated by Hoagland nutrient solution each four days. Because of small volume of pots, seedlings growth were halted and terminal buds were formed after about 5 cm growth. For initiating growth again, sucrose (0, 50 and 100 gr/lit) and gibberelline (0, 50, 100 and 200 mgr/lit) were sprayed on halted seedlings. Spraying by 50 gr/lit sucrose and 200 mgr/lit gibberelline concentration had the most effect on the growth by increasing 1.9 cm in seedlings' height. 100 gr/lit sucrose concentration without gibberelline leaded to more growth than the other free gibberelline treatments but by gibberelline supplying, 50 gr/lit was the best. Gibberelline in 200 mg/lit concentration had the most positive effect; however the different between effects of 200 mg/lit and 100 mg/lit treatments was not significant (0.05).

## S06.258
## Seed Germination of *Pasania konishii*

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*Pasania konishii* is one of the original tree species in Taiwan with edible seeds. Seed propagation might be an efficient way to produce seedlings since the rooting ratio of both cutting and layering are low. Germination ratio of seeds sowed directly after harvest and passed through winter in Taipei is only 55% after 10 months. The thick hard seed coat of might be physical barrier during seed germination and the seeds may have hypocotyl dormancy. Seeds were treated with stratification in 4 °C for 2 months and 4 level destruction of seed coat included scarification, distal end removed, and pericarp removed. Germination ratio of naked seeds whether stratificated or not can be as high as 90%, and the hypocotyl germination ratio is 70% in 90 days raised to 90% in 60 days after treated with stratification. Treatment of scarification resulted in less germination days but the germination ratio and the plant survival rate are lower than non-scarification. Distal end removed can also reduce the germination time and increase the germination ratio. Germination ratio of intact seeds which stratificated for 2 months was 70% and the hypocotyl germination rate was only 30%.

## S06.259
## The Effect of Salinity and Copper on Nutrients Concentration in Shoot and Root of Two Pistachio Seedlings (cv. 'Badami-Zarandi' and 'Ghazvini') in Greenhouse Conditions

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Salinization is one of the most important problems that restrict cultivation of crops in arid and semi-arid regions. Pistachio (*Pistacia vera* L.) is one of the most important commercial trees grown in Iran that is considered a potential crop for many arid and semi-arid regions (Karimi *et al*, 2009). Micronutrient uptake is a serious problem due to high pH, concidrable amount of Calcium Carbonate, soil and water salinity, in soils under pistachio culture (Khoshgoftarmanesh, 2004). Copper is an essential element for plant growth enzymatic activity, and it performs key functions in plant respiration and photosynthesis (Woolhouse and Walker, 1981). A greenhouse experiment was conducted to study the effects of soil copper application on nutrient concentrations of pistachio seedlings (cv. 'Badami' and 'Ghazvini') in saline conditions. Treatments consisted of four Cu levels (0, 2.5, 5, and 7.5 $mg{\cdot}Kg^{-1}$soil as $CuSO_4$), and five salinity levels (0, 800, 1600, 2400, and 3200 mg NaCl $Kg^{-1}$ soil). Treatments were arranged in a factorial manner in a completely randomized design with three replications. It was measured effect of treatments on macronutrients and micronutrients total uptake such as Cu, Fe, Mn, Zn, Na, K, Ca, Mg and P in shoot and root of pistachio seedlings. The results shown that salt treatment significanty decreased K, P, Ca, Mg, Cu, Fe, Mn and Zn total uptake, but increased Na and Cl total uptake. Application of copper 5 $mg{\cdot}kg^{-1}$soil, significantly increased cu, Fe and mn in shoot. Application of copper 2.5 $mg{\cdot}kg^{-1}$soil remarkable increased Cu, P, Mg, Fe and Mn uptake in root. Total uptake of 10 element in 'Badami' rootstock was much higher than 'Ghazvini'. Data obtained in present study emphasised that 'Ghazvini' rootstock is more tolerant to salinity than 'Badami'.

## S06.260
## Physiological Disorders of 'Kaleh-Ghoochi' Pistachio as Affected by Spray Application of Boron

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The occurrence of main physiological disorders such as abscission of inflorescence buds, fruit abscission, blankness, non-splitting, early splitting and nut deformation is closely related to the yield in pistachio crop. In this experiment, the effect of boron treatments on these disorders as well as vegetative growth and the yield was investigated in two consecutive years ("on" and "off" years). Boric acid treatments were applied with different concentrations (i.e. 1000 $mg{\cdot}L^{-1}$, 2000 $mg{\cdot}L^{-1}$ and 3000 $mg{\cdot}L^{-1}$) and at different stages including early bloom, four weeks after full bloom and eight weeks after full bloom. Results showed that the response of pistachio shoots to boron treatments was strongly depend upon the time of application and the concentration used. It was shown that spray application of 3000 mg $L^{-1}$ boric acid was the most promising concentration for either decreasing the referred disorders or increasing the yield. Moreover, the analysis of boron concentration in the leaves and nuts was investigated for clarification of boron movement.

## S06.261
## Effects of Rootstocks on Fruit Yield and Quality of Apple cv. 'Golab Kohanz'

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Apple cv. 'Golab Kohanz' is a land rack tree fruit which cultivated from long times ago in central Iran (Isfahan province). Generally, apple cv. 'Golab Kohanz' is an early crop with very tasteful and juicy but it has very low yield. Therefore, more research works is needed to solve this problem. Yield performance and fruit quality were assessed for 9 years in Agricultural Research Station in Semirom (31°25' N and 51°34' E, Iran) according to the six apple rootstocks, namely: M9, B9, M26, MM106, MM111 and Kohanz (commercial rootstock for Kohanz cultivar). For the 6 years studied, cumulative yields per tree and yield per trunk cross-section area were the highest on MM111, M26, MM106 and B9 respectively, whereas trees on M9 and Kohanz were the least productive. The results showed that individual fruit weight, size were significantly higher on MM111 and Kohanz rootstock, compared with the other rootstocks. Fruits on the B9 and MM106 rootstock had the lowest weight and fruit diameter. The rootstock type also affected the fruit juice amount and soluble solid content. Fruit from plant which were grafted on B9 rootstock had total soluble solid of 13.6 %, whereas on M9 and MM106 rootstock they had 12.7% of total soluble solid.

## S06.262
## Trend of Soil Salinization and Its Effect on Pistachio Yield of Rafsanjan Orchard

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In Rafsanjan area by review of local map of desired mentioned, location and the existed result of water sample analysis of the area plus preliminary on-farm ob-

servations, some orchards which have had our preferred relative conditions were selected randomly. Along with these activities, feasible place for excavation of the soil profile was marked out. In another step, the writing of the soil profile description was done by teamwork soil scientists for the depth of 0- 40, 40-80 and 80-120 cm. in soil profile. Soil samples were taken from above depths. The electrical conductivity (ECe) of soil extract, other routine analyzed factors and needed items for the above samples were measured in the lab. Some other data in relation to the orchard which were selected and sampled gathered too. These items were general questions about the orchard management parameters. The obtained data together with general information about the orchards were processed in Excel media. In this software, desired charts and figures were analyzed by linear regression method. This curve display and its process were also done by the use of SPSS, SAS, and other needed ones. As a whole the results reveal that: 1- Salinity threshold (here defined as the average soil salinity of 40-120 cm. of soil profile layer after which yield decreases) for pistachio is 8.65 for ECe and 4.2 (about 4) $dS \cdot m^{-1}$ for irrigation water (ECiw). The above mention yield was related to Almond-Shape Pistachio varieties such as Akbari or Ahmadaghaei. 2-The obtained results also showed that the feasible orchard management, especially number of irrigation water, is able to change the yield amount considerably in saline conditions.We should keep in mind that obtained results are general relationships and their precise amounts are greatly depend on specific conditions regional orchard.

## S06.263

### Evaluation of Different Persian Walnut Offspring as Seedling Rootstocks

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Walnut is an important crops among nut tree species. In spite of its high value, it didn't have the appropriate attention in the previous research activities. One of main problems in this species is the limited number of commercial cultivars bred up to now. On the other hand research activities on walnut rootstocks are still more limited. The aim of this study was comparing the offspring of some selected walnut genotypes as rootstocks. The parents were selected based on vegetative vigor and morphological characteristics in Karaj, Kerman, Mashhad and Tabriz. The evaluation of offspring was done in 2006 and 2007. Germination percent, inter-node number, inter-node length in 2006 and plant height in 2006 and 2007 were recorded. The two years old rootstocks were grafted with Hartley and Z63 scions in 2007, and the percent of graft take were recorded for each combination. The result showed that there was a difference in mean germination of the different region. Mean germination of the offspring of Karaj and Mashhad were 35% but Kerman with 23% showed the less germination. The plant height was not different in the offspring of different regions in the first year, while the offspring of Mashhad showed more vigorous growth in the second year. The variation among the offspring of each region was considerable, so that the widest range in germination was observed among genotypes of Karaj ranging from 17 to 64. The mean graft take of regions were not highly different; but the cultivars Hartley and Z63 showed 75% and 86% of graft take respectively.

## S06.264

### The Effect of Medium and Auxin Type on Persian Walnut (*Juglans regia* L.) Micro-Shoot Rooting

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Rooting is the most important stage limiting walnut micro-propagation. In this study, micro-shoots of two Persian walnut genotypes (Z60 and Z63) were cultured on DKW and MS media supplemented with either 1, 2, 3 and 4 mg/L IBA or NAA for root induction. Micro-shoots were then transferred into the root development media containing a mixture (1:1.25) of hormone–free DKW (¼ strength macronutrients) medium and vermiculite. The highest rooting percentage (%45), root number (2.5/plant), root weight (2.6 gr/plant) and root length (3.2 cm/plant) was obtained 8 weeks after culture from the z63 plants grown on MS medium supplemented with 4 mg/L IBA, and the lowest amounts of the above traits was observed in the DKW medium containing 1 mg/L NAA. Z63 genotype significantly produced more roots with the higher values of rooting indices compared with z60. In terms of root production, significant differences were observed between the various concentrations of IBA in MS medium but not between NAA concentrations. Both IBA and NAA auxins were not significantly different in this relation when they were added to DKW medium. It was concluded that, micro-shoots of Z60 and Z63 walnut genotypes were rooted differently when cultured on various nutrient media supplemented with various rooting hormones.

## S06.265

### Effects of Plant Growth Regulators on Quantitative and Qualitative Traits of Shahani Date Fruits

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In order to, evaluation the effects of plant growth regulators on quantity and quality traits of Shahani date fruits, this study was performed in two successive years as factorial in RCBD arrangement with 4 replications. Clusters of tested palms were pollinated with distinct and equal pollen; and then were treated with different concentrations of BA, GA3, NAA and 2,4-D, alone or in combination together, in two stages: Hababook and Keimeri at ripening stage were measured traits including: ripening percentage, TSS, pH, water percentage, fruit and pit weight, length and diameter. Results showed that in treatments having 2,4-D fruit size and in treatments having GA3 and BA core size become large. TSS in control treatment was more than other treatments. Treatments having auxin and GA3 were delayed ripening than other treatments. Generally, treatments having BA with low concentrations of auxin and GA3 were suitable for improvement of quantity and quality traits of Shahani date fruits.

## S06.266

### Time of Pruning Affects Annual Canopy Growth and Fruit Production of 'Miaoli no. 1' Mulberry in Taiwan

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Mulberry (*Morus* L.) is a newly emerging fruit crop in Taiwan but its pruning model has not been well established. In order to document the best time of pruning for annual canopy growth and fruit production of a commercial cultivar 'Miaoli No. 1' (*Morus atropurpurea* Roxb., a possible synonym of *Morus alba* L.), 10-year-old field-grown trees planted in Miaoli in Central Taiwan were severe pruned monthly, i.e., 120 cm from trunk, from June (right after harvest) to September in 2009. The impacts of pruning on the annual canopy growth included shoot length, number of nodes per shoot and leaf area produced by the new shoots after pruning were measured by winter dormancy. The bloom date and fruit quality and yield the following year were examined. Results indicated that all the aspects of annual canopy growth produced by the new shoot decreased gradually with a later time of pruning, but no significant difference on dormancy period and bloom date was recorded among treatments. At harvest, the number of bearing shoots, the yield per tree, the single fruit weight and the titratable acidity content (TAC) of fruit also decreased gradually in trees that were pruned late, whereas the total soluble solid content

(TSSC) of the fruit increased with delayed pruning. We concluded that when the trees of 'Miaoli No. 1' mulberry were pruned right after harvest, a maximum annual canopy growth and maximum yield could be obtained.

## S06.267

### Influence of the Planting System on Peach Tree Growth and Productivity

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In a young peach orchard planted on the Romanian plain on brown-reddish soil, different planting systems were studied. Peach trees of five varieties: Early Rich, Royal Estate, Rubirich, October Star and Late Luka, grafted on GF 677 rootstock, were planted in the early spring 2008. Four canopies with different planting distances were formed as follows: Tatura trellis and V planting system, planted at 5.0 x 1.0 m and 5.0 x 1.5 m, Sibari Y planted at 4.5 x 1.5 m and Vertical axe, planted at 4.0 x 1.5 m. Trees were led on wire trellis (Tatura trellis), on bamboo canes (V planting system and Sibari Y) or by pruning (Vertical axe). The inter row was cultivated with a mixture of perennial grasses and mowed mechanically. Drip irrigation was provided on the row, with auto compensating drippers for every tree. On the row, the soil was maintained clean by hand and mechanical cultivation. An integrated pest management was applied. Tree growth was evaluated using the measurement of the trunk cross sectional area, number and shoots length per tree, typology of the fruit branches, foliar index, etc. In parallel, blooming intensity, fruit set percentage, fruit number, fruit size and fruit production per tree were measured and evaluated. Measurements of the light interception and light penetration into the canopy were applied. For every canopy the volume of the hand labor and other specific costs were calculated. Within a single canopy there were not significant differences between the varieties behavior. Instead, the different canopies influenced the most important features of peach trees, as growth, physiology and productivity. The results give an idea on the most suitable planting system for the new peach varieties cultivated in integrated peach orchard, under efficiency and sustainability.

## S06.268

### Abnormalities Observed on 'Barhee' Date Palm Trees Propagated by Tissue Culture

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With a view of special economic & social place of date in date plantation areas and it's essential as an important crop in horticulture territory, notice to quality advancement of this crop with extent to international standards and increase in yield seems to be necessary. Therefore, usage of propagation technology of tissue culture in order to accelerate achievement to this purpose is an essential factor. From benefits of this propagation method could be refer to a dense and fast propagation of cultivars which their crop quality and / or their pollen quality are proved. Palm trees free of viral diseases producing, re-establishment of destroyed palm orchards in post war conditions or years of drought caused usage of tissue culture method instead of traditional method took in consideration. Still, there are probable incidences of genetic and epi-genetic changes in resulted progeny. The current research work was done in Jiroft area of Kerman province, in order to evaluate the situation of the date palm trees of 'Barhee' cultivar were derived from tissue culture method. In this investigation, 20 date palm trees of 4-year-old of 'Barhee' cultivar were evaluated during a year for vegetative and generative abnormalities, such as: tree dwarfism, rolling up of inflorescence, tip bending, the huge number of suckers and offsets, unsuccessful pollination and production of different kind of parthenocarpic fruits with 3-6 carpels. In order to achieve more accurate observations, this study will conduct another year and then they obtained data will analysis from statistical point of view and then the final report will release.

## S06.269

### Effect of High Doses of Nitrogen Applied to the Soil Previous to Fruit Harvest on Productivity, Vegetative Growth and Fruit Quality in the Highly Productive Sweet Cherry (*Prunus avium* L.) Combination 'Bing'/ 'Gisela® 6'

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Nitrogen applications to the soil close to fruit harvest are not a common practice in sweet cherry orchards due to their possible negative effects on fruit quality. In Chilean orchards, most soil applications are split, applying a low amount of N in early spring and the rest (most of the dose) later, during the postharvest period, to minimize detrimental effects on fruit firmness, color and early decay during storage. To date, the effect of high N doses in highly-productive sweet cherry dwarfing combinations previous to fruit harvest has not been studied in depth. In this regard, the objective of this study was to evaluate the effect of different N doses applied to the soil before fruit harvest in the semi-dwarfing combination 'Bing'/'Gisela®6'. The experiment was carried out in 2009 in a 7-yr-old sweet cherry orchard located at Rancagua in the Central Valley of Chile (34°7'S, 70°43'W). Trees were treated considering a completely randomized design with two factors: (a) Stage of fruit development [cell division (SI), pit hardening (SII) and fruit enlargement (SIII)] and (b) N dose (0=control, 50, 100, 150 and 200 kg of N/ha). The source of N was ammonium nitrate and urea (commercial source: UAN 32). Trees were evaluated for vegetative growth parameters (individual and total shoot length/tree, leaf area of shoots and spurs and trunk sectional area), fruit yield (kg/tree), and fruit quality at harvest [weight (g), size (mm), soluble solids content (S.S.C., %), firmness (N), titratable acidity (%)], mechanical damage (bruising and pitting), and pedicel dehydration. Additionally, fruit of each treatment was evaluated under modified atmosphere conditions (0 °C) for 40 days after harvest (DAH). Preliminary results indicate that N applications during SI increased fruit size compared to the control. However, for all application dates and doses, control trees registered the highest S.S.C. and yield. Regarding fruit mechanical damage 40 DAH, N applications during SIII showed the highest levels of mechanical damage. In terms of vegetative growth there we not significant differences among treatments.

## S06.270

### Effect of Timing of Soil Nitrogen Applications on the Absorption and Partitioning of the Fertilizer on the Semi-dwarfing Sweet Cherry (*Prunus avium* L.) Combination 'Bing'/ 'Gisela® 6'

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There is little information about the effect of timing of soil Nitrogen (N) application on the absorption and partitioning in dwarfing sweet cherry combinations using the 'Gisela®6' rootstock. To optimize the fertilization strategy in dwarfing sweet cherry trees is important to maximize the N use efficiency (NUE) by defining the most appropriate timing of the N soil application. In this study, double labelled ammonium nitrate ($15NH_4$ $15NO_3$) was applied to the soil in a 5-yr-old "Bing"/ "Gisela®6" sweet cherry orchard located in Rancagua, VI Region of Chile (34° 7'49.66"S, 70°43'15.70"O) during the growing season 2007/2008. The main objective of the experiment was to determine NUE and N partitioning in whole trees depending on the timing of N application. The $15NH_4$ $15NO_3$ was applied to the soil in three different times, which constituted the treatments (TR): TR1= pre-harvest, stage II of fruit development (30 days after full bloom, DAFB), TR2= early postharvest (100 DAFB) and TR3= late postharvest (160

DAFB). The whole trees were destructively harvested in two moments after the TR: (a) dormancy and (b) stage I (SI) of fruit development of the following spring. Trees were separated in different organs, dried (70 °C x 10 d), ground and processed for GC-MS analysis. In winter, roots registered the highest NDFF% relative values in all TR. During SI spring 2008/2009, the highest NDFF% relative values were found in roots and leaves. TR2 had a highest total NDFF (mg) level during winter. At SI spring 2008/2009 the total NDFF (mg) values were not significantly different among TR. In terms of NUE (%) in winter, the highest NUE (%) was observed in TR2, however, at SI spring 2008/2009 there were no significant differences among TR.

## S06.271

### Effect of Synthetic Mulch on Root Growth, Productivity and Fruit Quality of the Highly Productive Sweet Cherry (*Prunus avium* L.) Combination 'Lapins' / 'MaxMa® 14'

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The effect of synthetic mulch on root growth and physiology of highly productive sweet cherry dwarfing combinations has not been reported in depth. There is little information about the influence mulch on of root phenology and distribution along the soil profile. To understand better the effect of synthetic mulch on root distribution and growth, reproductive and vegetative aerial development and fruit quality, a study has been carried out since 2009/2010 growing season in a in a 7-yr-old 'Lapins' / 'MaxMa14' sweet cherry orchard located in Los Niches, VII Region of Chile (35°02'S; 71°11'W). The mulch is being used as an alternative to improve the productivity and vigor of the orchard since it showed poor yields and reduced vegetative growth the last two growing seasons. The study evaluates two treatments (TR): TR1: trees with synthetic mulch on the row and TR2: trees without synthetic mulch on the row. For the first season, each TR was evaluated weekly for 5 repetitions (5 trees/rep.). Trees were evaluated for root growth using a traditional 1 m3 rizhotron chamber (total root number and total root length at three depths along the soil profile: 0-30 cm, 30-60 cm and 60-90 cm)), vegetative growth (individual and total shoot length/tree, leaf area of shoots and spurs and trunk sectional area), fruit yield (kg/tree) and fruit quality [weight (g), size (mm), soluble solids content (S.S.C., %), firmness (N) and color (%)]. In addition, soil humidity (%) and temperature (T°C different depth) was measured for both TR. The mulch decreased the soil temperature on average 1.3 º C and maintained higher soil moisture (-15.8 Kpa) to respect TR2. The peak of root growth for both treatments was observed 50 days after full bloom (DAFB), but the distribution of roots along the soil profile was different for TR. In TR1, the highest root concentration (44.3%) was between 30 and 60cm soil depth, followed by the 60 to 90 cm soil depth (35.4%). In the TR2, the highest root concentration (45.3%). Root number and total root length in TR1 were higher in the first 60 cm of soil. In contrast, TR2 registered the highest root number and length between 60 and 90 cm of soil depth. There were no significant differences between TR for fruit yield and quality. It seems that although there were differences in root growth and development, only one season study is not enough to conclude the effect of synthetic mulch and further years of research are required.

## S06.272

### The Effect of Sampling Year and Geographical Regions on Some Physical Characteristics of Hazelnut Cultivars Grown in Turkey

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The aim of this study was to investigate effect of different sampling year and geographical regions on some physical characteristics of six hazelnut cultivars, such as Cakıldak, Fosa, Mincane, Palaz, Tombul and Uzunmusa. For this reason samples were taken from the same commercial hazelnut orchard located in Bolu Akcakoca, West Black Sea Region during 2005-2006 harvest period and also from Hazelnut Research Institute in Ordu, East Black Sea region in 2006 harvest period. Physical characteristics such as nut width, length and thickness, nut color, splitted nut ratio, empty fruit rate, twin fruit rate, shrivelled nut rate and rate of kernel weight to nut weight were determined in three replications. Each of them included 100 inshell nuts for each cultivar. Data were statistically analyzed at $P<0.05$ error level based on year x cultivar and geographical region x cultivar interactions. As a result of this study, the effect of year on nut characteristics investigated here showed significant differences based on cultivars. Significant effect of geographical regions on these characteristics of cultivars was observed.

## S06.273

### Camp Content in the Fruit of Thirty Chinese Jujube Cultivars

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Chinese jujube (*Ziziphus jujuba* Mill.) is used as both fruit and traditional Chinese medicine. Cyclic adenosine monophosphate (cAMP) is one of the main nutritional and functional components. The cAMP detection method was studied and cAMP contents in fruits of thirty Chinese jujube cultivars were analyzed. The optimized method for detection cAMP in Chinese Jujube by HPLC was as follows: using Agilent Eclipse XDB-C18 (4.6×150mm, 5um) column with mobile phase of methanol: 20 mmol $KH_2PO_4$ (V;V)=10:90 and the flow rate of 0.8 mL/min, measured by an ultraviolet detector under 254 nm×0.2 AUFS. The results showed the calibration curve was linear with the range of 1~50μg/mL. The mean recovery was 103.9%. The average relative deviation was 1.19% (n=5). The contents of cAMP in the fruits of thirty Chinese jujube cultivars were tested and analyzed using HPLC mentioned above. The results showed that there were extremely distinct differences in the contents of cAMP among cultivars. 'Malingcuizao' had a highest content of cAMP (287.37ug/g), while it was only 55.06ug/g in 'Zanyou No.1'. 'Minqindazao' and 'Taiguhuluzao' also had rather high contents of cAMP, being 277.39ug/g and 248.55ug/g respectively. Therefore, the most valuable Chinese Jujube cultivars in terms of cAMP content should be 'Malingcuizao' 'Minqindazao' and 'Taiguhuluzao' in this experiment. The developing and utilizing of bio-active substances such as cAMP in these cultivars are feasible.

## S06.274

### Physiological and Biochemical Changes of Apricot and Peach Varieties PPV Infected and PPV Free

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PPV virus determines severe damage on stone fruit species all over Europa. This virus determined some change of leaf color from light green to green-yellow. Therefore, pigments and photosynthetic activity of tree are affected by infection process. The aim of this paper was quantitative evaluation of leaf decolorization determinate by virus, using physiological parameters (photosynthesis and respiration), pigments chlorophylls and carotenoids, chromatic parameters and reflectance spectra. We quantified all this parameters on PPV infected and healthy peach and apricot varieties previously ELISA checked. We highlighted photosynthesis weaker and higher respiration intensity and also a lower content of chlorophylls at infected compared to health varieties. The results obtained evidence that it is possible to use L*, b* and h° parameters and reflectance spectras for diagnostics of physiological state to differentiate between health and infected varieties.

## S06.275

### α-Cinnamomin Elicit a Defence Response against *Phytophthora cinnamomi* in *Castanea sativa*

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*Phytophthora cinnamomi* and *P. cambivora* are considered as the causal agents of *Castanea sativa* ink disease. These soil-borne plant pathogens invade and destroy the root system leading to the death of the trees. Most *Phytophthora* species secrete elicitins, a group of unique highly conserved proteins that are able to enhance plant defence responses in a systemic acquired resistance manner against infection by several pathogens. A cluster of elicitins was identified in *P. cinnamomi* (Duclos *et al*, 1998) and the crystal structure of ß-cinnamomin determined (Rodrigues *et al*, 2006). α-cinnamomin was shown to restrict the invasion of root cortical tissues by *P. cinnamomi* preventing vascular colonization in cork and holm oak (Medeira, *et al*. 2007). In the present work, roots of chestnut plantlets grown *in vitro* were allowed to absorb α-cinnamomin at 100 µg/ml for, two days before being inoculated with *P. cinnamomi* and we studied the effects of pathogen on root colonization. Light and transmission electron microscopy observations showed that *P. cinnamomi* was restricted to the cortex of 65% of the roots pre-treated with α-cinnamomin. In these roots, the vascular cylinders were free of pathogen. On the contrary, the pathogen reached the vascular cylinder, penetrating the phloem and xylem vessels in all non-treated assayed roots. The signs of pathogen degradation in the cortical parenchyma, mainly in the intercellular spaces, and the increase of epidermal and sub-epidermal cell wall thickness associated with phenol-like compounds strongly suggest that α-cinnamomin induced in chestnut defence reactions against *P. cinnamomi*.

## S06.276

### Studies on Growth Disorders of Pistachio Caused by Root-Knot Nematode (*Meloidogyne javanica*) in Mahvelat Iran

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Pistachio is one of the most important of horticultural products in Iran. Numerous of diseases are affected to pistachio in the world. Gummosis, verticillium wilt and root-knot nematodes are the most important diseases in the world. Root-knot nematodes, *Meloidogyn*e species, are endoparasitic nematodes that reduced products and cause to structural, physiological and biochemical disorders in plants. Severity of damage is depended on species and intensity population nematode. In this survey, pistachio gardens of Mahvelat region (Razavi Khorasan province – Iran) with two cultivars, Ohadi and Badami, were studied. *Meloidogyne javanica* was found in the area with high populations. The experiments were setup with 50 replications in 2×5 factorial experiment in an imbalanced Completely Randomized Design. Number of galls and egg mass on the roots were measured. Amount of leaf chlorophyll, leaf surface, leaf necrosis, tree height, east-west spread, north-south spread, growth of annual branch, diameter of annual branch and fruit yield were determined. Results showed that with increasing of gall index/egg mass, growth characteristics of plant were significantly reduced according to Tukey test. There was no difference among the treatments about leaf necrosis and diameter of annual branch. Amount of chlorophyll and fruit yield in Badami cultivar were decreased significantly comparing with Ohadi cultivar.

## S06.277

### Comparison of Different Methodologies for the Estimation of Chilling Requirements of Five Sweet Cherry (*Prunus avium*) Varieties

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Over the last 40 years, trends toward advances in dates of flowering stages, because of global warming at springtime, have been observed for different fruit tree species. Moreover, the analysis of temperature data has also highlighted clear changes toward warmer temperatures during the endodormancy phase (autumn and early winter) when the buds need chilling effects to break the dormancy phase (chilling requirements). This new situation has led to an increasing concern in many parts of Europe that cropping of perennial fruits may provoke slow of insufficient accumulation of chilling effects. Genetic adaptation of varietal ranges toward lower chilling requirements must become a major breeding objective. Preliminary studies in sweet cherry (*Prunus avium*) were conducted in order to establish an effective and precise protocol for the quantification of chilling and heat requirements for flowering. This methodology could later be used over large numbers of genotypes, in order to investigate the genetic determinism of chilling and heat requirements. Two different types of forcing tests were compared. The first is based on current growth tests by exposing shoots to controlled warm conditions and by recording data on phenological evolution. The second consists in early growth tests by comparing the weigh of floral primordia in orchard conditions at a given date to the weigh of floral primordia issued from a shoot sample taken at the same date but submitted to warm conditions (Tabuenca's test). Five varieties ('Earlise', 'Garnet', 'Lapins', 'Regina', and 'Summit') were studied during two years at the experimental site of INRA-Toulenne (Southwest France). Out of these, two varieties ('Earlise' and 'Summit') were also studied at a second site, Ctifl-Balandran (Southeast France), during three years. Different models for the estimation of chilling requirements (Weinberger, Bidabé, Utah, dynamic model) were compared. Between-tests, between-years, and between-sites differences were studied and discussed.

## S06.278

### Different Physiological and Metabolic Responses of Pomegranate Genotypes to Freezing Stress

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Unexpected chilling and freezing is one of the most important problems for pomegranate growers in Iran. For example most pomegranate orchards were completely destroyed in the region because of severe winter freezing in 2008. Therefore a factorial experiment based on completely randomized design (CRD) was performed during 2008. Six genotypes included (Shirin e Poost Ghermez, Poost Sefid, Shahvar, Torsh e Malas, Shalghami and Shishe cap) and 9 temperatures in the range of -10 to -24 °C were compared. The results showed that the amount of browning, proline content, electrolyte leakage and antioxidant activity were increased by freezing incubation, whereas survival percentage was decreased. Not any re-growth was recorded in 3 genotypes (Shirin e Poost Ghermez, Poost Sefid, Shahvar) in -18 °C but Torsh e Malas, Shalghami and Shishe cap genotypes showed 30, 21.5 and 61.2 survival percentages respectively. The cultivar 'Shishe cap' could stabilize its membrane structure and electrolyte leakage to -20 °C. The proline content of 'Shishe cap' showed 12-fold increase at -24 °C in comparison with control. Therefore it seems that 'Shishe cap'cultivar was able to retain its osmotic potential effectively compare with the other cultivars.

## S06.279

### Stoma Behavior of Fig Leaves (*Ficus carica* L.) under Deficient Irrigation

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Water deficiency is the most problem for cultivating of fig (*Ficus carica*) in Iran. The research has been made in 2008 using "Green", "Black", "shah anjir" and "Matthew" local cultivars to study the stoma behavior of leaves in different systems of deficient irrigation in Ferdowsi University of Mashhad. Four level (treatments) of irrigation including supplying enough water for vases (100% field capacity) mild tension (75% field capacity) average capacity(50% field capacity)and severe capacity(25%field capacity) were applied. The results showed that the length, width and size of the stoma, width and size of guard cells decreased in treatments under severe dry stress but among the different types, the"Green" cultivar one had the least length, width and size of stoma and the least width and size of guard cells.

## S06.280

### Biological Changes and Active Oxygen-Scavenging Enzymes Activities in Apricot (*Prunus armeniaca* L.) Flower Buds during Dormancy Transitions

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The adaptability of apricot (*Prunus armeniaca* L.) to specific environments is strongly influenced by the overcoming of flower bud dormancy. In order to establish the involvement of the antioxidant enzymes during the dormancy process, the relationship between flower bud biochemical status and biological response to dormancy overcoming was investigated. The changes in activity of the oxygen-scavenging enzymes catalase (CAT), ascorbate peroxidase (APX) and guaiacol peroxidase (GPX) were analyzed during the flower bud dormancy process in several cultivars of different geographical origin. Breaking of endodormancy was quantified by determining the chilling required for the bud-burst. The cultivars were classified into three model types based on their Chilling Requirement (low, medium and high). During the dormancy period, the biochemical analysis revealed changes in the activities of CAT, APX and GPX. The CAT and the non-specific peroxidase GPX, resulted the most involved enzymes, at the release of endodormancy, in cultivars with low and medium Chilling Requirement.

## S06.281

### Photosynthetic Capacity, Chlorophyll Fluorescence and Leaf Reflectance Responses of *Prunus avium* L. to Different Irradiance Levels

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Orchard management practices to optimize the fruit set, development and yield can be improved by the knowledge of the physiological parameters of the plants. In 2009, variations in leaf gas exchange, chlorophyll fluorescence, reflectance indexes, growth and productivity were studied in eight-year old drip-irrigated *Prunus avium* L. cultivars Skeena and Sweetheart grafted on Edabriz in Northern Portugal. Measurements were conducted in sun and shade leaves at two different irradiance levels (high light: PPFD 1200-1600 $mmol \cdot m^{-2} \cdot s^{-1}$ and low light: PPFD 40-200 $mmol \cdot m^{-2} \cdot s^{-1}$). Both two cultivars had similar growth, production and accumulated production. As expected, at high light conditions net $CO_2$ assimilation rate (A), stomatal conductance (gs) and transpiration (E) rates were higher in sun leaves. In opposition, at low light there were no significant differences between sun and shade leaves. With respect to the chlorophyll fluorescence properties, dark-adapted sun leaves had the lowest maximum photochemical efficiency of photosystem II (Fv/Fm). Nevertheless, those leaves at high light had the highest quantum yield of PSII (ΦPSII), photochemical quenching coefficient (qP) and non-photochemical quenching (qNP). Moreover, at low light conditions ΦPSII and qP were higher in shade leaves and qNP was higher in sun leaves. Regarding the leaf optical properties, sun leaves presented the highest structural independent pigment index (SIPI), which reflects a higher carotenoids/chlorophyll a ratio, particularly important in non-radioactive energy dissipation. These results suggest that those cultivars beneficiate from management practices that optimize the canopy light exposition.

## S06.282

### The Photosynthetic Activity and Evaluation of Fruit Quality in Seven Fig Cultivars (*Ficus carica* L.)

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The study was carried on five-year-old trees grown in the orchard of Agricultural University of Athens. The seven cultivars studied were 'Kymis', 'Fracassana', 'San Pedro' and 'Politiko' (white cultivars) and 'Vasilika Black', 'Vasilika Melia' and 'Mission' (black cultivars). The rate of $CO_2$ assimilation (PN) and stomatal conductance (gs) were measured using a portable infra-red gas analyser. To evaluate fruit quality, the following characteristics were measured: Fruit diameter and weight, fruit (phloem) color and firmness, pH and acidity, soluble sugar concentrations using HPLC and total soluble solids (TSS). The maturation period of fruit was also determined. PN and gs significantly differed amongst cultivars. 'San Pedro' and 'Vasilika Black' shown the highest values while 'Politiko' the lowest. The mean fresh weight and fruit diameter were greater in cvs 'Politiko' and 'Kymis', while 'Fracassana' had the smallest value. Fruit firmness was least in 'Vasilika Black' and highest in 'Politiko'. Juice acidity was similar in 'Fracassana', 'San Pedro' and 'Vasilika Melia' with much higher pH values than the other cultivars. Glucose, fructose and sucrose were the main soluble sugars found in mature fruits of all cultivars: Glucose concentration was the highest, in all cultivars followed by fructose, and sucrose at much lower concentrations. 'Fracassana' and 'San Pedro' had higher total soluble sugar concentrations than the other cultivars, while TSS was higher in 'Kymis' and 'Mission' cvs. PN was significantly linearly correlated with gs (r=0.724), and the total sugar concentrations in fruits (r=0.383), while total sugar concentrations were significantly correlated with TSS (r=0.311). Under the environmental conditions of Athens, 'San Pedro' was the earliest maturing cultivar, followed by 'Mission' and 'Politiko', while the latest maturing was 'Vasilika Melia'.

## S06.283

### Estimating Break Dormancy in Sweet Cherry (*Prunus avium* L.) Cultivars in Hot Mediterranean Climates

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In sweet cherry cultivars, as an estimation method to know if breaking dormancy occurs, is rather usual to relate bud weight and bud evolution when they have cumulated different chill hours below 7 °C. However, in Mediterranean hot climates, it has not been observed a clear relationship between buds weight and cumulated chill hours for breaking dormancy. In a first step it was thought that the observed deviations at this respect could be connected to number of primordial flowers present in buds before sprouting. That is, the more the bud weight the bigger the flower number inside of bud. So, it was considered that was better to replace buds percent in state B-C instead bud weight for estimating break dormancy in relation to Chill Units accumulated. To validate this new method, it was made choice of 10 sweet cherry cultivars located in Cieza, Murcia. The days 5th, 10th and 15th January 2009 it was removed several dormant shoots out of each cultivar and put into jars with a 5 g/l sucrose water

solution soaking the basal end. Latter, it was recorded percents of buds in state B-C. In other shoots batch were weighted the buds and count their primordial flowers for finding the relationship between both variables: weight and number of flower. These three variables showed differences in values highly significant, what didn't allow establishing any conclusion. On the other hand, linear correlation coefficients between buds and flowers weight showed that any relationship between weight and flowers number of buds didn't occur. These results are in agreement with the behaviour of cherry flowering in hot Mediterranean countries, where a staggered flowering usually occurs. In fact, it is normal in these climates to observe flowers and leaves coincidence in sweet cherry, although in spite of that normal harvest were made every year.

## S06.284

### Effect of Daily Cycles Combining Moderate, High and Low Temperatures on Apricot Dormancy Release

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Efficiency of different temperature cycles on reproductive and vegetative bud dormancy release in apricot was evaluated. Effect of temperature treatments was evaluated when different amounts of chill were accumulated in field conditions (0, 107 and 215 CU), that is to say when different chilling requirements were satisfied. Temperature cycles were applied during 60 days in growth chambers (continuous temperature of 5 °C and temperature cycles of 19h/5h at 5/15 °C, 5/20 °C and 5/25 °C, as well as the same temperature cycles after pre-treatment of 5 °C during 30 or 45 days). After the temperature treatments, all shoots were forced at 25 °C until budburst. Mean time to budburst (in days) of vegetative and reproductive buds was evaluated. Efficiency of the different treatments was highly influenced by the state of bud dormancy when shoots were cut. When no chill had been accumulated, continuous 5 °C was the most efficient treatment, followed by 5/15 °C. However, when shoots had already received certain chill accumulation in field conditions, 5/25 °C was always the most efficient treatment, whereas 5/15 °C and 5/20 °C became as efficient as 5 °C. A similar trend was observed both in reproductive and vegetative buds for all temperature treatments, even though reproductive buds showed lower chilling requirements than vegetative buds. The results showed that high temperatures, such as 25 °C, can be very efficient for dormancy release when applied in a daily cycle with low temperatures after partial chilling has been accumulated. The introduction of this differential effect for different temperature cycles could help to improve the models to estimate dormancy release.

## S06.285

### Effects of Water Salinity on Growth Indices and Physiological Parameters in Some Wild Pistachio Rootstocks

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The effect of four water salinity levels (0.75, 5, 10 and 15 $dS \cdot m^{-1}$) on growth indices and physiological parameters of four *Pistacia vera* L. rootstocks (*P. atlantica*, *P. atlantica* subsp. *kurdica*, *P. atlantica* subsp. *mutica* and *P. atlantica* subsp. *cabulica*) were investigated under greenhouse conditions. Leaf dry weight was reduced to about 30-54% at ECw of 10 $ds \cdot m^{-1}$. Chemical analysis of shoot and root indicated that the concentration and distribution of $Na^+$, $K^+$ and $Ca_2^+$ in pistachio rootstocks were affected by salinity. The concentrations of Na+ and K+ increased in shoot with a rise in water salinity level. Comparison between Na+ concentration of shoot and root showed that all rootstocks limited the Na+ transportation to shoot tissue up-to 15 $ds \cdot m^{-1}$, and retained it in the roots. However, this ability was weaker in Kurdica rootstock. Based on measured parameters Atlantica and Kurdica could be considered as tolerant and sensitive pistachio rootstocks to water salinity, respectively. Keywords: *P. atlantica*, *kurdica*, *mutica*, *cabulica*, Salinity, $Na^+$, $K^+$

## S06.286

### The Evaluation of Chlorophyll Fluorescence between Six Native Pistachio Cultivars of Iran

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Considering to different climate of pistachio production regions in Iran, selecting of suitable cultivar for each region is necessary. Ecophysiological characteristics of cultivars show genetically differences between them and their reaction to the environmental conditions. The investigation of these characteristics can lead to deeper understanding of mechanisms that have correlation with growth, yield and acclimation and can be used as a good criterion in cultivar selection for each region. One of the most important ecophysiological characters is chlorophyll fluorescence. In this investigation chlorophyll fluorescence of six cultivars of pistachio, Ouhadi, Kalleh-ghoochi, Akbari, Ahmad-aghaei, Rezaei-zoodrass and Harati was measured. The measurements were done in On- and Off-shoots and in six fruit development stages. During different stages of measurement, photochemical quantum yield (Fv/Fm) that is resistant index to stress, increased at first but it decreased at later stages. The results showed that the highest maximum quantum yield is related to Kalleh-ghoochi cultivar and after that to Ahmadaghaei, Ouhadi, Harati, Akbari and Early rezaei, respectively. Thus, it is suggested that in the case of the presence of environmental stress problems the cultivars with high ecophysiological and photochemical quantum yield e.g. Kalleh-ghoochi should be used.

## S06.287

### The Effects of Kaolin Particle Films on Leaf Net Assimilation Rates and Shoot Growth of Immature 'Western' Pecan Trees in Southern New Mexico

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Pecan orchards are slow in coming to production, usually taking 6-8 years before bearing the first commercial-size harvest. The purpose of this study is to evaluate whether kaolin particle film increases leaf net assimilation, growth and establishment rates of immature 'Western' pecan (*Carya illinoinensis*) trees grown under hot, high light intensity, low relative humidity conditions of southern New Mexico, USA. Canopies of trees in their first leaf and second leaf were sprayed with a kaolin particle (Surround® WP) suspension eleven times from early May through early October, 2009, at approximately 3 week intervals. Net assimilation rates of fully sun-exposed leaves measured mid-season, July 15, 2009, on kaolin particle-film treated second-leaf trees were 47.8% higher than that of untreated control trees during the 1000-1200 HR time period but did not differ significantly from the control earlier or later in the day. However, by the end of the 2009 growing season there were no statistically significant differences in trunk diameter, total current-season shoot length or percentage fruiting terminals for the first- or second-leaf trees. Vegetative growth and fruiting will be again monitored in the 2010 season.

## S06.288

### Effects of Chilling Tempratures on Proline, Total Protein, Sugars and Nutritional Elements of Flower Buds of Pistachio Trees

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Late spring frost has an important role on reducing yield and fruit quality of pistachio trees. The present research was done to evaluate effects of chilling temperatures on proline, total protein, sugars and nutritional elements of flower buds of pistachio trees. This study was conducted using a split-plot design with three replications where the main factor was three times of dormancy (winter), flowering (beginning of spring) and after spring frost and secondary factor was pistachio cultivars ('Ahmad-aghaee', 'Ouhadi', 'Kaleh-ghochi' and 'Akbari') which was done at Ferdowsi University of Mashhad and Institute of Pistachio Research of Iran (Rafsanjan). The Studied Variables included proline, total proteins, sugar and nutrient elements were assessed. The highest rates of proline (27.36 mg/g fresh weight of flower bud) and lowest (7.86 mg/g) were found in Ahmad-aghaee after chilling injury and bud swelling, respectively. The highest rate of total protein was shown by 'Akbari' (70.79%) and 'Ouhadi' (71.25%) at flower burst time, and the lowest amount was obtained at bud swelling time of 'Ouhadi' (25.39%) cultivar. Data showed the increment of nitrogen, potassium, zinc and iron contents of clusters, which illuminates the relationship between chilling resistance and nutrient elements.

## S06.289

### The Effect of the Flowering Time of Different Cultivars of Almond'S Hard Shell on Its Seed's Dormancy Breaking Time and Germination

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Seed's dormancy is considered as one of the effective factors in seeds' germination and consequently in the growth of seeds of many herbal species. Shortening the dormancy period and enhancing the germination percentage in fruit types could be a valuable strategy for the seed researcher and plant nurseries. In this research the seeds of different hard shell almond cultivars (Sahand late-flowering, Touno middle-flowering cultivars, and Bomi1 early -flowering) were used. First, the seeds' samples were exposed to the running water for 24 to 28 hours. After that the seeds were kept in the wet perlit (to the extent of field capacity) at 4 to 6 °C for 15 weeks. Percentage of seeds germination was recorded during cold stratification once a week. The results showed that different treatments have significant effect on the decrease of the time of different cultivars' seed germination; in other words, on the decrease of the chilling requirement in them. In such a way that seeds of Touno middle-flowering, Sahand late-flowering and Bomi1 early -flowering cultivars have more growth rate and higher germination uniformity respectively.

## S06.290

### Detection of Aroma Compounds of Some Apricot Cultivars by Headspace Gas Chromatography Technique

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A study was aimed to detect aroma profile of 21 apricot genotypes such as Turfanda Eski Malatya, Karacabey, Paviot, Zerdali No.1, Aprikoz, Soğancı, Hasanbey, Levent, Royal, Şekerpare, Çataloğlu, Kabaaşı, Stark Early Orange, Sakıt-3, Şam, Hacıhaliloğlu, İri Bitirgen, Casna Drenova, Çöloğlu, Ordubat, İmrahor which are grown Malatya provinces of Turkey. Aroma compounds of experimental varieties were separated, identified and quantified using Gas chromatography (GC) with mass spectrometry detection. Extraction was done automatically using headspace apparatus of GC/MS. According to the results aroma composition of apricot genotypes were ranged from genotype to genotype and local genotypes were detected having higher concentration in terms of identified aroma compounds.

## S06.291

### Nutritional Value and Health Care Functions of the Chinese Jujubes (*Ziziphus jujuba* Mill.) and the Wild Jujube Fruits (*Ziziphus spinosus* Hu.)

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The Chinese jujube (*Ziziphus jujuba* Mill.) and its wild species, acid jujube (*Ziziphus spinosus* Hu.) can provide not only a wealth of energy to the bodies, but also mineral elements and bioactive substances for health care functions. 1 Studies on nutrition and chemical composition 1.1 Carbohydrate: They have significant amounts of carbohydrates, primarily including glucose, fructose, sucrose, and oligosaccharide, Arab PG and galactal PG, a composite of glucose and fructose. 1.2 Protein and Amino acid: The crude protein content was 2.92% in dried Chinese jujube fruit and the Chinese jujube contains 16 kinds of amino acids in all. 1.3 Crude fiber 1.4 Vitamins and Carotin: Vitamin C in the fresh fruits of Chinese jujube and wild jujube is the most abundant, thus known as the "live vitamin C" and "Natural Vitamin pill ". 1.5 Mineral elements: It showed that fresh jujube fruits contented 14mg Calcium, 23mg phosphorus, 0.5mg iron, 61mg calcium, 55mg phosphorus and 1.6mg iron. 1.6 cAMP and cGMP: The cAMP content was between 0.74~105.03μg/g and between 1.30~52.78μg/g in fresh Chinese wild jujube fruits. The cGMP was between 4.2~220.9μg/g in dried fruits. 1.7 Triterpenic acid and saponins: The major triterpenoid-type substance such as lupine type, betulinic acid, oleanolic acid and ursolic acid have been detected from Chinese jujube fruits. It demonstrated that the total saponins content was between 1.885~4.448mg/g, averaging 3.276mg/g.

## S06.292

### Evaluation of the Temperature Effect and Pectinolytic Enzyme Complex to Obtaining of Compounds Carotenoids from Bagasse Cashew Apple

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The apple cashew bagasse, byproduct of the juice industry, constitute a source of polyphenols and carotenoids, compounds of high added value in terms of their functional properties in food, beyond the dyeing power of carotenoids. The objective of this study was to evaluate the efficiency of maceration of pomace of cashew apple in temperatures of 30, 35 and 40 °C for one hour to obtain carotenoid compounds. The extract was obtained by sequential prenssing bagasse with water at a ratio of 1:1 (residue: water), macerate for 1 hour at 30, 35 and 40 °C. A pectinolytic enzyme complex was added (500 ppm) the residue before the first pressing. The application of enzymes in the process showed an overall gain of 23%. Among the extracts obtained with pectinolytic enzymatic complex the highest levels of carotenoids were obtained at temperatures of 30, 40 and 35 °C, respectively.

## S06.293

### Influence of Maceration Time and Enzimatic Concentration to Obtaining of Carotenoids Compounds from Bagasse Cashew Apple Extract

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The cashew tree is a typical culture of the Brazilian northeast of great socio-economic importance. The cashew bagasse extract is a source of carotenoids, which can acquire high-value due to their use as natural dyes in foods, and antioxidant func-

tional properties. The objective of this study was to evaluate the influence of soaking time and pectinolytic enzyme concentration to obtain carotenoid compounds from cashew apple. To select the best time, enzyme concentration and pomace: water proportions for soaking, we used a temperature of 30 °C, the proportions of pomace: water (1:1 and 1:2, respectively), with concentrations of 250 ppm , 500 ppm of enzymes and the control group without enzymes, treated for one, two and three hours. The extract was obtained by sequential prenssing with water at a ratio of 1:1 (residue: water) homogenized for one and two hours in temperatures of 30 °C. To obtain the extract with pectinolytic enzyme complex, was added 500 ppm of enzymes before the first pressing. The best conditions of enzyme concentration and residue: water proportion were the addition of 500 ppm of pectinolytic enzyme complex in aqueous solution and soaking in a 1:1 ratio. All extracts macerated for an hour, with and without addition of enzymes showed higher levels of carotenoids than extracts macerated for two hours at 30 °C.

## S06.294

### A Polygalacturonan Isolated from the Fruits of Chinese Jujube and Its Effect on the Proliferation of Cultured Lymphocytes

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A purified polysaccharide JuBP-2 was isolated from the water extract of the fruit of Chinese jujube (*Ziziphus jujuba* Mill.), an important traditional Chinese medicinal and fruit tree. Chemical and spectroscopic analyses indicated that JuBP-2 is a highly branched polygalacturonan interspersed with rhamnogalacturonan in the main chain. JuBP-2 had a molecular mass of 1600 000Da with [α]20D+154(c=1.05,$H_2O$). It was composed of rhamnose, arabinose, glucose, galactose and galacturonic acid in a molar ratio of 1:8.83:2.08:7.44:33.79. The main backbone chain in JuBP-2 was mostly composed with (1→4)-linked α-D-GalA interspersed with 1,2-linked α-L-Rha and the side chains were attached to the backbone at the O-4 position of rhamnose residues. Arabinose, glucose and galactose were in the side chains. Arabinose was present in the funan form. Most Araf (67.75%) is 1,5-linked and the rest is 1,3,5-linked. Galactose was present in the pyranose form and predominantly 1,6-linked in the complex. In addition, 1,3,6-linked and some terminal-linked Galp were also detected. Glucose was present in the pyranose form and terminal-linked. JuBP-2 showed an effect of stimulating the immune response, which when applied onto the cultured rat lymphocytes induced the cell proliferation in a dose-dependent manner.

## S06.295

### Metabolic Characterization of *Prunus cerasus* L. and *Prunus mahaleb* L. Fruits

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It is widely accepted that a diet rich in fruits and vegetables reduces the risk of several oxidative stress diseases, including coronary heart disease, cancer and stroke. These health benefits are ascribed to phytochemicals such as carotenoids and polyphenolics. In the search for antioxidative chemicals from native fruits of the Puglia region of Italy, *Prunus cerasus* L., an acidic cherry widely used for culinary purposes, and *Prunus mahaleb* L., a tree species commonly used as rootstock in cherry crop, have been studied. The *P. mahaleb* fruits have a high content of organic acids, fructose and vitamin C, but are not consumed fresh because of a bitter and sour taste. In this work we obtained the 1H NMR spectra of the two species and from the comparison of these spectra, we found that *P. mahaleb* fruits have an higher concentration of phenolic compounds, such as flavonoids, and organic acids, in comparison to *P. cerasus* fruits. The same results were obtained when we focused on anthocyanins. In this study we identified the signals of anthocyanin protons in 1H NMR spectra of a mixture of compounds in aqueous extracts of both *P. cerasus* and *P. mahaleb* fruits but the latter species showed an higher concentration and a larger number of these compounds. This metabolomic analysis gave us the data to scientifically revalue traditionally-used plants like *P. mahaleb* and to identify the potential as source of biofunctional compounds to be used in food and/or pharmaceutical industry. Moreover in this study, NMR spectroscopy coupled with multivariate data analysis was applied to Prunus metabolomics in order to investigate the botanical origins of *Prunus cerasus* and to identify the compounds responsible for differentiation of these two species of *Prunus* (cerasus and mahaleb) and of two cultivars of *Prunus cerasus* (Montmorency and Marasca di Zara).

## S06.296

### Determination of Fig Fruit Extracts (*Ficus carica*) Antioxidant Properties

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The fig tree (*Ficus carica* L., Moraceae) is very common in the Mediterranean and in countries with dry and warm-temperate climate. Since ancient times the figs have been used only for human consumption. Their nutritive and pharmacological properties have been investigated recently. Their consumption helps in the prevention of vein blockage, high content in fibers has laxative effects, and the fig latex inhibits the growth of carcinoma cells.

The aim of this study was to determine a content of some active components contained in extracts of five different figs cultivars (Šaraguja, Termenjača, Crnica, Bjelica and Bružetka bijela). Samples were freeze-dried fig fruits. Extracts were obtained by 70% methanol or ethanol. Analysis of fig extracts included determination of total phenols and flavonoids, as it was determined that a broad of pharmacological effects have been derived from the content of this compounds. For determination of antioxidant activity, scavenging capacity on DPPH* radicals and reducing power were performed. By high performance liquid chromatography (HPLC) some antioxidant compounds were detected and quantified. Total phenolics content in *F. carica* extracts was from 7.24 to 11.17 mg CAE/g of dry extract. All methanolic extracts showed higher content of total phenols. The DPPH radical scavenging capacity was found to exhibit IC50 value for the extract concentration lower than 0.40 mg/ml for extract cultivars Crnica, while for others this capacity was higher than 0.60 mg/ml. Using reducing power antioxidant test higher antioxidant activity for Bjelica than all other extracts was determined. Results obtained by reducing power method were compared to activity of ascorbic acid, standard antioxidant compound.

## S06.297

### Evaluation of Pomological and Biochemical Traits Affecting Fruit Quality in a Nectarine [*Prunus persica* (L.) Batsch] Progeny

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Quality evaluation of fruit has become a very important issue in the fruit industry. In addition, epidemiological studies suggest that consumption of fruit rich in phenolic compounds is associated with health-protective effects due to the antioxidant properties of these components. In order to identify genotypes with good organoleptic properties and antioxidant-rich content, samples of flesh fruit from a F1 population derived from the cross 'Venus' x 'Big Top' nectarines were studied. Total polyphenols, flavonoids, anthocyanins, L-ascorbic acid, sugar contents and the relative antioxidant capacity (RAC) were analyzed. Agronomical traits such as tree yield (kg/tree), fruit weight (g) and the analysis of fruit quality parameters [firmness, soluble solids content (SSC), pH, titratable acidity (TA) and ripening index (RI=SSC/TA)], as well as pomological traits (fruit type, date of bloom and

maturation, flesh colour and stone adherence, etc) were determined in the progeny. The analysis showed a normal distribution typical of quantitative characters for all studied traits and a high variability among genotypes was also observed indicating that genetics plays an important role on these fruit quality traits. Segregation was also observed when compared the progeny with its parents, and some genotypes showed even higher values for antioxidant content than 'Venus' and 'Big Top'. The genetic analysis and localization of QTLs involved in the studied agronomical and biochemical traits will be helpful for monitoring future breeding programs.

## S06.298

### Fruit Quality and Productivity of Peach and Nectarine on Six New Rootstocks

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Fruit quality and productivity of 8-yr-old 'Rich Lady' and 'Ryan Sun' peaches, and 'Ruby Diamond' and 'Venus' nectarines, grafted onto Cadaman-Avimag, Viking, Atlas, GxN 15, GF 677, MRS 2/5 and Nemaguard rootstocks (with Nemaguard considered as the control), were evaluated during the 2008-2009 growing season. The trees were planted in the Univiveros experimental nursery in Paine (Metropolitan Region, Chile). Total yield, fruit size distribution, number of fruit, and fruit weight were recorded. In the winter, the trunk cross-sectional area (TCSA) was measured to determine the efficiency of each rootstock/variety combination. Fruit quality parameters including soluble solids, blush color development, and flesh firmness were also measured. On average, 'Cadaman' yielded the greatest fruit weight and number of fruit, compared with the control, followed by GxN, Atlas and GF 677 to a lesser degree, while Viking was similar to the Nemaguard control, and MRS 2/5 yielded less than the control. There were no great differences between the rootstocks and the control with respect to fruit size and weight, although the most vigorous, Cadaman and GxN 15, were significantly higher (190.1 and 197.2 grams, versus 179.5, respectively). In production efficiency, only MRS 2/5 and Atlas exceeded the control, while the other rootstocks were all below 'Nemaguard.' For fruit quality parameters, Viking had the highest accumulation of soluble solids with respect to Nemaguard (11 to 10.8 º Brix) and MRS 2/5 had the highest percentage of blush color compared with the control (78.3% versus 71.9%). For flesh firmness at harvest, GF 677 was the firmest (9.3 lb.) and MRS 2/5 was the softest (7.3 lb).

## S06.299

### Kaolin Sprays and Individual Fruit Bagging Effects on Quince Fruit Quality

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Mediterranean fruit fly damage to quince fruit is widely spread in central Greece and use of alternative to chemical insecticides methods were studied. These methods included kaolin sprayable material (Surround®) and individually bagging with paper bag each fruit. During the summer 2009, quince tree branches were sprayed with 5% kaolin periodically since June and at the same time individual fruit were bagged in gray paper bags at two farms, a conventional (University of Thessaly Experimental Farm in Velestino) and an organic farm (Lechonia Magnesias), both located in central Greece. Kaolin treated leaves had higher chlorophyll content and were macroscopically greener than control leaves but did not have higher productivity based on specific leaf weight measurements. The greener leaf color could be due to less stressful conditions experienced from the kaolin-treated branches. At harvest, fruit from kaolin-treated branches were greener than fruit from control branches and the latter were greener than the bagged fruit. In kaolin-treated quince fruit, the soluble solids content, % dry matter content and starch index were similar to control fruit. On the contrary, bagged fruit seemed to have inferior quality based on lower starch and dry matter content. In conclusion, kaolin treatment to branches did not significantly affect leaf productivity (although leaf chlorophyll content increased) and fruit quality although it seemed to slightly delay skin color yellowing. Unfortunately, kaolin was not able to protect the quince fruit from fruit fly damage. On the contrary, fruit bagging resulted in more yellow fruit and less starch that could be perceived as more advanced maturity, but with lower % dry matter and organoleptic quality than the fruit from the other two treatments. Nevertheless, bagged fruit were free of fruit fly damage.

## S06.300

### Enzymes of Organic Acid Metabolism in the Fruit of Plum (*Prunus salicina* Lindl.) during Development

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The aim of this study was to investigate how the abundance of key enzymes involved in organic acid metabolism changed in plum fruit during development. The enzymes studied were phosphoenolpyruvate carboxykinase (PEPCK), phosphoenolpyruvate carboxylase (PEPC), NADP malic enzyme (NADP-ME) and pyruvate, orthophosphate dikinase (PPDK). In the flesh of plum, PEPC was detected throughout development, whereas PEPCK and NADP-ME were detected when the fruit became larger. PEPCK and NADP-ME were also present when there was no net dissimilation of malic acid, which represented the bulk of the organic acid content of the flesh. In the last period of ripening there was a net dissimilation of malate at the same time that there was an increase in NADP-ME and a decrease in PEPCK. Potential roles of the considered enzyme in organic acid metabolism in plum fruit are discussed.

## S06.301

### Capacity of Extracts of *Castanea sativa* Mill. to Remove Lipid Peroxidation in the Membrane of Erythrocytes

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Using electron paramagnetic resonance (EPR) spectroscopy capacity of extracts of chestnut to prevent/remove lipid peroxidation in the membrane of erythrocytes provoked by $H_2O_2$ were determined. Erythrocytes are continually exposed to high concentrations of oxygen and to frequent variations of $pO_2$. The $H_2O_2$ pass the membrane, and also react with lipids provoking peroxidation and oxidative damage. It has been reported that $H_2O_2$ provokes decrease of erythrocytes membrane fluidity. Three cultivars: sweet chestnut, Lovran's Marrone and grafted Italian Marrone cultivar were investigated. The parts of chestnut such as: leaves, catkins and spiny burs were extracted with 50% ethanol as an extragents and afterwards dry extracts of examined samples have been gained. The total phenolics and flavonoids content were determined using standard spectrophotometrics methods. The yield of the dry extract expressed in % (by mass) was from (1.82±0.066) % for spiny burs of sweet chestnut to (10.58±0.078) % for catkin of grafted Italian Marrone cultivar. The highest content of total phenolic compounds ((3.98±0.01) % of GAE) and flavonoids ((0.96±0.01) % of CE) were determined in dry extract of catkin of sweet chestnut. The difference between order parameters obtained for untreated and erythrocytes treated with $H_2O_2$ are statistically non-significant, so it can be concluded that all extracts showed sufficient antioxidative activity to prevent/remove lipid peroxidation of erythrocytes membrane.

## S06.302

### Influence of Roasting Parameters on Quality of Hazelnut cv. 'Tonda Gentile delle Langhe' for the Processing Industry

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The Piemonte Region (North-West Italy) has a long tradition of handicraft and

industrial processing of sweets and cakes prepared with roasted hazelnuts and Venchi Ltd is one of the main local firms. The aim of this study was the evaluation of the influence of roasting parameters on the final quality of roasted hazelnut kernels 'Nocciole Piemonte IGP'. The effects of the different temperatures on paste and chopped kernels colour have been evaluated with two different instruments (colorimeter and scanner) to define the best technique of evaluation and the possible correlations between roasting temperatures and colorimetric results. On roasted kernels the sensorial analysis has been applied. Comparing the characteristics of the nuts roasted at different temperatures, the samples roasted to lower temperatures have lower saturation values and consequently lighter colour. Comparing the results between scanner and colorimeter methods, a better sensitivity in evaluating the colour appears using the scanner. Indeed, both paste and chopped kernels evidence a larger range of values in comparison with the results calculated using the colorimeter. The evaluation of the sensorial parameters has been obtained with a panel of trained tasters. The results put in evidence that the "odour of hazelnut" allows to distinguish significant statistical differences in the tested samples. Furthermore, this parameter is positively correlated with the judgment of appreciation, with aroma of hazelnut, softness, odour and aroma of caramel and intensity of sweet taste. The aroma of rank, as expected, is negatively correlated with the general judgment.

## S06.303
### Result Finding on Implementation of Haccp System in Iranian Pistachio Production

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More than 70 percent of Iranian produced pistachios are exported, the quality and hygienic control systems must be considered in order to maintain the international markets confidence and extension of exports as well. As the aflatoxin contamination of pistachio is a major trade barrier of or export of Iranian pistachios the ministry of Jihad-e-Agriculture has run a pilot project named "recognition and control of critical points in pistachio production "in selected pistachio processing units. As the aflatoxigenic fungi are abundant in production areas so implication of integrated phytosanitary management (IPSM) systems and good agricultural practice (GAP) in plantation and production and harvest stages and during handling to processors and processing must be considered in order to reduce contamination potential. In order to introduce the HACCP system in pistachio production the following steps are considered in the covered orchards and processing units: -Selection of orchards for project based on proper variety, tree spacing and proper tree from training. -Amendment of Irrigation techniques in order to reduce tree canopy relative humidity and avoid drought stress. -Tree pruning in order to improve air circulation and light penetration in tree canopy and avoid shoot contact of with orchard sail. -Deep placement of macro and micro nutrients for enhancement of tree nutrition. -Control of pests, which are important in spore inoculation with integrated pest management approach method. -Improvement of harvest and handling of pistachio to processing plants. -Definition and setting of the critical control points in processing units along with related corrective and controlling actions in order to reduce the contamination potential by more effective removal of the contaminated pistachios. -The results show that in all orchards that the IPSM and GAP techniques are observed and processed under HACCP system, the final contamination is significantly decreased compared to control orchards.

## S06.304
### Polyphenolic Composition of Some Italian Hazelnut (*Corylus avellana* L.) Cultivars for a Kernel Quality Evaluation

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Hazelnut is one of the most important raw materials for the pastry and chocolate industry and they have an important role in human nutrition and health due to their very special nutritional value. Hazelnuts are a good source of monounsaturated and polyunsaturated fatty acids, proteins, vitamins, minerals and antioxidant phytochemicals. The environmental stresses such as pest attack and water stress during fruit growth and ripening are the cause of changes on biosynthetic system of the plants that can reflects in an alteration of the metabolic pool. The metabolomics method records the metabolic "fingerprints" and then attempts to associate with determinate biological functions. In fact, the metabolomics is considered an efficient tool for addressing future needs in agriculture, human nutrition and in food science, as a tool for quality, processing and safety of raw materials and final products. The untargeted metabolomics focuses on the detection of many groups of metabolites as possible to obtain patterns or fingerprints without necessarily identifying nor quantifying a specific compound(s) and untargeted analyses have been used in the identification of possible fingerprints of biological phenomena such as plant diseases. In the present research we applied untargeted metabolomic analyses in order to develop an alternative rapid diagnostic method able to detect fruit damages, that can affect kernel quality negatively. The determination of some groups of antioxidants compounds was carried out in roasted healthy and bug-damaged hazelnut samples. The samples showed a different distribution of phenolic acids and different levels were associated to nut quality and to the damage intensity.

## S06.305
### Relationship between Physical and Shell Characteristis of Early Splitting Pistachios and Contamination to *Aspergillus flavus*, Aflatoxin and Insects in Three Iranian Commerical Pistachio Cultivars

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Pistachio early splitting implies the most sources of contamination to *Aspergillus* species and aflatoxins. The time of early splitting formation were evaluated in three commercial pistachio cultivars including 'Ohadi', 'Kalehghoochi' and 'Ahmadaghaei' in two different areas. The physical characteristics of early splitting pistachio as well as frequency of *Aspergillus flavus* infection, shell staining, aflatoxin content and contamination to insects were determined. The results indicated that the time of early splitting formation varied in different years, areas and cultivars. The highest percentage of early splitting occurred 15 days before harvest time in all cultivars. The frequency of infected kernel to *Aspergillus flavus* increased in early splitting pistachios with fresh, semi-dried and dried hulls, respectively. The pistachio splitted during mid-July to end of July had higher infection frequency to *Aspergillus flavus*, aflatoxins and insects than those splitted during mid-August to end of August. There was a positive relation between the time of early splitting and shell discoloration and old splitted pistachios had the highest discoloration. The old early splitting pistachios also had the highest amount of Aspergillus flavus infection, content of aflatoxin kernel and insect damages compared to the pistachios splitted next to harvest time, which correlated to each other in positive way. The content of aflatoxin in different parts of pistachio fruit decreased in the order of kernel, shell and hull, respectively – no aflatoxin was detected in pistachio hull. Although in early splitting pistachios the kernels and shell had the same weight ratios, 95 percent of sum of aflatoxins was detected in the kernels. These observations suggest that the amount of aflatoxin tends to underestimate when kernel and shell included in analysis of aflatoxins. Most of *Aspergillus flavus* strains were toxinogenic, producing aflatoxin B1 or aflatoxin B1 and B2.

## S06.306
### A Comparative Study of Phenolic Profiles in Almond (*Prunus amygdalus* L.)

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Limited information is available on the qualitative and quantitative composition

of individual phenolics in almonds, especially in perspective new selections and local cultivars. Reverse phase HPLC coupled to negative mode electroscopy ionization (ESI) mass spectrometry (MS) was used to identify phenolic compounds from almond kernel extracts in ten Slovenian cultivars. Six flavonols and four flavanols were confirmed in all analyzed cultivars. The content of individual phenolics was compared to the content measured in two Italian and two French cultivars, grown in similar climatic and soil conditions. Among the phenolic compounds, catechin was present in highest content in all analyzed cultivars, with values ranging from 3.9 $mg \cdot kg^{-1}$ to as much as 75.7 $mg \cdot kg^{-1}$. Epicatechin had the second highest content from the group of flavonols, in small amounts procyanidin B2 and procyanidin dimer were also detected. In some cultivars, procyanidins were present in much higher contents, suggesting these compounds to be highly cultivar dependent. From the group of flavonols especially quercetins (quercetin-3-O-rutinoside, quercetin-3-O-glucoside) were detected in low amounts and a high content of kaempherols glucosides and isorhamnetin glucosides were also obtained from almond kernels. In the group of flavonols isorhamnetin-3-O-rutinoside was present in highest content with values ranging from 1 $mg \cdot kg^{-1}$ to 34.8 $mg \cdot kg^{-1}$. Significant differences in all the identified phenolic compounds were detected among cultivars and selections. In summation, some of our local selections and cultivars are extremely rich in individual phenolic compounds in comparison to some European grown cultivars and could present a potential source of bioactive polyphenols.

## S06.307

## Phenolic Composition and Antioxidative Activity of Hazelnut Kernels (*Corylus avellana* L.) Affected by Skin Removal and Roasting

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Hazelnut (*Corylus avellana* L.) is one of the most popular nuts worldwide and its biochemical composition has been extensively studied. Due to their health promoting properties they are often recommended in a balanced diet, mostly they are consumed roasted. Studies have shown that nut skins are rich in phenolic compounds and possess stronger antioxidant activities than those of their kernel. Hazelnut skin is removed prior to roasting and thus hazelnut health promoting properties are greatly reduced. In the present study, individual and total phenolic content (TPC) and antioxidative potential of six hazelnut cultivars were investigated and three treatments were established: unroasted hazelnut kernels with skin, unroasted kernels without skin and roasted kernels without skin to determine the effects of thermal treatment on the biochemical profiles of hazelnuts. HPLC-MS identification of individual phenolics confirmed the presence of seven flavan-3-ols (catechin, epicatechin, two procyanidin dimers and three procyanidin trimers) three flavonols (quercetin-pentoside, quercetin-3-O-rhamnoside and myricetin-3-O-rhamnoside), two hydrobenzoic acids (gallic acid, protocatechulic acid) and one dihydrochalcone (phloretin-2'-O-glucoside). With the exception of flavonols, all the compounds were detected in roasted and unroasted hazelnuts without skin. The content of individual phenolic compounds was always highest in whole hazelnuts with skins and was significantly reduced after skin removal. Similarly, TPC and antioxidative potential decreased when skin was removed. Roasting had a significant negative effect on individual phenolics but not on the TPC and antioxidative potential of kernels. From a health promoting phytochemical composition of hazelnuts the consumption of whole unroasted kernels with skins should therefore be preferential to peeled kernels either roasted or unroasted.

## S06.308

## Compositional Changes in the Kernel of Three Hazelnut Cultivars during Nut Growth and Maturation

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The effects of environmental and genetic factors on synthesis and accumulation of chemical constituents related to nut quality in hazelnut seeds are scarcely known. In this study changes of kernel and pellicle composition during nut growth and maturation were analyzed as a function of cultivar and year. Nuts of three cultivars widely grown in Lazio (Central Italy), Tonda Gentile Romana, Tonda di Giffoni and Nocchione, were sampled over two years at weekly intervals from beginning of July to harvest (beginning of September) in a mature orchard located in the Viterbo province. Content and composition of oil, sugars, organic acids in the kernel and total polyphenols content in the pellicle were determined. Seed moisture progressively decreased from July to September, whereas pellicle dehydration started at the half of August in both years. Oil accumulation reached the highest level in the first half of August. Soluble sugars content was unstable during growth and showed a decrease at sampling dates within the end of July and beginning of August which can be related to water stress and increase of oil synthesis. Starch showed a peak at the beginning of August and then declined, with differences among cultivars. The level of organic acids, mainly represented by malic and citric acids, decreased until the end of July-beginning of August and was then almost constant until the harvest. Fatty acids and sugars composition changed during nut development. A decrease of palmitic and stearic components and an increase of oleic acid and ratio unsaturated/saturated fatty acids was observed. Total polyphenols in the pellicle increased until the beginning of August. The complex of these dynamics may explain the different seed taste in immature and mature state and highlights the importance of the orchard management and the conditions under which kernel develops and matures.

## S06.309

## Tocopherol Concentration in Almond Oil Is an Indicator of Summer Temperatures

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Oil of almond (*Prunus amygdalus* Batsch) kernels contains a high concentration of tocopherols, mainly α-tocopherol, followed by similar and low contents of γ- and δ-tocopherol. Genotypic and year to year variation of these three homologues was confirmed. As tocopherols are natural mono-phenols with anti-oxidant activities, and phenolic compounds are typically produced in plants in response to stress, which may occur at both high and low temperatures, high temperatures during July, corresponding to the ripening period of almond, appear to be critical for the increase of tocopherol in the almond kernel oil. Higher α- and γ-tocopherol concentrations were obtained after a hot summer in 'Felisia', showing that the increase of tocopherol in almond oil under high temperatures could be a response to heat stress during kernel ripening. Thus, tocopherol concentration could be used as an indicator of the summer temperature in the new scenario of global warming. These results also indicate that the selection of genotypes resistant to drought stress to be planted in regions characterised by hot summers could be very interesting to obtain fruit with higher concentration of tocopherols, which may be a source of natural antioxidants in the food industry both from the nutritive and the healthy standpoints

## S06.310

## Evaluation of the Effects of Heating the Chestnut Flour with Defatted Cocoa

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In the past time, chestnut has represented a precious help in the human nutrition and, nowadays, after a period of neglect in the second half of the last century, it has been rediscovered, due to the important environmental role of this plant and to the increasing attention of the consumers towards healthy foods. Among the numerous traditional foods which are prepared by using the flour of the dried fruits of the chestnut, those obtained by using also cocoa as an ingredient are very appreciated for their organoleptic characteristics, but they could also be interesting from a nutritional point of view, due to the peculiar compounds present in the cocoa and in

the chestnut flour. One of such food products is a kind of chocolate, made of 50% of cocoa and 50% of toasted dried chestnut flour, which was very popular in Paris in the 1700's. This paper reports some simple tests in which samples of chestnut flour were subjected to heating together with defatted cocoa, in such a way to imitate the preparation of the above mentioned cake, in order to make a preliminary estimate of the changes which occur in these ingredients, considering in particular the content of the antioxidants.

## S06.311
## Superficial Changing of *Aspergillus* Species Density on Pistachio Nuts during Processing

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Contamination of pistachio nut by toxigenic *Aspergillus* species and their toxins is the most challenges in pistachio consumption and exportation in local and international markets. The population density of *Aspergillus* species were determined in 17 mechanized, semi-mechanized and traditional processing units using AFPA and modified Czapek Dox Agar media. A dilution method was used to quantify populations of *Aspergillus* species. The pistachios processed in traditional processing units had higher frequency of *Aspergillus* species than mechanized and semi-mechanized ones. Comparison different washing systems revealed that water shower baths is more efficient than non-current and water flotation tanks to reduce population densities of *Aspergillus* species as well as cross-contamination. However, water flotation tank was able to sort the pistachio which had high frequency of *Aspergillus* species and aflatoxin content. There was a positive correlation between shell staining and population density of *Aspergillus* species which can be applied to sort out the contaminated pistachios during processing. The population density of *Aspergillus* species was not significantly different during 2-3 sun-drying days. Nevertheless, conditions during maturation of pistachio nuts in the orchards are suitable for growing *Aspergillus* species which may result in aflatoxin production. Overall, population density of *Aspergillus* spores increased during peeling and then decreased during washing and drying stages at different pistachio processing plants. Increased spore density throughout peeling stage implying a risk of *Aspergillus* spore introduction to uninfected pistachio nuts. This is the first report to determine the population densities of *Aspergillus* species in pistachio processing plants and the role in contamination.

## S06.312
## Evaluation of Leafing Date and Flowering in Walnut Cultivars

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Persian walnut (*Juglans regia* L.) is an important nut crops that its cultivation is under extension, including Iran. A program was started in the past two decades to select national superior genotypes for using as walnut cultivars. About 50 superior genotypes were selected among seed originated trees in three different phase (group). The first group consisted of seven selecteions (Z67, Z53, B21, Z63, K72, Z30 and Z60), were planted for advanced evaluation with Serr, Hartley, Pedro, Lara, Franquette, Ronde de Montignac, Vina and Chandler in a α latis experimental design with two replications and 4 trees per plot in 1994 in karaj. The evaluation of leafing date, pistillate flowering (start and end) and pollen shedding period (start and end) in 15 cultivars/genotypes (c/g) were done during 2005 and 2006. The data showed that among the 15 c/g; Z30 and Z53 are protogynous, Ronde de Montignac homogamous tend to protogynous and the other were protandrous. The leafing date was very variable so that Z53 showed to be the earliest, leafing two days before Serr. B21, K72, Z30 and Z60 had the same leafing time of Serr. The Z63 and Z67 showed to be 1 to 3 days later leafing than Serr, while Vina, Pedro, Lara, Hartley and Chandler 6 to 9 days Later. Ronde de Montignac and Franquette showed to be the latest cultivars leafing respectively 16 and 18 days after Serr. Regarding the male and female flowering, Z30 and Z53 showed to be good pollinator for Serr, Z60, Z63, K72; while the Ronde de Monignac showed to cover well the pistillate flowering period of Hartley, Chandler, Pedro and Lara.

## S06.313
## Antioxidant and Antifungal Activity of Different Parts of Pomegranate (*Punica granatum* L.) Depends on its Phenolic Content

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Deteriorations of agricultural products occur during storage and it is related to oxidative processes and microorganisms. On other hand, many plants are the sources of compounds with antioxidant and antifungal activities that might be used as natural preservatives. So to investigate the antioxidant and antifungal properties of pomegranate, a factorial experiment based on randomized design with 5 replications was conducted. In this study the effect of 3 different pomegranate parts (peel, seed and leaf) and 2 different kind of extracts (aqueous and methanolic) with 4 concentrations (0, 500, 1000 and 1500 ppm) were investigated on 2 postharvest fungi (*Alternaria citri* and *Aspergillus niger*). Based on results the methanolic peel extract showed the highest inhibitory effects onthe mycelia growth (IMG) and spore germination (ISG) with 47.6 and 37.7 percentage respectively. The phenolic compounds of peel extract was also measured 1.8 fold higher than pomegranate leaf extract and antioxidant capacity percentage of 55.3, 35.7 and 16.4 were obtained for peel, seed and leaf extracts respectively. Therefore it seems that the higher percentage of phenolic compounds in the peel and seed of pomegranate could cause the higher antifungal and antioxidant activity of these plant parts extracts.

## S06.314
## *Thrips* spp. Recorded from Commercial Figs, *Ficus carica* (*Moraceae*), in the Western Cape Province of south Africa

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During a recent pests and disease survey on selected fig, *Ficus carica* (*Moraceae*), orchards in South Africa, internal infestation of fruit by thrips was observed. Packed fruit which were subject to quality control prior to export were destructively sampled and again thrips infestation was noted. The Western flower thrips, *Frankliniella occidentalis* and the Onion thrips, *Thrips tabaci*, were found inside the fig cavity feeding on the flowers, causing the latter to discolor. Additional to life thrips being found inside the fruit cavity, fungal growth was occasionally noted. *Thrips* specimen were collected and sent for positive species identification to the Biosystematics Division of the Agricultural Research Council – Plant Protection Research Institute (ARC-PPRI) in Pretoria, South Africa.

## S06.315
## Crop Loss on Pomegranates, *Punica granatum* (*Lythraceae*), Caused by Early Season *Nanophyes* spp. (*Coleoptera*: *Apionidae*) Infection

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A number of unidentified but distinct *Nanophyes* spp. (*Coleoptera*: *Apionidae*) where found causing damage to pomegranate, *Punica granatum* (*Lythraceae*) shoots in South Africa. Pomegranates predominantly bear flowers on new growth, thus damage or loss thereof results in reduced flowering and subsequent lower crop load. Three orchards in geographic apart locations of the Western Cape Province in South Africa, incurred heavy Nanophyes infestation pre flowering, resulting in reduced flowering and lower fruit set. At location 1 the first flower flush was

lost, yet post pyrethroid application and subsequent weevil control, a second flush set and matured to fruit. Location 2 sustained weevil damage beyond the typical flowering season and no significant 2nd flush was obtained even after pyrethroid application. At site three damage was so severe that trees dropped leaves and all young buds where infected. Growth of these trees was severely stunted and even after a pyrethroid application showed slow recovery by budding low down on the main stem. Due to this infection no flowers developed and complete crop loss was thus sustained.

## S06.316
## The Biology and Managemente of Chestnut Rot in South-Estern Australia

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Internal rot of chestnuts is a significant problem facing the Australian chestnut industry. It affects the kernel, manifesting in light, medium and/or dark brown lesions on the endosperm and embryo. Previous surveys at Melbourne Markets, Victoria, Australia have shown rot incidence up to 40% (Anderson, 1993). Consumer rejection is likely with rot incidence this high. The pathogen responsible has previously been identified in Australia and New Zealand as the fungal endophyte, *Phomopsis castanea* (Sacc.) Petr. (Anderson, 1993; Washington *et al.* 1999; Wadia *et al.* 2000). Recent research shows that a significant source of infection occurs during the flowering period via ascospores released from decaying burrs on the orchard floor (Smith, 2008). This study aims to survey the incidence of chestnut rot in South-Eastern Australia and determine the pathogen responsible. A hierarchical field survey across 14 chestnut orchards in Victoria, and 8 orchards in New South Wales was conducted to determine rot incidence in South-Eastern Australia. Three hundred nuts of 4 commercially important chestnut varieties were sampled in each orchard. Field rot incidence was significantly different between regions, farms and varieties. This is likely due to a combination of factors including orchard and regional climate e.g. rainfall, wind patterns, combined with orchard management practices (pruning, tree spacing, hygiene; and variety selection). The pathogen responsible for causing internal rot was isolated and identified. Sixty two percent of isolates (n=568) from rotted nuts were identified as morphotypes of the fungal genus *Gnomoniopsis* Berl. The teleomorph perithecia of *Gnomoniopsis* were observed overwintering on decaying burrs on the orchard floor, indicating that ascospores are a likely source of primary infection. A market survey was conducted at Flemington, New South Wales, Australia to determine market rot incidence. This survey showed rot incidence at acceptable industry levels (≤10%). These field and market surveys, and identification of the pathogen will better inform the Australian and international chestnut industries of the scope of the issue of chestnut rot, and provide a basis for improved management of chestnut orchards.

## S06.317
## Changes in Enzymes Involved in Photosynthesis and Organic Acid, Amino Acid, and Sugar Metabolism in the Fruit of Prickly Pear Cactus during Ripening

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The aim of this study was to investigate changes in the abundance of various enzymes in the different components (flesh, locular gel, vasculature tissue and seeds) of the fruit of prickly pear cactus [*Opuntia ficus-indica* Miller (L.)] during ripening. The enzymes studied were phosphoenolpyruvate carboxykinase (PEPCK), phosphoenolpyruvate carboxylase (PEPC), pyruvate, orthophosphate dikinase (PPDK), cytosolic aspartate aminotransferase (cyt AspAT), aldolase, glutamine synthetase (GS), ribulose-1,5-bisphosphate carboxylase/oxygenase (Rubisco). To avoid problems in measuring enzyme activity the approach taken was to use antibodies specific for each enzyme in conjunction with immunoblotting of sodium dodecyl sulphate polyacrylamide gels (SDS-PAGE). During ripening, there were marked changes in abundance of several of these enzymes and these changes were dependent on the tissue investigated. Potential roles of the considered enzyme in the different parts of the fruit are discussed.

## S06.318
## Netting of Orchards: Combining Physical Protection with Physiological Benefits

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The protection of orchards is becoming an essential practice in many parts of the world. The need to protect the crops results from global climate changes, urbanization processes that push agriculture towards less amenable environments, and the need to meet market quality demands. Covering the orchard by nets provides a most effective solution. The netting can protect from excessive solar radiation, environmental hazards (hail, wind, frost), or flying pests (insects, birds, bats). Unfortunately, it comes for a relatively high financial cost, which is not always justified by the mere protective function of the net. The investment in netting can, however, become profitable, if added physiological benefits are achieved as well. R&D efforts carried by several research groups have greatly advanced our understanding of the impacts of netting on the light and microclimate regimes in the covered orchard, and the resulting horticultural performance. The further developing of photoselective nets has added a sophisticated way to regulate the orchard light environment. Photoselective netting is a new concept, which is based on various chromatic additives, light dispersive and reflective elements that are introduced into the netting materials. Different photoselective net products were developed to selectively screen out certain spectral components of solar radiation in the UV and/or visible spectral range, and to additionally transform direct light into scattered/diffused light. The spectral manipulation is aimed to specifically promote desired physiological responses, while the scattering improves the penetration of the modified light into the inner plant canopy, thus increasing the efficiency of light-dependent processes (e.g. fruit colour). Indeed, the netting of orchards was found to effectively prevent fruit damaging by sunburns, hail, wind, birds, etc., while also mitigating extreme climatic fluctuations. The modified microclimate is reducing heat and drought stresses, and improving water use efficiency, especially in hot or moderate climates. The use of photoselective, light-dispersive nets additionally achieves specific benefits, depending on the type of net, the cultivar and the climatic area. Specific photoselective benefits include modifying time-to-harvest (early or late maturation), fruit size, fruit colour, and more. Photoselective reduction of insect-pest infestation is another potential benefit, demonstrated so far only in vegetables. The lecture will survey orchard netting studies carried in different parts of the world, different netting materials and different fruit tree crops/cultivars, with emphasis on deciduous crops in Israel and Spain. We will summarize positive and negative aspects of orchard netting, economical considerations, practical applications by growers, and potential future trends.

## S06.319
## Analysis on the Volatile Compounds of Chestnut Catkins

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40 volatile components were found in chestnut catkins including thirteen terpenes compounds, ten aromatic compounds, ten hydrocarbon compounds, four ester compound, one ketones compound and two aroma compounds. The main volatile compounds were terpenes compounds (44.015%), aromatic compounds (21.152%) and ester compounds (12.111%).