EHC 12-16 May 2024 Bucharest, Romania

EUROPEAN HORTICULTURE CONGRESS

S10: POSTHARVEST AND HORTICULTURAL PRODUCTS QUALITY

Conveners:

Dr. Dirk Köpcke (dirk.koepcke@lwk-niedersachsen.de)

Prof. Liliana Bădulescu (liliana.badulescu@usamv.ro)

S10: POSTHARVEST AND HORTICULTURAL PRODUCTS QUALITY; BUCHAREST, EHC2024, MAY 12-16

ORAL PRESENTATIONS

SESSION I:

ADVANCED POSTHARVEST TECHNOLOGIES OF FRUITS, VEGETABLES, AND ORNAMENTALS

S10-O-I-1

From static to dynamic controlled atmosphere: enhancing long-term quality preservation of apple fruits through storage at the lowest tolerated oxygen level

Angelo Zanella*, Stefan Stürz, Nadja Sadar

Research Centre Laimburg, 39040 Ora (Posta), Italy

*Correspondence: angelo.zanella@laimburg.it

Effective post-harvest management strategies are crucial for maintaining the quality and extending the shelf life of horticultural products. The overall longevity of certain crops, stored with the most appropriate cooling procedures, can be prolonged further by optimizing the storage atmosphere composition based on values determined empirically and set statically for the entire storage period. This technology has witnessed significant advancements, particularly with the evolution of controlled atmosphere (CA) storage techniques, moving from static composition settings to dynamic adjustments tailored to the specific requirements of plant products—genotype, phenotype and age. The Dynamic Controlled Atmosphere (DCA) is a system in continuous evolution, based on various physiological concepts, which involves the active regulation of atmospheric conditions to optimize fruit storage environments. Emphasis is given to the approaches with storage conditions set to the lowest tolerated oxygen level (LOL) within dynamic controlled atmosphere (DCA) for the long-term quality preservation of apple fruits. A pivotal role has emerged for DCA based on chlorophyll fluorescence response (DCA-CF). This technology utilizes real-time bio-sensing, allowing for the dynamic adjustment of atmospheric conditions based on the metabolic responses of stored fruits detected by sudden changes in chlorophyll fluorescence at the LOL. Reasons for its adoption include residue-free techniques, reduced respiration rates, delayed ripening, minimized enzymatic browning, control of storage disorders and of certain diseases, improved retention of quality. Commercially adopted in South Tyrol, Italy, a region renowned for its substantial apple production (≈10 % of EU), DCA-CF has penetrated the market, adding to other established technologies like 1-MCP treatment and as an alternative for organically produced fruit. Attention is directed towards the development, validation, and impact of the DCA-CF technique, emphasizing its influence on enhancing apple fruit quality preservation, beyond research aspects, incorporating insights into commercial applications and scalability.

Keywords: DCA, chlorophyll fluorescence, hypoxia, 1-MCP, scald, shelf-life, Malus X domestica

S10-O-I-2

Effects of storage temperature on fresh sage and its use for the preservation of tomato fruits

Panayiota Xylia*, Christos Goumenos, Antonios Chrysargyris, Nikolaos Tzortzakis

Department of Agricultural Sciences, Biotechnology and Food Science, Cyprus University of Technology, 3036 LIMASSOL, Cyprus

*Correspondence: pa.xylia@edu.cut.ac.cy

Sage (*Salvia fruticosa*) is a well-known herb with many health benefits that is used fresh in many cuisines. As with other herbs, fresh sage is a perishable product and very little is known for its postharvest storage. The objective of the present was to evaluate the effects of storage temperature (2, 6, and 20 °C) on fresh sage during shelf life (15 days). In addition, the biological activities of sage's ethanolic extracts and the use of sage EO for the preservation of tomato fruits were also explored. The results from this study revealed increases in weight loss and respiration rate of fresh sage during storage at 20 °C. Lower phenolic content and antioxidant activity were reported throughout storage at 20 °C compared to 2 and 6 °C. This shows that lower temperatures (especially 6 °C) contribute to the preservation of fresh sage. The vapor application of sage EO on tomato fruits was found to preserve quality attributes of the fruit whilst EO-treated red fruits were more appealing during testing. On the other hand, higher EO concentration increased the respiration rate and ethylene emission of tomatoes. In conclusion, sage is a herb of high nutritional value with great biological activities (in vitro and in vivo) and further investigation of its postharvest preservation and its use is needed.

Keywords: sage; phenols; postharvest quality; temperature; tomato

S10-O-I-3

Implementation of synthetic waxes and nanoparticles in the postharvest of purple passion fruit as tools to improve its quality

Aníbal Orlando Herrera-Arévalo, Emanuel David Santos-Suarez, Ana María Orjuela-Rodríguez, Helber Enrique Balaguera-López1, Joaquín Guillermo Ramírez-Gil*

Facultad de Ciencias Agrarias, Universidad Nacional de Colombia, Bogotá.

*Correspondence: jgramireg@unal.edu.co

The purple passion fruit (*Passiflora edulis* Sims f. *edulis* Sims) is a climacteric fruit that is highly sought after in the global market for its desirable organoleptic and nutraceutical characteristics, making it a potential export commodity. However, its short post-harvest life poses a challenge for international logistics. This study focusses on extending the shelf life of export-grade passion fruits by implementing coatings made from natural waxes and silver-doped titanium dioxide nanoparticles (TiO2-Ag). The fruits, harvested under European market standards, underwent coating applications, and were stored under different conditions; the results showed that the different treatments, particularly the combination of waxes and nanoparticles, effectively maintained fruit firmness and elasticity, and coatings also impact key parameters like total titratable acidity, suggesting a slowdown in metabolic processes. These findings support the use of combined wax and nanoparticle applications as a promising strategy to enhance post-harvest quality and prolong the shelf life of purple passion fruit.

Keywords: Potential anti fungi, ripening, nanoparticles, natural resin

S10-O-I-4

NOSH-A, a donor that releases nitric oxide (NO), hydrogen sulfide (H2S) and aspirin, as a promising tool to enhance phytochemical content of strawberry fruits

George Manganaris[1], **Egli Georgiadou[2]**, Anna Maria Taliadorou[2], Vassilis Fotopoulos[2], Carlos Javier Garcia Hernandez[3], Fransisco Tomas-Barberan[3], Maria Isabel Gil[3],

[1]Anexartisias 57, PAREAS Building, P.O. Box 50329, 3603 Lemesos, Cyprus

[2]Cyprus University of Technology, 3603, 3603 LEMESOS, Cyprus

[3]CEBAS-CSIC, Murcia, Spain

*Correspondence: george.manganaris@cut.ac.cy

Strawberry (*Fragaria x ananassa* Duch.) is one of the most popular fruit due to its superior taste and its health-promoting properties. At the same time, it is a highly perishable crop with limited market life. The working hypothesis of our experimental approach was to dissect the efficacy of an array of molecules with potential 'priming' effect on postharvest performance and antioxidant potential of strawberry fruits after 4,8 and 12 days of cold storage (4°C, 90% R.H.) and additional maintenance at room temperature for 1 day. Strawberry fruits (cv. 'Savana') of uniform size and ripening stage (commercial ripeness >80% of the surface red color), were hand-harvested and immediately transferred to the laboratory. After removal of defective fruits, they were separated to 24 lots of 60 fruits each. Each three lots were subjected to immersion with the following postharvest treatments: (1) control (untreated), (2) hydro-primed, (3) NOSH-A, (4) chitosan (CTS), (5) CTS-NOSH-A, (6) sodium alginate (Alg), (7) alginate-NOSH-A and (8) CTS-Alg-NOSH-A. NOSH-A (patent WO/2015/123273) acts as a donor that releases nitric oxide (NO), hydrogen sulfide (H2S), and aspirin (acetylsalicylic acid) concurrently. Chitosan is a biobased, biologically safe and biodegradable polymer that has been exploited as a nanocarrier to deliver efficiently an array of compounds, while alginate (sodium-based in our case) is another biodegradable polymer applied in nano smart delivery systems. Quality attributes (fresh fruit weight, volume, color, flesh firmness, soluble solids content (SSC) and titratable acidity (TA)) were determined, without however any striking differences among treatments. Interestingly, a notable increase in an array of phytochemical compounds were monitored in fruits treated with NOSH-A such as ellagic acid, pelargonidin-3-glucoside, pelargonidin-3-rutinoside, catechin. Notably the increment in such compounds was more pronounced after 8 days cold storage with a consequential decrease after 12 days of cold storage.

Keywords: postharvest; phytochemicals; antioxidants; phenolic acids; anthocyanins; flavonols

S10-O-I-5

Postharvest challenges for the four main apple cultivars in Norway

Hanne Larsen[1]*, Theresa Weigl[2], Siv Fagertun Remberg[3], Jorunn Børve[2]

[1]Nofima – Norwegian Institute of Food, Fisheries and Aquaculture Research, Ås, Norway

[2]Norwegian Institute of Bioeconomy Research (NIBIO), P.O. Box 115, 1431 Ås, Norway

[3]Faculty of Biosciences, Norwegian University of Life Sciences (NMBU), 1432 Ås, Norway

*Correspondence: hanne.larsen@nofima.no

The four main apple cultivars in Norway, 'Discovery', 'Summerred', 'Red Gravenstein' and 'Red Aroma' constitute 80% of the volume on the market. These cultivars provide good yields in a Nordic climate with a short growing season but have relatively limited storage and shelf life. The main challenges are rapid loss of firmness and senescent-related disorders, both connected to ripening and ethylene. Possible ways to secure fruit quality at the consumer end by improvements at the packinghouse level were investigated in several projects. One of the factors to evaluate was ethylene levels in fruit storage rooms. Ethylene concentrations were measured in cold storage rooms with different volumes of fruit using a portable instrument with an electrocatalytic sensor for continuous in-situ measurement of ethylene in the air. Ethylene concentrations between 10-35 ppm were measured in 18 % of the rooms, whereas 82 % had concentrations between 0-10 ppm. Fruit samples were assessed for ethylene production rates in their expected cold storage period. The values obtained were used to evaluate the risk of high ethylene levels in certain rooms before packaging, to recommend which cultivars could be kept in the same rooms, and for how long. In addition, harvesting less ripe fruit, with storage at lower temperatures, short-term CA storage and 1-MCP treatment have been tested for further improvement of fruit quality during storage.

Keywords: early ripening, ethylene concentration, ethylene production rate, fruit quality, 1-MCP, short-term storage.

S10-O-I-6

Effects of postharvest technologies on quality parameters of organic blueberries

Andrei Petre[1]*, Andreea Barbu[1], Mihai Frîncu[1], Violeta Alexandra Ion[1], Liliana Bădulescu[1], Adrian Asănică[2]

Research Center for Study of Food Quality and Agricultural Products, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59, Mărăști Blvd., Bucharest, Romania

Facutly of Horticulture Bucharest, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59, Mărăști Blvd., Bucharest, Romania

*Correspondence: andrei.petre@qlab.usamv.ro

Wild blueberries (*Vaccinum myrtillus* L.) and Highbush blueberry (*Vaccinium corymbosum* L.) produce fruits appreciated for their high antioxidant content. The present study focuses on the quality parameters of organic blueberries in different storage conditions, to compare the behaviour of blueberry varieties during postharvest period. Three organic grown blueberries varieties: 'BlueGold , 'Duke' and 'Legacy', were harvested in July 2022 from farm located in Dambovita county in Romania. Organic blueberries were subsequently stored in normal (1º C, 95% RH) and controlled atmosphere conditions (1. 1˚C, 95% RH, 3% O_2 and 5% CO_2, 2. 1˚C, 95% RH, 3% O_2 and 15% CO_2) and their quality parameters were systematically analyzed throughout the storage period.The quality parameters of blueberry fruits included: firmness, total titratable acidity, shape index, total soluble solids, dry matter content, total phenolic content, antioxidant activity. Research performed revealed that blueberries stored in controlled atmosphere conditions were better preserved than those stored in normal atmosphere in terms of quality parameters such as firmness, total phenolic content and antioxidant activity.

Keywords: storage, quality indicators, controlled atmosphere, postharvest, organic

SESSION II:

EFFECTS OF PREHARVEST MANAGEMENT ON POSTHARVEST QUALITY OF FRUITS, VEGETABLES, AND ORNAMENTALS

S10-O-II-1

Impact of pre- and post-harvest conditions on the quality, flavor, and health-promoting properties of fruits and vegetables

Bhimanagouda Patil*, Samikshya Bhattarai, Deepak Jha, Vikas Dadewal

VFIC, Texas A&M University, Department of Horticulture, 1500 Research Parkway Ste A120, College Station, TX 77845, United States of America

*Correspondence: bhimanagouda.patil@ag.tamu.edu

Considering postharvest effects on the nutritional quality and health-promoting properties of fruits and vegetables is important for delivering a high-quality product to consumers. Our studies have demonstrated the impact of growing conditions, maturity at harvest, storage conditions, and treatments such as temperature, irradiation, and chemicals, on postharvest quality, including health-promoting biological activities associated with specific bioactive compounds. Focusing on grapefruits, onions, melons (watermelon, cantaloupe, etc.), and tomatoes, our research sheds light on how these factors influence the abundance of volatile compounds, nutritional content, and health-promoting attributes. In grapefruits, harvesting at the right maturity enhances levels of volatiles like D-limonene, β-caryophyllene, and nootkatone. Storage conditions affect furocoumarin levels, indicating a senescence-associated decline. Lowering storage temperature diminishes these volatiles, possibly due to reduced activities of their biosynthetic enzymes. High-nitrogen soil negatively impacts grapefruit quality, reducing volatiles and vitamin C content. Bioactive compounds such as furocoumarin, d-limonene, and vitamin C are involved in inhibiting degradative enzymes and enhancing human metabolism. Degreening enhances nomilin content, which has demonstrated anticancer effects against breast and pancreatic cancer. Low-dose gamma irradiation enhances health-promoting compounds in grapefruits. Further investigation of seasonal variation in grapefruit pectin composition associated pectin content with negative regulation of heparin-catalyzed reduced FGF signaling, which further indicates its potential as an agent with anti-growth factor properties, offering potential health benefits. In another set of studies, supplemental lighting boosted firmness in greenhouse-grown tomatoes, limiting the activity of cell wall–degrading enzymes, and improving shelf-life. These light conditions enhanced phenolic and carotenoid contents, vital for long-term health benefits in humans, particularly for chronic and gut-related syndromes. Light also had a positive impact on the levels of aroma volatiles, enhancing the quality and market value of tomatoes. In conclusion, our studies underscore the importance of pre-and postharvest management in maximizing the overall quality and health benefits of produce, considering specific factors such as harvest maturity, storage conditions, and novel light treatments.

This project is supported by NIFA-SCRI- 2017-51181-26834 through USDA National Center of Excellence at the Vegetable and Fruit Improvement Center of Texas A&M University partially supported in part by funding from the Texas A&M Institute for Advancing Health through Agriculture.

Keywords: limonoids, flavonoids, quality

S10-O-II-2

Some varieties of Indian mangoes are better stored on the tree than harvested and treated with 1-MCP

Sangeeta Chopra[1]*, Shubhangi Nile[1], Manish Srivastava[2], P.K. Sharma[1], P.K. Sahoo[1], Roaf Parray[1], Randolph Beaudry[3]

[1]Division of Agricultural Engineering, ICAR, Pusa Campus, New Delhi, Delhi, 110012, India

[2]Fruits and Horticultural Technology FHT, IARI, Pusa Campus, New Delhi, Delhi, 110012, India

[3]Department of Horticulture, East Lansing, MICHIGAN, 48824, USA

*Correspondence: dhingra.sangeeta@gmail.com

This study aimed to assess differences in the ripening behavior of Pusa Manohari and Amrapali mango (*Mangifera indica*) fruit retained on the tree and harvested mangoes with and without 1-methylcyclopropene (1-MCP) treatments. On-tree mangoes, grown at ICAR_IARI, Delhi, India, were freshly harvested every 3 days, starting 120 days after flowering, from an IARI orchard and evaluated after a 4-hour incubation at 27 °C. These on-tree mangoes were tested for internal and external color, firmness, total soluble solids (TSS), respiration rate, and density. Additionally, mangoes harvested on the 6th, 16th, 22nd, and 42nd day from the start date were stored (off-tree) in ambient conditions. 1-MCP treatments (1-ppm) were given as a single dose on the day of harvest or given as multiple (daily) doses for 7 consecutive days. These off-tree mangoes were evaluated for quality characteristics over the storage duration. Over the 60 days of the study, on-tree mangoes exhibited negligible changes in TSS until they were harvested, at which point, ripening and starch conversion was rapid. Starch conversion rate was maturity-dependent, increasing as the harvest season progressed. The rate of change of skin color, flesh color, ethylene production, time to climacteric, and fruit firmness was also slowed markedly by retention of fruit on the tree. Single doses of 1-MCP had no effect on any ripening parameter. Multiple/continuous doses of 1- MCP produced a slight delay in ripening of Pusa Manohari, but not Amrapali. The mangoes left on the tree took a longer time to ripen as compared to when they were harvested and stored in ambient conditions even when treated with 1-MCP. The data suggest that, lacking refrigeration, the best option for retaining fruit quality in these two mango varieties is to delay harvest. The nature of the inhibitory action of the tree on ripening is not known.

Keywords: 1-MCP, mangoes, ripening, maturity

S10-O-II-3

Effect of growing substrate composition and storage temperature on quality parameters of a red mini plum tomato fruits, cv. Solarino

Anna Agosti[1]*, Samreen Nazeer[1], Lorenyo Del Vecchio[1], Leandra Leto[1], Martina Cirlini[1], Benedetta Chiancone[1,2]

[1] Department of Food and Drug, University of Parma, Viale Parco Area delle Scienze 27/A, 43124 Parma, Italy

[2] Institute of Biophysics, National Research Council (CNR), Via Ugo La Malfa 153, 90146 Palermo, Italy

*Correspondence: anna.agosti@unipr.it.

Fertilizers from agri-food waste such as biochar (BC) and wood distillate (WD) are considered an innovative solution in agriculture, to improve fruit quality and promote the circular economy. However, the effect of these products on post-harvest parameters of tomato fruits needs to be better investigated. Due to its short shelf-life and susceptibility to mechanical damage, huge post-harvest losses are witnessed in several tomato varieties. This study aimed to evaluate, in a soilless system, the influence of substrate composition on the shelf life of a tomato red mini plum variety (cv. Solarino). Specifically, BC and WD (3ml/l) were added to a coconut fiber substrate, alone or in combination (2%BC, 5%BC, 2%BC+WD, 5%BC+WD), and harvested fruits were stored at room temperature (RT) and at 4°C. Fruit quality parameters were monitored once a week for two weeks. As expected, fruits stored at 4°C evidenced a decay slower than those at RT, and they seemed to suffer less the effect of the substrate composition, as observed, for weight. Interesting results were observed within fruits stored at RT, Total Soluble Solid content showed, in control samples, after one week of storage, an increase of 13%, and then, in the second week, a decrease of 15%. On the other hand, in fruits from treated plants, increment and reduction percentages were markedly lower (on average +6.9% and -3.4%). In addition, growing substrate composition influenced the antioxidant activity, during the fruit storage, with a more marked increase registered for fruits from 2% biochar enriched substrate. Preliminary results reported in this study set the base for further investigation into how adding agri-food-derived fertilizers in the growing substrate could influence post-harvest quality characteristics of tomato fruits and consequently, improve their shelf-life.

Keywords: Biochar, circular economy, shelf-life, *Solanum lycopersicum* (L.), wood distillate

S10-O-II-4

Yield and quality traits of early carrot as affected by genotype and harvest time

Claudio Cannata*, Federico Basile, Francesco Giuffrida, Cherubino Leonardi, Francesco Adorna, Rosario Paolo Mauro

Department of Agriculture, Food and Environment, University of Catania, Via S. Sofia 100, 95123 Catania, Italy

*Correspondence: claudio.cannata@phd.unict.it

In Southern Italy, the cultivation of early carrots relies on few cultivars (Nantes-types), characterized by orange roots, tolerance to early vernalization, and prolonged quality in the field. This last characteristic is beneficial for regulating the product's presence on the market, enabling growers to adjust their harvests according to market demands. Nevertheless, the introduction of novel product typologies appears essential to broaden the product's appreciation in European markets and better cater to the preferences of evolving consumers. For these reasons, a field experiment was conducted in Sicily (South Italy), to address the effects of two harvest times (183 vs. 197 days after sowing, hereafter T1 and T2) on root yield and quality traits of the carrots 'Dordogne' (orange root), 'Yello Mello' (yellow) and 'Purple Sun' (purple). Irrespective of the harvest time, 'Dordogne' and 'Mello Yello' proved the highest root yield (on average 69.1 t ha-1), whereas marketable yield was higher at T2 than at T1 (60.6 vs. 56.2 t ha-1). Concerning the quality traits, root dry matter, total soluble solids (TSS) and titratable acidity peaked in 'Purple Sun' (12.46 %, 9.55 °Brix, and 0.016 % of MAE); additionally, TSS was higher at T2 than at T1 (8.91 vs. 8.11 °Brix, on average). Passing from T1 to T2, 'Purple Sun' displayed a significant decrease in total carotenoids (50 vs. 29 mg kg-1 FW, -42 %), and a concurrent increase in total phenolic content (2,391 vs. 3,275 µmol CGAE kg-1 FW, +37%), and antioxidant activity (2,108 vs 2,634 µmol TE kg-1 FW, +25%). These results give important information about the possible contribution that novel product typologies could give in Southern Italy to improve product diversification, root yield and functional traits of the off-season carrots intended for fresh consumption.

Keywords: *Daucus carota* L.; cultivars; coloured carrots; carrot quality, nutraceutical traits.

S10-O-II-5

Characterization and postharvest behavior of mulberry fruit (*Morus nigra* L.) during ripening

Giancarlo Colelli*, **Danial Fatchurrahman**, Noelia Castillejo, Ayoub Fathi-Najafabadi, Maria Luisa Amodio

Department of Agricultural Sciences, Food, Natural Resources and Engineering (DAFNE), University of Foggia, Via Napoli 25, 71122 Foggia, Italy

*Correspondece: giancarlo.colelli@unifg.it

Mulberry is a highly appreciated fruit but with a very short shelf life when harvested at full maturity. Therefore, with the limited information in the literature, it is crucial to know better its metabolic behavior and its postharvest characteristics in which we can act to prolong its shelf life. The objective of this work was to identify the metabolic behavior and evaluate the evolution in the main physicochemical parameters of nine maturity stages, according to fruit weight (from 0.52 for stage 1 to 5.7 g for stage 9) and color (namely hue angle varying from 137 for stage 1 to 328º for stage 9), at harvest and during 3 days of storage at room temperature. After this storage period, Total Soluble Solids (TSS) increased by 10.5 and 7.8% at maturity stages 5 and 6, respectively; pH increased by 26, 32.7, 11.3, and 3.8% at the maturity stages 4, 5, 6, and 7, respectively; while Titratable Acidity (TA) decreased by 32.8, 52, and 30.3% at the maturity stages 4, 5, and 6, respectively. A climacteric peak was only observed at the maturity stages 4, 5, and 6 indicated by the rise of ethylene production with maximum peaks at 83, 132, and 138 uL ethylene/kg*h respectively. Additionally, after 3 days of storage, those stages showed ripening, as indicated by the increase in TSS and decrease in TA, and changed in color, while the earlier stages failed to complete ripening. As a conclusion, for the data obtained in this experiment, mulberry fruit showed a climacteric behavior; the wide differentiation of mulberry maturity stages has allowed a better postharvest characterization of this species.

Keywords: ripening, ethylene, color, climacteric, pH, TSS, acidity

S10-O-II-6

The influence of water stress and two rootstocks on cv Femminello Zagara Bianca lemon (*Citrus lemon* L.) fruit quality

Eugenia Guccione[1]*, Alessio Allegra[1], Paolo Inglese[1], Pedro Javier Zapata[2], María José Giménez[2], Fabrizio G. Casales[1], Francesco Paolo Marra[1], Giuseppe Sortino[1]

[1]Department of Agricultural, Food and Forest Sciences – University of Palermo, Viale delle Scienze, building 4, entrance H - 90128 Palermo, Italy. 90128, Italy

[2] Department of Agri-Food Technology, EPSO, University Miguel Hernández, Ctra. Beniel km. 3.2, Alicante, Orihuela 03312, Spain

*Correspondece: eugenia.guccione@unipa.it

‘’Forzatura’’ is an ancient water stress management technique still practiced today by southern Italian growers who intend to exploit re-flowering that characterizes *Femminello Zagara Bianca* lemon fruit (*Citrus limon L. Burm.*) to obtain an out-of-season flowering that originates "verdelli" fruiting, available during the summer season. However, ‘’forzatura’’ turns out not to be respectful of the lemon plant causing a significant and rapid depletion of the plant resource which leads to a drastic reduction in the life of the lemon grove. The aim of the present study was to investigate the effects of forcing on quality parameters of ‘’primofiore’’ lemons of *Femminello Zagara bianca* trees grafted on two different rootstocks, *Citrus volkameriana* Pasc. and *Citrus sinensis* [L.] Osb. × *Poncirus trifoliata* [L.], comparing ‘’forzatura’’ technique at 0% of field capacity (F), the effect of two irrigation strategies, 25% and 50% of field capacity (FC), and a control one (100% FC), which allowed the achievement of summer flowering without the suspension of irrigation by maintaining moderate stress values quantified with stem water potential (Ψstem), leaves chlorophyll content and nitrogen balance index (NBI). Results showed that the adoption of deficit irrigation strategies provided fruits with higher juice yield for *Carrizo* rootstock, while in terms of net production, fruit weight, polyphenol content and TSS/TA ratio, *C. volkameriana* rootstock had higher values. A lower green index, quantified by observing the parameter a*, was proven to be higher in the two different irrigation strategies thesis, meaning that the degreening process was probably caused by drought.

Keywords: *Femminello Zagara Bianca*, Citrus limon, Citrange carrizo, Citrus Volkameriana, Forzatura technique, drought stress, deficit irrigation strategies post-harvest.

S10-O-II-7

Lighting influence on microgreen antioxidant systems: a comparative analysis of white and mixed light spectrum and intensit

Ieva Gudinskaite*, Kristina Laužikė, Giedrė Samuolienė

Lithuanian Research Centre for Agriculture and Foresty, Lithuania

*Correspondence: ieva.gudzinskaite@lammc.lt

Light is one of the most important growing environmental factors, which can influence plants' nutritional value, visual appearance, and overall taste. Our research aims to show that lighting intensity and spectral composition may have an impact on microgreens' antioxidant activity. The experiments were conducted in (I) a greenhouse (Lat 55°) and (II) in a controlled environment chamber (CEC). *Brassica juncea, Brassica oleracea* var *italica*, *Brassica oleracea* microgreens were grown in peat substrate with supplemental light-emitting diodes (LEDs) lighting, and the total PPFD of 150, 200, and 250 µmol m^{-2} s^{-1} was maintained for 16h with 21±3 °C. For supplemental light in a greenhouse was used white lamps and in CEC spectral composition consisted of deep red 61 %, blue 20 %, white 15 %, and far red 4 %. Results showed that for mustard on harvest day and after 1 day of storage the highest FRAP and DPPH antioxidant activity was determined under 150 µmol m^{-2} s^{-1} in both treatments, but during the 3rd storage day, the differences lost significance. For Broccoli, on the harvest day, the highest DPPH activity was determined under 200 µmol m^{-2} s^{-1}, but during 1st and 3rd day of storage under 150 µmol m^{-2} s^{-1} in CEC this PPFD resulted in the lowest, while in a greenhouse in the highest activity. For kale on harvest day the highest DPPH activity was determined under 200 µmol m^{-2} s^{-1} in CEC and under 250 µmol m^{-2} s^{-1} in a greenhouse. During storage, both treatments resulted in highest DPPH activity under 250 µmol m^{-2} s^{-1}. To conclude, investigated microgreens showed species-dependent responses to light intensity and spectral composition alterations. Mustard and broccoli, showed to exhibit higher antioxidant activity when grown under 150 µmol m^{-2} s^{-1} kale under 250 µmol m^{-2} s^{-1}.

Keywords: Postharvest quality; postharvest storage; antioxidant activity; light conditions.

S10-O-II-8

Effect of foliar calcium application on senescent breakdown in 'Summerred' apple fruit

Theresa Weigl[1,2]*, Jorunn Borve[2], Hanne Larsen[3], Carl Gunnar Fossdal[2], Ingunn Ovsthus[2], Emily Follett[2], Siv Fagertun Remberg[1]

[1]Faculty of Biosciences, Norwegian University of Life Sciences (NMBU), 1432 Ås, Noredrway

[2]Norwegian Institute of Bioeconomy Research (NIBIO), P.O. Box 115, 1431 Ås, Norway

[3]Nofima, Norwegian Institute of Food, Fisheries and Aquaculture Research, P.O. Box 210, 1431 Ås, Norway

*Correspondence: theresa.weigl@nibio.no

The mid-early ripening cultivar, 'Summerred', is popular among consumers and widely grown in Norway. However, 'Summerred' fruit is prone to rapid softening and development of senescence-related disorders, especially senescent breakdown. Calcium can have a significant role in maintaining firmness and delaying senescence of fruits. In a two-year study, foliar application of calcium chloride (CaCl2) was conducted six times, with varying weather conditions between the growing seasons. Fruit was harvested at optimal commercial maturity and stored at 4 °C for either six or nine weeks, followed by simulated shelf-life conditions at 20 °C. Ethylene levels were monitored during storage to detect ripening discrepancies. At harvest, CaCl2-treated fruit exhibited significantly lower ethylene production compared to untreated fruit, although no differences were observed during the end of the storage period. Senescent breakdown showed significant variability between the two seasons, with an incidence of up to 15 % in the first season and nearly no incidence in the second season. Senescent breakdown increased with storage length but was not affected by foliar CaCl2 application. Real-time PCR analysis of fruit flesh samples revealed increased expression of polygalacturonase and β-galactosidases genes after storage, indicating their involvement in apple softening. Notably, there were no differences in gene expression between CaCl2-treated and untreated fruit after storage. Expression patterns of genes involved in ethylene biosynthesis at harvest were different between the two seasons. Higher expression was observed in the year when more disorder development occurred, indicating advanced maturity at harvest. There were no significant differences in Streif index between the two years.

Keywords: calcium chloride, ethylene, fruit quality, gene expression, physiological disorders, storage length

S10-O-II-9

Plant growth regulator effects on physiological storage disorders of ‘McIntosh’ and ‘Empire apples’

Christopher B. Watkins

Department of Horticulture, Cornell University, Ithaca, NY 14853-5908, United States of America

*Correspondence: chris.watkins@cornell.edu

Preharvest applications of the plant growth regulators (PGRs), aminoethoxyvinylglycine (AVG) as ReTain, and 1-methylcyclopropene (1-MCP) as Harvista, are used by many apple industries to reduce pre-harvest drop and control fruit maturation and ripening by inhibiting ethylene production and perception, respectively. However, less attention has been paid to the effects of these PGRs on susceptibility of fruit to physiological disorders in storage, and also in relationship with postharvest 1-MCP treatments. The effects of PGRs on physiological disorders will be described using a few cultivars as examples. 1. inhibition of stem end flesh browning of ‘Gala’, and of soft scald of ‘Honeycrisp’; 2. increased susceptibility to carbon dioxide injuries in ‘McIntosh’ and ‘Honeycrisp’; 3. increased susceptibility to bitter pit in ‘Honeycrisp’, and 4. either decreased or increased superficial scald incidence in “Delicious’ and ‘NY2’. Research showing pre- and post-harvest effects of PGRs on watercore incidence and dissipation will also be presented. Interactions with postharvest 1-MCP treatments will be discussed. Most outcomes from PGR use can be ascribed to effects on fruit maturity. The results highlight the importance of integrating on farm management protocols with decisions made by storage operators to maximize fruit quality outcomes.

Keywords: aminoethoxyvinylglycine; AVG; Harvista; 1-MCP; maturity;

S10-O-II-10

Efficacy of pre-harvest salicylic acid treatment on postharvest quality enhancement of marian plums (*Bouea oppositifolia* (Roxb.) Meisn.)

Suriyan Supapvanich[1]*, Li Da[1], J. Phakawan, Chairat Techavuthiporn[1]

[1]*Department of Agricultural Education, School Industrial Education and Technology, KMITL, 1 Chalongkrung Road, Ladkrabang, Bangkok 10520, Thailand*

*Correspondence: suriyan.su@kmitl.ac.th

Marian plum *(Bouea oppositifolia* (Roxb.) Meisn.) is a tropical that holds significant commercial importance in Southeast Asia. Softening and disease incidence are the main problems limiting the postharvest quality of the fruits. The purpose of this study was to determine the efficacy of pre-harvest salicylic acid (SA) spray on fruit quality maintenance during storage at room temperature (25±1 °C). The fruits were pre-harvest sprayed with SA at concentrations of 0 (water), 1, 2 and 3 mM prior to harvest for 3 d. The finding showed that 3 mM SA evidently delayed the progression of fruit coloration from the time of harvest to the end of storage (day 8) in comparison to the control treatment. During storage, disease incidence in the 3 mM SA-treated fruits was not found in the comparison of other treatments. All SA treatments reduced the magnitude of weight loss increase. The 3 mM SA treatment delayed fruit softening, lipid membrane degradation, total soluble solids increase and maintained the high level of total acidity. In addition, the application of 3 mM SA significantly increased the ferric reducing antioxidant potential, and all SA treatments effectively maintained free radical scavenging activity compared to the control treatment. In conclusion, pre-harvest SA spray at 3 mM prior to harvest is an effective approach to maintaining the postharvest quality of marian plums during storage.

Keywords: Salicylic acid; marian plum; postharvest quality; softening; antioxidants

SESSION III:

TRENDS IN QUALITY OF HORTICULTURAL PRODUCTS (PRESERVATION, MANAGEMENT, SAFETY)

S10-O-III-1

Vertical farming and beyond: the influence of different light conditions on the physiological, nutritional and postharvest quality of indoor-grown lettuce

Ellen Van de Velde*, Marie-Christine Van Labeke, Frank Devlieghere, Kathy Steppe, Emmy Dhooghe

Ghent University, Coupure Links 653, 9000 Ghent, Belgium

*Correspondence: ellen.vandevelde@UGent.be

Vertical farming is often proposed as a way to optimize water and pesticide use and achieve a higher and more predictable yield per unit area. In addition, the growing conditions in these facilities are highly controlled, allowing to steer plant growth and promote the synthesis of specific compounds. Artificial lighting represents an important share in the energy costs of vertical farms. Moreover, excessive lighting is known to promote the development of tipburn, a physiological disorder characterized by necrotic leaf edges. Therefore, the intensity, spectral characteristics and timing of artificial lighting need to be managed very carefully. We performed several experiments to study the growth and quality of lettuce plants grown in an indoor facility with varying light conditions. During cultivation, non-destructive sensors were used to monitor plant growth. Tipburn incidence and severity were also monitored during the growing period. Since the postharvest phase has often been overlooked in earlier studies on light management in vertical farms, quality measurements were performed at harvest and at different moments during storage. To this end, the lettuce plants were shredded and packed under controlled atmosphere (3% O2). In order to evaluate the decline of nutritional value, the contents of sugars, carotenoids and total phenolics were analyzed. Furthermore, the respiration rate was studied by measuring oxygen levels in the packages at different timepoints and calculating the oxygen consumption rate. The microbial contamination of the produce was examined by counting the number of colony forming units. Finally, a consumer panel was asked to evaluate the lettuce on parameters such as appearance, texture and odor. Our results provide valuable insights into the effects of preharvest lighting conditions on the postharvest physiology of lettuce, which is pivotal to determine the shelf life and optimize storage conditions.

Keywords: vertical farming, light spectrum, lettuce, tipburn, nutritional quality, respiration, microbial contamination, consumer acceptance

S10-O-III-2

Towards a more sustainable fresh fruit and vegetable industry in Western Australia: an application of the PESTLE framework

Peter J. Batt[1]*, Graham McAlpine[2]

[1]*University of Western Australia, 35 Stirling Highway, 6009 Perth, Australia*

[2]*Perth NRM, Bentley DC, WA, 6983, Australia*

*Correspondence: peter.batt@uwa.edu.au

While most often used in the strategic management literature, this study employs the PESTLE framework to examine the sustainability of horticulture food chains in Western Australia. While climate change and changing rainfall patterns are modifying production practices, profitability at the producer level and at the retailer level is the greatest concern for the long-term sustainability of the industry. At the producer level, as input costs and the cost of compliance continue to increase, output prices are steadily declining as competition between the major supermarket chains drives prices down. Similarly, small independent retailers are struggling as competition among the major supermarket chains erodes prices and the costs of running their business increase. At both a state and local government level, there is a need for improved long-term planning, a review of competition policy and greater investment in public infrastructure. As consumers are unwilling to pay a price premium to support sustainable food production, government will need to explore alternative mechanisms to remunerate growers for the ecosystem services that they provide to society.

Keywords: policy, strategy, profitability, governance, competition

S10-O-III-3

From genes to harvest: exploring the factors influencing blueberry fruit firmness

Iordăchescu Mihaela*, Bădulescu Liliana

Research Center for Studies of Food and Agricultural Products, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Mărăști 59, Bucharest, Romania

*Correspondence: mihaela.iordachescu@qlab.usamv.ro

Fruit firmness (FF) is one of the main economically important quality traits in blueberries. Present study aims to review the genetic and environmental factors as well as cultivation and postharvest practices that influence blueberry FF. Physiological factors such as fruit maturation and ripening, as well as cell wall dynamics during ripening process are ultimately under genetic control. Cell wall biosynthesis genes, ethylene-related genes, calcium-related genes, aquaporin-related genes, expansin genes, and transcription factors-encoding genes are among the genetic factors influencing FF. Temperature, water, and nutrient availability are environmental factors that play a role in determining FF. Lastly, harvesting techniques as well as harvesting time and postharvest storage conditions also influence FF. In conclusion, an integrated approach is necessary to obtain blueberries with a FF that allows for increased consumer acceptance, shelf life, and postharvest handling. A better understanding of the molecular mechanisms controlling FF is needed to develop novel appropriate firmness cultivars. Optimum cultivation techniques applied to these new varieties, combined with best postharvest practices will ensure that high quality blueberries are delivered to consumers.

Keywords: *Vaccinium* spp.; fruit quality; blueberry quality; blueberry firmness

S10-O-III-4

Identification of chemotypes of rosemary specimens (*Salvia rosmarinus* Schleid) from the IMIDRA collection

Alicia Sánchez-Gorostiaga*, Pedro Mauri, José Plaza Ramos, Celia Cano Shaw, Barbara Stefanutti

Instituto Madrileño de Investigación y Desarrollo Rural Agrario y Alimentario (IMIDRA), Finca El Encín. Autovía A2, Km. 38,2. 28805 - Alcalá de Henares, Spain.

*Correspondence: alicia.sanchez.gorostiaga@madrid.org

The essential oil (EO) of rosemary (*Salvia rosmarinus* Schleid) holds significant potential in the cosmetic, food preservation, and pharmaceutical industries. However, the majority of commercially available EO in Spain derives from wild populations, with few rosemary cultivations established from selected chemotypes (QT). The ornamental rosemary collection at IMIDRA, comprising 35 accessions, has been field-reproduced to obtain clones adapted to the edaphoclimatological conditions of Madrid and to identify QT with high EO yields that could constitute an economically viable alternative due to their market value. The mother plant bank was vegetatively multiplied, cuttings were treated with rooting inductors, and were maintained in thermostatic tables with misting for three months. Subsequently, they were potted and transferred to the field with localized support irrigation. After nine months of growth, 10 individuals were selected based on their growth characteristics, uniformity, and health status. Essential oil extraction from leaves and stems was performed by hydrodistillation with a Clevenger apparatus, determining the yield and chemical composition of the obtained EOs. Winter yields range between 0.7 – 0.8% dry weight (d.w.), although three clones exceed 1.2% d.w. Analysis of the EO composition identifies clones with high levels of verbenone (10.5%), alpha-pinene (38.8%), or limonene (24.7%), which do not conform to the rosemary QTs present in the market, such as the QT-camphor, QT-cineole, and QT-verbenone. Our clones could represent a cultivation alternative for industries and farmers due to the high values of these molecules or the novel combination of compounds in the EOs.

Keywords: essential oil, food, cosmetics, pharmaceutical, cultivation

S10-O-III-5

Color spaces for quality prediction of impact damaged and stored banana fruit

Pankaj Pathare*, Mai Al-Dairi

Sultan Qaboos University, Al-Khod, Oman

*Correspondence: pankaj@squ.edu.om

Color is one of the key quality attributes that is highly utilized to describe the external quality of fresh produce. However, using color to predict other physiological quality attributes using modeling can facilitate the process of in-deep evaluations of fruit quality for researchers, scientists, horticulturists, etc. This paper is aiming to use three color spaces for the quality assessment of mechanically damaged banana fruit. By using the drop test method as a simulated handling practice, banana fruit were damaged by a 60 g stainless steel ball from a height of 60 cm by applying three repeated series (1, 3, and 6) on three different surface zones (top, middle, and bottom) on banana fruit. To compare the quality with non-damaged fruit, one set of banana fruit was kept as a control. The damaged and the control banana fruit were stored at 13 and 22°C. The total number of treatments was 20. A computer vision system was used to capture all images of the study and an image process technique was performed to evaluate the color, surface area (AS), and bruise area (BA). Also, the weight loss % was calculated. The experiment lasted for 12 days. The obtained R (Red), G (Green), and B (Blue) color values were converted to X (component with color information), Y (lightness), and Z (component with color information) color space, and then finally to L* (lightness and darkness), a* (redness and greenness), and b* (yellowness and blueness) color space (CIELab). The relation between each of these color spaces and changes in weight loss%, BA, and AS of mechanically damaged fruit during storage at both conditions were analyzed. The results found that the repeated impact could statistically influence the BA of banana fruit. Bananas were more likely to change color at higher temperatures and under 6 times repeated impact. Weight loss % and AS were temperature dependent. Storage at 22°C allowed for higher changes in the studied parameters. Using linear regression helped to predict the changes in weight loss %, BA, and AS from RGB, L*a*b*, and XYZ color spaces data. The accuracy of the regression model emphasized the importance of the skin color characteristics of bananas which can help to estimate other quality alterations during the postharvest supply chain.

Keywords: color, prediction model, banana, color spaces, image processing

S10-O-III-6

Changes in phenolic composition of table olives produced under regulated deficit irrigation during natural fermentation

Anabela Fernandes-Silva[1,2]*, Maria Sousa[1], Rosa Carvalho[1], António Inês[3,4]

[1]Department of Agronomy, School of Agrarian and Veterinary Sciences, University of Trás-os-Montes e Alto Douro, UTAD, Quinta de Prados, 5000-801 Vila Real, Portugal

[2]Centre for Research and Technology of Agro-Environment and Biological Sciences, Inov4Agro- Institute for Innovation, Capacity Building and Sustainability of Agri-food Production; University of Trás-os-Montes e Alto Douro, Quinta dos Prados, 5000-801 Vila Real, Portugal

[3]Vila Real Chemistry Research Centre (CQ), University of Trás-os-Montes e Alto Douro, UTAD, Quinta de Prados, 5000-801 Vila Real, Portugal

[4]Department of Biology and Environment, School of Life and Environmental Sciences, University of Trás-os-Montes e Alto Douro, UTAD, Quinta de Prados, 5000-801 Vila Real, Portugal

*Correspondence: anaaf@utadpt

Regulated deficit irrigation allows to decrease the amount of water applied without significant effects on yield and fruit quality. The influence of two irrigation treatments were evaluated in natural debittering olives ("Cobrançosa") from irrigation without water stress (FI) and regulated deficit irrigation (RDI) treatments. At the beginning of fermentation, the concentration of hydroxytyrosol, verbascoside and isoverbascoside were more concentrated in samples from FI, while oleuropein, the main phenolic compound responsible for bitterness, the phenolic acid clorogenic, luteolin and luteolin-7-glucoside and quercetin rutinoside were higher in olives from RDI treatment. Despite these differences, they were not statistically important, as well as the sum fraction of phenolic compounds. During fermentation, and in both irrigation treatments, the concentration of all individual phenolic compounds, namely oleuropein, decreased, while the concentration of hydroxytyrosol increased due to the hydrolysis of oleuropein. The higher changes in oleuropein were observed in the first week after the beginning of fermentation, in which a decrease of less than one-third of the initial content in olives from FI was observed while in RDI it was about half. At the end of the fermentation, the oleuropein content in olives from FI is close to zero while in RDI it was 25% of initial content, whereas an increment in the content of hydroxytyrosol of 300 to 350% was observed in olives from FI and RDI treatments, respectively. It can be concluded, therefore, that it is possible to reduce the amount of water applied and improve the quality of table olives.

Keywords: *Olea europaea* L; Cobrançosa, texture, oleuropein, hydroxytyrosol, biophenols

SESSION IV:

POSTHARVEST BIOCHEMISTRY AND PHYSIOLOGY OF FRUITS, VEGETABLES AND ORNAMENTALS

S10-O-IV-1

Growing quality

Julian Verdonk[1]*, Silvia Langer[1], Rob Schouten[2]

Horticulture and Product Physiology, Plant Science Group, Wageningen University and Research, Netherlands

Wageningen University and Research, Wageningen, Netherlands

*Correspondence: julian.verdonk@wur.nl

After harvest, the quality of fresh plant products doesn't stay constant. This is a problem because it leads to a less appreciated product, reduced value, and ultimately food waste and loss. The quality of horticultural plant products is determined by colour, texture, shape, flavour, and aroma. In addition, they are often loaded with bioactive phytochemicals or specialized metabolites. During cultivation, physiological and biochemical processes lead to changes in colour and texture, as well as flavour and aroma, generating a more appealing product. However, these perishable plant products are still alive, and during postharvest these living plant products continue ripening and/or developing, and exposure to physical stress, temperature changes, and changes in atmosphere and humidity can seriously limit their quality. Quality at harvest has a large impact on desirability, value, and on postharvest shelf life. For example, carbohydrate and antioxidant levels of plant products at harvest relate to shelf life. Quality is determined by genotype; however, it has been demonstrated that growth conditions are just as important. Quality can be manipulated using abiotic factors during pre, and postharvest. Our current research demonstrates that temperature, light spectrum, and relative humidity during cultivation or postharvest storage determine physiological and biochemical processes that shape the quality of plant products. To improve plant product quality, we must understand how we can use cultivation practices during preharvest to grow the best quality. This requires a study of the mechanism of signal transduction from the abiotic signal to the response in the plant.

Keywords: postharvest, plant product quality, shelf life, abiotic conditions, preharvest, specialized metabolites

S10-O-IV-2

Drying temperature alters quality components of peppermint leaves

Liane Kahlert[1]*, Katharina Luhmer[1], Silke Hillebrand[2], Jakob Ley[2], Stefan Brennecke[2], Ralf Pude[1]

[1]University of Bonn, Klein-Altendorf 2, 53359 Rheinbach, Germany

[2]Symrise, Mühlenfeldstrasse 1, 37603 Holzminden, Germany

*Correspondence: l.kahlert@uni-bonn.de

The technical drying of medicinal and aromatic plants is an indispensable part of the processing chain in order to preserve the plants as well as bioactive and flavouring compounds they contain. The drying technique has to be adapted individually to the crops being dried. Drying at temperatures exceeding 45°C is not recommended for peppermint, a traditional and economically important medicinal plant, as this results in volatilisation of compounds and reduction in the essential oil content. However, little is known about the accumulation of these volatile compounds in the in the condensed water phase that is produced through drying. Therefore, the potential use of this side stream for the extraction of active ingredients and flavourings should be examined. The aim of this study was to investigate the optimum drying temperature within a temperature range between 15 - 75 °C with regard to quality preservation of dried leaves of peppermint (Mentha × piperita 'Multimentha') on the one hand and to examine load and composition of the water phase on the other. Colour, microbial load as well as the essential oil content and quality were considered as quality parameters. Drying temperatures of 75 °C resulted in a lower essential oil content of the leaves because of simultaneous migration of monoterpenes into the water phase. The qualitative analysis of the side stream showed that 75 °C provided the best peppermint aroma profile. Lower drying temperatures (15 - 45 °C), in contrast, are beneficial for the retention of volatile compounds and the leaf color. Low drying temperatures and long drying cycles can promote microbial growth, so that the threshold for moulds according to the DGHM (German Association for Hygiene and Microbiology) was exceeded at 25 °C.

Keywords: low-temperature drying, *Mentha* × *piperita*, essential oil, condensation, volatile organic compounds, VOC, aroma

S10-O-IV-3

Postharvest characteristics of parthenocarpic prickly pear (*Opuntia ficus-indica* L. (Mill))

Berenice Karina Flores-Hernández[1], **Ma. de Lourdes Arévalo-Galarza[1]*,** Manuel Livera-Muñoz[1], Aida Martínez-Hernández[2], Cecilia Peña-Valdivia[3], Guillermo Calderón-Zavala[1]

[1]Colegio de Postgraduados Campus Montecillo. Carretera México-Texcoco km 36.5, Montecillo, Texcoco, Estado de México, México. C.P. 56230

[2]Colegio de Postgraduados Campus Campeche. Postgrado en Bioprospección y Sustentabilidad Agrícola en el trópico. Carretera Federal Haltunchén-Edzná km 17.5, Sihochac, Champotón, Campeche, México. C. P. 24450

*Correspondence: larevalo@colpos.mx

Opuntia ficus-indica L. (Mill) produces edible fruits called prickly pear or cactus pear, they have a pleasant flavor and nutritional value, therefore may be considered as functional fruit. Prickly pear production represents an option for fruit-growing areas with water scarcity, however, per capita consumption in the world of this fruit is low compared to other fruits due to its short shelf life and the presence of many hard seeds. In recent years, parthenocarpic varieties of prickly pear have been developed, with attractive colors, flavor similar to the original and with aborted seeds that are almost imperceptible to the consumer. However, its postharvest behavior has not been documented. Therefore, the aim of this study was to compare the postharvest characteristics of prickly pear fruits of the CPTF20-Red and CPTF30-Yellow cultivars naturally fertilized with their parthenocarpic counterpart. For the study, between 50 and 60 fruits of each variety and condition were harvested at horticultural maturity, the analyzes were carried out on pulp and pericarpel; and the data analized under a completely randomized design. It was observed that parthenocarpy mainly affects morphological characteristics of the fruits, since they have smaller size, greater pericarpel thickness and lower stomatal frequency compared to natural fertilization. In contrast, parthenocarpic fruit has double shelf life and significantly less weight loss compared to the fruits obtained by normal fertilization. The parthenocarpic fruits CP20TF and CP30TF presented a higher concentration of betacyanins in (18.4 mg 100 g^{-1} PF) and carotenoids (8.0 mg 100 g^{-1} PF) in pulp, respectively. The sugar-acid ratio in the fruits was between 70 and 75, since the parthenocarpic CP30TF fruits had the highest ratio and were rated as having the best flavor. Parthenocarpic fruits represent a viable option for commercial production due to their longer shelf life, lower weight loss and 20 to 50 % higher concentration of compounds such as carotenoids, betaxanthins and betacyanins as well as vitamin C.

Key words: shelf life, pigments, pericarpel

S10-O-IV-4

A validation of the essential nature of the citramalate synthase pathway in the de novo synthesis of esters and the importance of the sensory impact of the pathway in apple

Randolph M. Beaudry[1]*, Philip Engelgau[1], Sumithra Wendakoon[2], Aubrey Dubois[3], Emily Mayhew[3], Nobuko Sugimoto[1]

[1]Department of Horticulture, 1066 Bogue Street, Michigan State University, East Lansing Michigan 48824, United States of America

[2]Department of Agricultural Sciences, Ryukoku University, Osaka, Japan

[3]Department of Food Science and Human Nutrition, Michigan State University, East Lansing Michigan 48824, United States of America

*Correspondence: beaudry@msu.edu

Citramalate synthase (CMS) has been demonstrated to feed acetyl-CoA and pyruvate into a pathway leading to the formation of 2-methylbutyl branched-chain esters in ripening apple via evidence from isotopic feeding, protein characterization, gene expression, metabolite analysis, and germplasm evaluations. However, it was also suggested by critics of this study that the operativity of this pathway would have to be further validated. This criticism has some merit in that there is the potential for pre-formed isoleucine to contribute to the formation of 2-methylbutyl esters. Fortunately, the citramalate pathway to 2-methylbutyl esters includes a regulatory step between alpha-ketobutyrate and the ester precursor alpha-keto-beta-methylvalerate involving the protein acetolactate synthase, which is very specifically targeted by sulfonylurea herbicides. We found that sulfonylurea compounds applied to discs of ripening apple and quince fruit arrested the ripening-related accumulation of branched-chain amino acids and, importantly, nearly completely suppressed the synthesis of 2-methylbutyl esters. The data demonstrate that ester formation is de novo from CMS via alpha-ketobutyrate, rather than from preformed amino acids or amino acids accumulating from the degradation of proteins. The relevance of the CMS pathway to human consumers was tested using sensory analysis of treated apple fruits, which demonstrated the ability of humans to recognize the absence of branched-chain esters in fruits with highly complex aroma profiles. We also evaluated population genetics of accessions from breeding programs across the world and found human-facilitated breeding has selected for apple fruit that possess at least one functional CMS allele. Collectively the data demonstrate the central importance the citramalate synthase pathway in 2-methylbutyl ester formation in apple and further indicate its relevance to quality perception. Finally, the data largely debunk the catabolic pathway of branched-chain ester formation, commonly ensconced in textbooks and reviews, regarding the formation of these valuable aroma-active compounds.

Keywords: apple, aroma, citramalate, biosynthesis, banana, fruit.

SESSION V:

HORTICULTURAL PRODUCTS QUALITY EVALUATION AND PRESERVATION (METHODS, NON-DESTRUCTIVE TESTING, ACREDITATION, POLICIES, CHALLENGES)

S10-O-V-1

Postharvest lipidomics of lettuce leaves

Thomas Baron[1]*, Juliette Jouhet[2], Marion Schilling[2], Mathilde Cussac[2], Florence Charles[1], Véronique Vidal[1], Christian Chervin[3], Huguette Sallanon[1]

[1]Avignon University, 301 rue Baruch de Spinoza, Avignon, France, 13160 Chateaurenard, France

[2] CEA Grenoble Center, 17 rue des Martyrs, Grenoble, France

[3] Université de Toulouse AgroToulouse, INP-ENSAT BP 32607 31326, Castanet-Tolosan, France

*Correspondence: thomas.baron@univ-avignon.fr

Lipidomics is a new method in postharvest studies. RNA-seq data on lettuce leaves revealed important changes in gene expression linked to lipid metabolism. Here, we report a global lipid analysis in lettuce leaves over 14 d of storage, in dark cold conditions, with or without an initial light treatment. Our LC-MS analyses of 171 lipid compounds, among which digalactosyldiacylglycerol, triacylglycerol, and phosphatidic acid, revealed variations in response to the postharvest conditions. Our results suggest the reallocation of phospholipid fatty acids to galactolipids through storage time, which may be associated to lettuce capacities to withstand storage without rapid chlorophyll degradation in contrast to other leafy vegetables. The unsaturation level of fatty acids increased over storage time. Intermittent light treatment at the beginning of storage stimulated phosphatidic acid accumulation, concomitantly with upregulation of phospholipase D gene expression. We also observed an increase in triacylglycerol content after light treatment. Usual indicators of membrane damage, electrolyte leakage, and malondialdehyde, were unchanged during storage. Results are discussed in the light of known changes in postharvest life of lettuces and other leafy vegetables.

Keywords: *Lactuca sativa*; fatty acids; cold storage; galactolipids; triacylglycerol; phosphatidic acid

S10-O-V-2

Bio-impedance approach for discrimination of internal browning in apple after storage

Sundus Riaz[1,2,3]*, Pietro Ibba[1], Nadja Sadar[3], Ahmed Rasheed[1], Stefan Sturz[3], Luisa Petti[1], Paolo Lugli[1,4], Angelo Zanella[2,3]

[1]Faculty of Engineering, Free University of Bolzano-Bozen, Italy

[2]Department of Storage and Post-harvest Biology, Laimburg Research Centre, Ora, Italy

[3]Faculty of Agricultural, Environmental and Food Sciences, Free University of Bozen-Bolzano, Bolzano, Italy

[4]Competence Centre for Mountain Innovation Ecosystems, Free University of Bozen-Bolzano, Bolzano, Italy

*Correspondence: sundus.riaz@student.unibz.it

Apple is one of the most valuable cash crops in Italy, due to its great economic importance in the European market and driven by consumer preferences. In this region, a wide variety of apple cultivars are grown; among them, some are susceptible to internal browning during cold storage and postharvest management. Currently, there is no specific method capable of directly analyzing internal browning in apples. This study aims to develop an efficient, low cost and non-destructive technique to estimate internal browning in apples after seven months of post-harvest storage using electrical impedance spectroscopy (EIS) technique and compared with other well-investigated optical non-destructive, using delta absorbance meter (DA) and Near-infrared spectroscopy (NIR) and destructive (refractometer) quality analysis techniques. The quality parameters such as dry matter, chlorophyll and sugar content determine the ripening stages, age, and texture condition of fruits, were used to validate the bioimpedance results. In low and mid-frequency region of the bioimpedance spectrum, good discrimination was observed between healthy and internally browned samples, with statistically significant differences (p-values ≤ 0.01). The frequency points (40 Hz and 10 kHz) efficiently investigate the physiochemical changes that are produced during the development of internal browning in the apple, while the high frequency region (2.5 MHz) was not significant (p-values ≥ 0.05). The dry matter and sugar content measurements of fruit on the sunny and shaded sides were also short of discriminating between healthy and internally browned apples (p-values ≥ 0.05). However, chlorophyll content on the sunny side of the fruit discriminates between healthy and internal browned apples, with statistically significant differences (p-values ≤ 0.05) while proved to be insignificant for the shady side (p-values ≥ 0.05). This real-time, optimized, user-friendly, and cost-effective technique will help to reduce post-harvest loss and address sustainable agriculture and food security in future.

Keywords: Electrical impedance spectroscopy, internal browning, quality parameters, post-harvest quality.

S10-O-V-3

The development of disorders and decay in 'Braeburn' apple during storage and shelf life visualized under X-ray CT

Rachael Wood[1]*, Dirk Schut[2], Anna Trull[3], Leo Marcelis[1], Rob Schouten[4]

[1]Horticulture and Product Physiology, Wageningen University and Research, Droevendaalsesteeg 1, 6708 PB Wageningen, Netherlands

[2]Computational Imaging, Centrum Wiskunde en Informatica CWI, Science Park 123, 1098 XG Amsterdam, Netherlands

[3]Greefa Machinebouw B. V., Langstraat 12, 4196 JB Tricht, Netherlands

[4]Wageningen Food and Biobased Research, Bornse Weilanden 9, 6708 WG Wageningen, Netherlands

*Correspondence: rachw512@gmail.com

X-ray computed tomography (CT) studies have recently begun to focus on the feasibility of using CT for in-line sorting of fruit with internal disorders. Commercial in-line sorting generally occurs immediately or within a few days of storage removal. However, for decay and some physiological disorders, incidences progressively worsen at room temperature after removal from controlled atmosphere (CA) storage. Thus, symptoms may not have developed when in-line sorting occurs, and fruit may be incorrectly classified as healthy. This study aimed to examine the development of physiological disorders during storage and shelf life in whole apples with CT to determine if there are any early indicators of disease. In this study, 86 'Braeburn' apples were stored under browning-inducing CA conditions (0.5 °C, 1.5 kPa O2, 5 kPa CO2) for 17 weeks and subsequently kept under shelf life conditions (20 °C) for 14 days. Fruit were scanned periodically throughout CA storage and shelf life. A subsample (38) was scanned before CA storage, and six fruit were kept in shelf life conditions for 35 days or until rotten to examine senescence under CT. Results showed that the dark regions in CT scans associated with core browning did not develop until fruit were removed from storage and kept in shelf life conditions for at least four days. The mean greyscale value (MGSV) of CT images did not change during shelf life in fruit that remained healthy, whereas the MGSV significantly reduced in fruit that developed decay, core browning and other disorders (lenticel breakdown, bitter pit and shrivel). Furthermore, the MGSV was higher before CA storage and on the day of storage removal before shelf life in fruit that remained healthy throughout the experiment than in fruit that developed core browning and decay. These results indicate that the MGSV of CT images could be used to indicate fruit health. Fruit identified as developing disorders during shelf life could be used for other apple products before symptoms develop, significantly reducing food waste. This study is the first to show the development of disorders and decay in whole apples during shelf life with CT.

Keywords: browning; controlled atmosphere; decay; postharvest; X-ray computed tomography

S10-O-V-4

Can apple firmness be estimated non-destructively using X-ray CT?

Rachael Wood[1]*, Dirk Schut[2], Anna Trull[3], Leo Marcelis[1], Rob Schouten[4]

[1]*Horticulture and Product Physiology, Wageningen University and Research, Droevendaalsesteeg 1, 6708 PB Wageningen, Netherlands*

[2]*Computational Imaging, Centrum Wiskunde en Informatica, Science Park 123, 1098 XG Amsterdam, Netherlands*

[3]*Greefa Machinebouw B. V., Langstraat 12, 4196 JB Tricht, Netherlands*

[4]*Wageningen Food and Biobased Research, Bornse Weilanden 9, 6708 WG Wageningen, Netherlands*

*Correspondence: rachw512@gmail.com

Fruit firmness is one of the main quality parameters influencing consumer acceptance of apples, which is destructively measured using a puncture test with a penetrometer. Numerous studies have investigated alternative non-destructive devices for evaluating fruit firmness to help reduce food waste; however, they have yet to achieve high levels of accuracy consistent across growing seasons, orchard locations and sometimes even devices from the same manufacturer. Research has shown that the volume of intercellular spaces in apples is negatively related to fruit firmness, and X-ray computed tomography (CT) can non-destructively determine the porosity of fruit (per cent of air spaces). CT studies of other fruit have shown relationships between CT parameters and penetrometer firmness; however, there are no reports on apple firmness. This study aimed to determine if apple fruit firmness can be estimated using CT parameters. Approximately 175 'Golden Delicious' apples from two orchard locations in the Netherlands that were previously stored under controlled atmosphere (CA) conditions (1 °C, 1 kPa O_2, 3 kPa CO_2) for three months were used in the study. Fruit were treated with 1-MCP (625 ppb) or ethylene (100 ppm) for 24 hours or left untreated, and all fruit were kept at 12 °C. Fruits were then stored in regular air at 12 °C (80-90 % RH) for five weeks. Subsamples (60 fruit) were removed weekly for CT scanning; the resolution was 125 µm, and the total scan time was approximately five minutes. One day after CT scanning, fruit were destructively analysed for firmness using a penetrometer. A subsample (60 fruit) was scanned before treatment application and after five weeks of storage. Preliminary results show that the mean grey scale value of CT images from the equator region of 'Golden Delicious' apples positively correlates with fruit firmness as determined using the penetrometer. In addition, preliminary results show that the percentage of voids in the outer cortex tissue is negatively associated with fruit firmness. These preliminary findings suggest that apple firmness can indeed be estimated using CT parameters.

Keywords: apple; firmness; postharvest; quality; x-ray computed tomography

S10-O-V-5

Textural aspects of tomatoes exposed to different LED lights during the postharvest

Silvia Langer*, Vrinda Bandekar, Leo Marcelis, Julian Verdonk

Horticulture and Product Physiology, Wageningen University, Droevendaalsesteeg 1, 6708PB, Wageningen, Netherlands

*Correspondence: silvia.langer@wur.nl

Texture is one of the most critical factors influencing tomato shelf life and consumer acceptance. It encompasses a wide range of physical characteristics which may be objectively determined by applying different methodologies. LED lighting has been reported as an affordable and sustainable option for increasing the nutritional value of tomatoes. However, little is known about its impact on postharvest textural parameters. This study aimed to quantify the texture changes of tomatoes exposed to different postharvest LED light conditions. The experiment consisted of exposing 315 mature green tomatoes (cv 'Perimo') to red (R), blue (B), and white (W) LED light treatments at an intensity of 120 mol m-2s-1 continuously for 27 days at 20 °C while keeping control (C) in darkness. The firmness index was tracked with a non-destructive acoustic sensor. The hardness and stiffness applying compression and penetration were assessed for further texture analysis, at 3 and 6 (initial time) and 13 and 27 days (final time). Moreover, visual appearance, weight loss, fruit diameter, pericarp thickness, ethylene, total soluble solids (TSS), acidity, sweetness index (SI), and pH measurements were performed. All LED light treatments significantly reduced the firmness index but the blue light delayed the firmness index loss compared with red and white treatments. The compression and penetration tests revealed that red-treated tomatoes retained stiffness and increased the hardness of the fruit, at the initial time. Tomatoes exposed to LED lights increased the weight loss and produced a higher ethylene content which explained the faster colour change and dramatic softening at the late stages of the experiment. Moreover, TSS and SI were higher in LED-treated tomatoes. In conclusion, this study disclosed that textural properties, such as internal structure, elasticity, and resistance to cut, differed in tomatoes treated with varied LED lights. It is worth highlighting how diverse texture quantification methods can yield different conclusions.

Keywords: tomato quality, LED light, postharvest, texture, firmness index, stiffness, hardness

S10-O-V-6

Non destructive prediction of maturity index and vitamin C of tomatoes

Maria Luisa Amodio*

Foggia University, Via Napoli 25, 71100 Foggia, Italy

*Correspondence: marialuisa.amodio@unifg.it

This study aimed to assess the potential of non-destructive optical techniques in predicting internal quality attributes, including total soluble solid content (TSS), pH, total titratable acidity (TA), L-ascorbic acid (AA), and vitamin C (VC) content, in soilless cultivated tomatoes. To scale up the experiment, three distinct hydroponic growing techniques, varying in water and fertilizer use, were implemented across two cultivation cycles for two tomato varieties (cv 'Carminio' and cv 'Mose'). Hyperspectral images (HSI) in the Vis-NIR and NIR range, along with reflectance spectra obtained through Fourier Transform (FT)-NIR spectroscopy, were acquired throughout the harvesting period, totaling approximately 250 tomatoes. Predictive models for each quality attribute were developed using Partial Least Squares Regression Analysis (PLSR) applied to HSI (Vis-NIR and NIR) and FT-NIR spectrometer data. Models constructed on FT-NIR data with selected ranges demonstrated superior accuracy and robustness in prediction (R2 of 0.96, 0.93, 0.89, 0.81, 0.83 for pH, TSS, TA, AA, VC, respectively). The study highlights the effectiveness of FT-NIR and HSI techniques in non-destructively examining the quality of soilless cultivated tomato fruits, addressing a crucial knowledge gap in soilless tomato production. This research contributes to advancing crop productivity, resource efficiency, and sustainable agricultural practices, benefitting growers, producers, consumers, and the environment. While promising, further validation is necessary for widespread application, supporting the adoption of low-input growing techniques.

Keywords: PLS, FT-NIR spectroscopy, hyperspectral imaging, quality, hydroponics

SESSION VI:
POSTHARVEST PATHOLOGY, DISEASE CONTROL, TREATMENTS, VALUE-ADDITION

S10-O-VI-1

Ozone protection against fungal diseases during storage: a new alternative?

Marielle Pages*, Frédéric Violleau, Didier Kleiber

École d'ingénieurs de Purpan, 75 Voie du Toec, 31076 Haut-Garonne Toulouse, France

*Correspondence: marielle.pages@purpan.fr

Botrytis cinerea, *Phytophthora* spp and *Neofabraea alba* cause illness on apple. Their controls are mainly managed by fungicide treatments but their uses are an environmental and a social concern. Ozone could be an interesting alternative to fungicides in order to decrease the fungal pressure. Indeed, this strong oxidant is well-known for its disinfectant capacity and is characterized by its low remanence in the environment compared to conventional fungicides. The first purpose of our study was to evaluate the influence of ozone on fungal material germination ability and to observe the mechanisms involved in the spores inactivation. Biocidal activity of ozone was confirmed on these three fungal species thanks in vitro experiments. Oxidation membran level monitoring leads to conclude lipid peroxidation, and consequently the alteration of the membrane integrity, are involved in the antifungal action of ozone. After these first in vitro part, the second section was carried out during apple storage. Apples (3500/modality) were placed in ozone storage rooms for 1 month. Three ozone gas modalities were countinuously applied: no ozone gas (control modality), low ozone gas and high ozone gas. Visual counting and microbiological analyses were realised. Ozone treatment leads to a significant reduction in the number of apples affected by *Phytophthora* (until 67%). These results were attested by microbiological analyses.The strong fungicide properties of ozone treatment and the absence of remanence make ozone a promising candidate for limiting limiting fungal development and the uses of conventional fungicides.

Keywords: ozone, fungicide, apples, scale up

S10-O-VI-2

Insecticidal activity of a diatomaceous earth and a natural Cuban zeolite against adults of the bean weevil, *Acanthoscelides obtectus*

Ilaria D'Isita*, Onofrio Marco Pistillo, Federica Lo Muzio, Ammara Asghar, Marco Coduti, Michele Acquaviva, Antonella Marta Di Palma, Giacinto Germinara

Department of Agricultural Sciences, Food, Natural Resources and Engineering (DAFNE), University of Foggia, Via Napoli 25, 71122 Foggia, Italy

*Correspondence: ilaria.disita@unifg.it

The bean weevil, *Acanthoscelides obtectus* (Say) (Coleoptera, Bruchidae), is one of the most serious pests of stored legumes worldwide. There is a global interest to replace chemical insecticides due to their effects on environment, human health, and pest resistance. Many inert dusts, manly including diatomaceous earth (DE), proven to be effective in controlling stored-product insect pests, while the insecticidal activity of zeolites is still little investigated. The present study aimed at evaluating the insecticidal activity of a DE (Insectosec, Newpharm) and a natural Cuban zeolite (Zeokill, Bioagrotech) against *A. obtectus* applied on seeds of different legumes. Chickpea or lentil samples (80 g) put in cylindrical plastic containers (Ø 6 x 8 cm) were treated with increasing doses (0, 0.5, 1.0, 2.0, 4.0, 8.0 kg/ton) of DE or zeolite, infested with 20 newly emerged *A. obtectus* adults, and maintained at 25±2°C, 60% r.h., and L12:D12 photoperiod. The number of dead specimens was recorded at 3, 7, 10, 14, 21 days-exposure and the mean percentage of insect mortality calculated. For both legumes, the DE and zeolite treatments induced adult mortality increasing with the dose and exposure time. On chickpea, the total insect mortality was achieved at the lowest dose tested (0.5 kg/ton) after 3 and 7 days-exposure to DE and zeolite, respectively. Similarly, on lentil the total insect mortality was recorded at 0.5 kg/ton and 1 kg/ton doses after 7 day-exposure to DE and zeolite, respectively. Overall, both inert dusts were effective in controlling *A. obtectus* at lower doses tested and in short exposure-times, with the DE showing a faster insecticidal activity. Notably, the insecticidal activity of inert dusts can vary with the substrate treated, probably due to a different adherence of the particles to the surface of the seeds.

Keywords: stored-product insect pests, inert dusts, mortality bioassays, physical control means, IPM

S10-O-VI-3

Impact of relative humidity on husk scald development and physiological parameters of pomegranate skin during cold storage

Giancarlo Colelli[1]*, Mahshad Maghoumi[1], Maria Luisa Amodio[1], Danial Fatchurrahman[1], Luis Cisneros-Zevallos[2]

[1]Department of Agricultural Sciences, Food, Natural Resources and Engineering (DAFNE), University of Foggia, Via Napoli 25, 71122 Foggia, Italy

[2]Department of Horticultural Sciences, Texas AM University, College Station TX 77843, United States of America

*Correspondence: giancarlo.colelli@unifg.it

Husk scald (HS) is a superficial browning of the skin that develops from the stem end and spreads to the blossom end of the fruit during long-term storage at non-chilling temperatures and considerably reduces marketability. The experiment involved subjecting 'Wonderful' pomegranate fruit to storage at a temperature of 11°C for a duration of 70 days to expedite the onset of husk scald (HS) incidence on the skin. The study aimed to assess the impact of varying relative humidity levels (55%, 75%, and 95% ± 5%) within the cold storage environment on the manifestation of husk scald. Various skin attributes, including fruit weight loss (WL), browning index (BI), antioxidant activity (AA), total phenolic (TP), total anthocyanin (TA), electrolyte leakage (EL), Malone dialdehyde (MDA), respiration rate (RR), marketability, polyphenol oxidase activity (PPO), husk scald incidence, and skin firmness, as well as aril sugar/ acidity ratio were measured at the initiation of storage and at intervals of 20, 50, and 70 days, with each treatment replicated three times. Results indicated that a reduction in relative humidity led to a significant increase in WL, BI, EL, MDA, RR, husk scald incidence, and PPO, whereas TP, TA, mold presence, and marketability were higher at 95% RH. Notably, aril sugar/acid ratio and skin firmness and AA remained unchanged across all treatments. We propose a hypothesis suggesting that reduced relative humidity induces water stress, potentially altering cell wall permeability. This alteration may facilitate interactions between phenolic compounds and PPO, subsequently accelerating the enzymatic browning process and husk scald development on the skin. Accordingly, long-term storage of pomegranates up to 70 days at 11°C was improve in the range of 75 – 95% RH, extending its potential use as fresh or fresh-cut produce or juice processing.

Keywords: pomegranate, relative humidity, cold storage, husk scald, fruit quality, postharvest physiology

S10-O-VI-4

A targeted inoculation of single lenticels of apple fruit

Humdah Qayyum[1]*, Miriam Ranzi[1], Sanja Baric[1,2]

[1]Faculty of Agricultural, Environmental and Food Sciences, Free University of Bozen-Bolzano, Bozen-Bolzano, Italy

[2]Competence Centre for Plant Health, Free University of Bozen-Bolzano, Bozen-Bolzano, Italy

*Correspondence: humdah.qayyum@unibz.it

Apple is an economically important fruit crop that can experience substantial losses because of fungal diseases. The existing procedures for non-wounding-based in vitro inoculation of apple fruit are relatively time-consuming, requiring a large volume of conidial suspension. Furthermore, the procedures are not suitable for controlled infection of specific lenticels. Therefore, this study proposes a simple and robust inoculation approach for apple postharvest pathogens that infect the fruit through lenticels. Apple fruit of the cultivar 'Golden Delicious' were inoculated with two different concentrations, 107 and 106 of conidia mL^{-1}, of *Colletotrichum godetiae* using adhesive water-resistant spot plasters impregnated with 50 µl of conidial suspension. The fruit remained exposed to the inoculum for time periods of 7, 14, 21 and 28 days. The results revealed that the higher conidial suspension concentration resulted in a higher infection rate of 61% compared to the lower concentration leading to an infection rate of 25%. Furthermore, the inoculum exposure time of 14 days increased the likelihood of successful lenticel infections with 79% of infected inoculation sites for the concentration of 107 conidia mL^{-1}, and significantly increased the mean lesion diameter. To our knowledge, this is the first protocol for a non-invasive targeted infection of specific sites on apple fruit by using sterile disposable plasters, which may promote further research in analyzing the infection dynamics regulated within the lenticel during the disease progression.

Keywords: fungi, postharvest pathology, latent infection, conidia, *in vitro* inoculation

S10-O-VI-5

Side rot of apple fruit, a new postharvest disease in South Tyrol (northern Italy)

Sanja Baric*, Eva Staffler, Selena Tomada

Free University of Bozen-Bolzano, Faculty of Science and Technology, Universitätsplatz 5, 39100 Bozen-Bolzano (BZ), Italy

*Correspondence: sanja.baric@unibz.it

Cadophora luteo-olivacea is a cosmopolitan fungal species known from environmental samples but also as a causal agent of different plant diseases. In South Tyrol (northern Italy), which is the largest contiguous apple producing area in Europe, *C. luteo-olivacea* has been isolated from apple fruit with postharvest symptoms of side rot over a three-year sampling period. The prevalence of *C. luteo-olivacea* in relation to the number of examined rotten fruit was 1 to 1.5%, but the pathogen was found in each year of sampling and in fruit deriving from different geographic areas. As knowledge on this postharvest pathogen is limited, the present study aimed to assess the susceptibility of four common apple cultivars and the sensitivity of the fungus to a selection of fungicides commonly used in integrated and organic apple production. Ten isolates of *C. luteo-olivacea* were selected for the experiments, each of them representing a distinct genotype as revealed by inter simple sequence repeat (ISSR) fingerprinting with four primers. The inoculation test showed that all isolates were able to induce lesions and a dry rot in artificially wounded apple fruit of the cultivars Golden Delicious, Granny Smith, Cripps Pink and Fuji. Nevertheless, the expansion of the lesions was slow and did not exceed 6.2 mm on average after 14 days of incubation at 21°C. The largest lesions were observed on the cultivar Fuji. The highest degree of inhibition of radial mycelium growth, studied on solid medium enriched with the recommended dose of a fungicide, was found for a mixture of eugenol, geraniol and thymol, followed by boscalid, while the other active substances (captan, fludioxonil and orange oil) were less effective, varying between isolates. However, in a microtiter plate assay, used to examine the inhibition of conidial germination, the effectivity of boscalid was lower, similar to orange oil, while fludioxonil had none or a minimum effect in most of the isolates. The relative insensitivity of *C. luteo-olivacea* isolates to some fungicides commonly applied in apple growing could be the reason for its recent appearance as a postharvest pathogen of apple in South Tyrol. The presentation, finally, summarizes the actual knowledge on *C. luteo-olivacea* and evaluates its potential to become a major postharvest pathogen of apple.

Keywords: postharvest pathology; apple fruit; fungal plant disease

SESSION VII:
POSTHARVEST MANAGEMENT (TECHNICAL, ECONOMIC AND ADMINISTRATIVE ISSUES)

S10-O-VII-1

A data-driven approach for fresh produce preservation inside cold room

Tuany Gabriela Hoffmann[1]*, Akshay Sonawane[1], Reiner Jedermann[2], Ulrike Praeger[1], Daniel Neuwald[3], Manfred Linke[1], Viacheslav Barkov[4], Martin Atzmueller[4], Barbara Sturm, Pramod Mahajan[1]

[1]Leibniz Institute for Agricultural Engineering and Bioeconomy, 14469 Potsdam, Germany

[2]University Bremen, Library Street 1, Bremen, Germany

[3]Lake of Constance Research Center for Fruit Cultivation KOB, Schuhmacherhof 6, Ravensburg, Germany

[4]Osnabrück University, Joint Lab Artificial Intelligence Data Sc, Osnabrück, Germany

*Correspondence: THoffmann2@atb-potsdam.de

Food refrigeration process is primarily governed by heat and mass transfer. Both crucial factors directly impacting food quality. Cold room storage presents spatio-temporal non-uniform temperature and humidity conditions, with non-uniform airflow. These dynamic conditions can affect the integrity and safety of fresh produce during cold storage. In the developing landscape of apple cold storage practices, the integration of advanced monitoring and control systems, coupled with data science and data analytics, provides a revolutionary approach to precision energy management. Central to this evolution is the concept of a digital twin, which serves as an intelligent process monitoring and control tool, fostering sustainable energy and quality management in the industry. The objective of the current research is to obtain real-time apple cooling data, which later can be applied to control dynamic cooling system. Parameters such as temperature, humidity, air speed profile, as well as heat release and condensation detection on fruit surface emerge as critical data for analysis and decision-making. In addition, when coupled with the refrigeration system control, it can ensure that the set conditions are precisely adjusted to the needs of the fresh produce. These spatially distributed parameters will be collected inside a bin of apples, and in a laboratorial cold room scale. Spatial temperature distribution, heat release, condensation, and fruit mass variation will be investigated under different cooling rates. Interpretable modeling methods provide prominent options for data analysis and knowledge discovery. The findings will enhance our understanding of the cooling process within apple bins and improve the prediction of current fruit status at the industrial level by leveraging real-time data from a streamlined set of sensors, facilitating adaptive adjustments to cooling parameters. Incorporating real-time data into dynamic cold storage facilities control shows great promise for data-driven enhancements, transforming postharvest management and providing more sustainable and efficient food supply chain.

Keywords: postharvest; cold storage; cold chain; fresh produce; heat transfer.

S10-O-VII-2

Evaluating the global feasibility of evaporative cooling: A viable approach for storage of perishables?

Sangeeta Chopra[1]*, Rahul Garg[2], Rohit Sharma[3], Abhishek Adhikari[2], Sameer Dhingra[4], Randolph M. Beaudry[5]

[1]Division of Agricultural Engineering, Pusa Campus, New Delhi, Delhi, India

[2] Civil Engineering Department, Indian Institute of Technology, Roorkee, Uttarakhand, India

[3]Department of Processing Food Engineering, Punjab Agricultural University, Ludhiana, Punjab, 141004, India

[4] SD Inventions Ltd., Ordafond, Shristhal, Canacona, Goa, 403702, India

[5] Michigan State University, Department of Horticulture, A22 Plant& Soil Sci. Building, East Lansing, MI 48824-1325, United States of America

*Correspondence: dhingra.sangeeta@gmail.com

This study evaluates the global viability of evaporative cooling for perishables storage as a response to the pervasive challenge of food loss. Evaporatively cooled (EC) storage structures are considered to offer a cost-effective alternative to refrigeration and have been promoted for perishables storage in developing countries, especially those with arid or semi-arid regions or seasonal hot and dry periods. Previous research has focused on optimal evaporative cooling periods, has often failed to include the influence of elevated night-time humidity, and commonly neglected to assess yearly performance. To comprehend the global utility of EC storage across the entire year and to include the impact of night-time humidity, temperature data from ERA5-Land, spanning two decades, was analysed. Mathematical expressions relating wet bulb depression to reductions in CO2 respiration and storage life improvements using leafy amaranth as a model plant were employed to identify viable locations. The reduction in CO2 respiration served as the basis for calculating daily relative change in storage life. The effectiveness of EC was assessed by determining the cumulative yearly storage life improvement (CYSLI), representing the total benefit, in days, of extra storage accrued from evaporative cooling throughout the 365 days of the year. The research extends to predicting the effectiveness of evaporative cooling in different regions worldwide for 2100, considering the evolving global climate. The CYSLI analysis across the world from 2012-2021 indicates a varied global distribution in EC benefits, with the majority (65.31% of globe) experiencing no or very modest benefits (0 to 70 days), particularly in north temperate and tropical zones. In contrast, a quite small portion (0.48%) of the globe, roughly 0.58 million km2, exhibited a reasonably high CYSLI (between 210 to 245 days), predominantly in the hottest regions such as arid and semi-arid zones, which are often not densely populated. The land area of providing this level of storage improvement is anticipated to increase by 2100. A simple tool has been developed in which users can input the latitude and longitude of a region of interest and the potential for crop storage improvement is returned for that location. This research contributes valuable insights into deciding which locations across the globe would benefit from EC structures for storage of perishables which might mitigate food security concerns, and addresses the impacts of climate change on perishable food storage.

Keywords: smallholder, fruit, vegetable, postharvest, evaporation, cooling, climate

S10-O-VII-3

Drying temperature alters quality components of peppermint leaves

Liane Kahlert[1]*, Katharina Luhmer[1,2], Silke Hillebrand[3], Stefan Brennecke[3], Jakob Ley[3] and Ralf Pude[1,2]

[1]Renewable Resources, Institute of Crop Science and Resource Conversation, University of Bonn, Klein-Altendorf 2, 53359 Rheinbach, Germany

[2]Field Lab, Campus Klein-Altendorf, University of Bonn, Klein-Altendorf 2, 53359 Rheinbach, Germany

[3]Symrise AG, Mühlenfeldstr. 1, 37603 Holzminden, Germany

*Correspondence: l.kahlert@uni-bonn.de

The technical drying of medicinal and aromatic plants is an indispensable part of the processing chain in order to preserve the plants as well as bioactive and flavouring compounds they contain. The drying technique has to be adapted individually to the crops being dried. Drying at temperatures exceeding 45 °C is not recommended for peppermint, a traditional and economically important medicinal plant, as this results in volatilisation of compounds and reduction in the essential oil content. However, little is known about convective drying at temperatures below 30 °C. The aim of this study was to investigate the temperature effects in a range between 15–75 °C with regard to quality preservation of dried leaves of peppermint (Mentha × piperita 'Multimentha'). Colour, microbial load as well as the essential oil content and composition were considered as quality parameters. Drying temperatures of 75 °C resulted in a lower essential oil content of the leaves because of the evaporation of monoterpenoids. The qualitative analysis of the essential oils yielded minor differences between the drying temperatures and different harvest intervals. At 75 °C, an increase in quality can be noticed due to reduced content of value-decreasing components such as pulegon or menthofuran. Lower temperatures (15–45 °C), in contrast, are beneficial for the retention of volatile compounds and the leaf color in the plant material. Low drying temperatures and long drying cycles can promote microbial growth, in this case the threshold for moulds according to the DGHM (German Association for Hygiene and Microbiology) was exceeded at 25 °C.

Keywords: low-temperature drying, Mentha × piperita, essential oil, volatile organic compounds, VO

S10-O-VII-4

The correlation between external quality attributes and fraction dimension of damaged banana fruit

Mai Al-Dairi[1]*, Pankaj B. Pathare[1], Rashid Al-Yahyai[2]

[1]Department of Soils, Water and Agricultural Engineering, College of Agricultural & Marine Sciences, Sultan Qaboos University, Oman

[2]Department of Plant Sciences, College of Agricultural & Marine Sciences, Sultan Qaboos University, Oman

*Correspondence: s124911@student.squ.edu.om

The fractal dimension (FD) is an image analysis method that is mostly used to clarify the texture characteristics of the image. In this study, impact bruise damage and quality of 'Fard' and 'Somali' local banana cultivars were investigated for one drop height and two storage temperatures (13 and 22°C) using fractal image analysis. For the damage test, a 0.11 kg stainless steel ball was dropped from 0.6 m (0.64 J). External quality attributes like surface area and color were evaluated using machine vision. The bruised region was used to extract the fractal dimension (FD) values by implementing the fractal image analysis. The measurements were conducted on days 0, 3, 9, and 15 of storage. The results showed that the FD values and browning color described the bruising intensity of banana cultivars. The browning color of the bruise increased during storage, particularly at 22°C in Fard banana. The color values of lightness (L*), and yellowness (b*) changed significantly over the storage period and storage temperature. The surface area values obtained by machine vision were statistically significant. The FD values were correlated (r) with the resulting color values, and surface area of both cultivars at both temperatures. Thus, the fractal dimension (FD) analysis is necessary and considered a successful tool used to determine and describe the postharvest external appearance of different fruits and vegetables.

Keywords: Fractal dimension, color, machine vision, bananas, external quality

S10-O-VII-5

How do consumers perceive and use compostable pots? – A qualitative household study with fresh kitchen herbs

Anne-Katrin Kleih[1]*, Christin Stallkamp[2], Andreas Ulbrich[2], Kai Sparke[1]

[1]Horticultural Economics, Hochschule Geisenheim University, Geisenheim, Germany

[2]Faculty of Agricultural Sciences and Landscape Architecture, Hochschule Osnabrück, University of Applied Sciences, Osnabrück, Germany

*Correspondence: AnneKatrin.Kleih@hs-gm.de

The environmental impact of food packaging has come under increasing scrutiny in recent years. Studies show that consumers are dissatisfied with plastic packaging. As a result, new packaging solutions are being developed in the horticultural sector, such as post-consumer recycling (PCR) and compostable pots. However, the success of sustainable packaging depends to a large extent on consumer acceptance and (appropriate) use and disposal at home. In this study, we focused on how consumers 1) perceive compostable pots and 2) how they use them at home. To answer these questions, we conducted a qualitative household study with 25 households. Each household was given three different types of potted herbs in PCR and compostable pots. Households were instructed to use the herbs as they normally would and to document their plant care with a written log, photos, and voice messages for two weeks. During this time, they were visited at home and interviewed using a guideline-based qualitative interview. The data were analyzed using qualitative content analysis. The results indicate that the very positive perception of compostable pots contrasts with the consumers' use of them and the functional limitations of the pots due to the onset of degradation. Most households kept the pots indoors, on the windowsill, and thus did not take advantage of compostable pots. In addition, participants were skeptical and unsure about the functionality and handling of the pots, such as whether planting and decomposing the pots would really work and how to dispose of the pots. Not all households recognized the compostable pots as such. Increased information, education and clear labeling is needed to ensure that consumers can make informed choices and effectively handle compostable pots at home.

Keywords: sustainable packaging, fresh produce, waste, consumer behavior

S10-O-VII-6

Effects of packaging conditions on the extension of postharvest life of green “eat-all” almonds during cold storage

Giancarlo Colelli*, **Danial Fatchurrahman**, Noelia Castillejo, Aysha Saleem, Ayoub Fathi-Najafabadi, Maria Luisa Amodio, Paolo Inglese

Department of Agricultural Sciences, Food, Natural Resources and Engineering (DAFNE), University of Foggia, Via Napoli 25, 71122 Foggia, Italy

Dip. SAAF, Università degli Studi di Palermo, Viale delle Scienze Ed. 4, 90128 Palermo, Italy

*Correspondence: giancarlo.colelli@unifg.it

Almonds (*Prunus amygdalus*) can be harvested and consumed early in spring when the endocarp is still tender and non-lignified, the hull is green and fuzzy and the seed is completely formed with a jelly endosperm; at this stage the drupe can be eaten as a whole, having a crunchy and juicy texture, a sweet-and-sour taste, with notes of green aroma, and a slight astringency. Green “eat-all” almonds are a very popular in many Countries in the Mediterranean area (north Africa, Middle-East, Arabic peninsula, and Turkey). Typically, they are distributed and sold at room temperature and this usually leads to high water loss of juiciness, color change, increased hardening, and sometimes decay. With the objective to extend their postharvest life, ‘Filippo Ceo’ green almonds were stored in passive modified-atmosphere packaging (MAP) at 5ºC. Two types of films, polypropylene (PP) and microperforated polylactic acid (MP_PLA), were used to package the almonds, while some were placed in macro-perforated clamshells as a control treatment (CTRL). Over 33 days at 5ºC, several factors were evaluated, including color change, vitamin C content, total phenols, antioxidant capacity, total chlorophyll, weight loss, firmness, headspace gas concentrations, and sensory qualities. The study found that the O2 levels in MP_PLA bags only slightly decreased to 19.6 ± 0.1%, with a small increase in CO2 to 2 ± 0.3%. In PP bags, the gas concentrations changed noticeably, with O2 at 1 ± 0.1% and CO2 at 20 ± 0.5%. Green almonds stored in MP_PLA packaging exhibited better overall quality compared to those in PP and CTRL, with slower color changes, higher vitamin C retention, and antioxidant capacity. Almonds in PP bags had lowest water loss and highest firmness. The CTRL samples, stored without MAP conditions, showed the poorest results, with some decay at the end of cold storage. This result can help to improve the commercial life of green “eat-all” almonds and ensure the high-quality during storage.

Keywords: green almonds, quality, MAP, respiration rate, CO2, water loss, chlorophyll

S10-O-VII-7

Evaluation of pasta fortified with broccoli (*B. oleracea* var. italica Plenck) for quality traits

M.C. Di Bella[1], Maria Grazia Melilli[2], Ana Cornelia Butcaru[3*], Corina Nicoleta Predescu[4], Liliana Tudoreanu[5], F. Branca[1], F. Stanica[3]

[1]*Department of Agriculture, Food, and Environment (Di3A), University of Catania, via Valdisavoia 5, Catania, 95123, Italy*

[2]*National Council of Research, Institute of Biomolecular Chemistry (CNR-ICB), Via P. Gaifami 18, 95126 Catania, Italy*

[3]*Research Centre for Study of Food and Agricultural Products Quality, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 011464 Bucharest, Romania*

[4]*Faculty of Veterinary Medicine of Bucharest, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 105 Splaiul Independentei, District 5, 050097 Bucharest, Romania*

[5]*Interdisciplinary Laboratory for Research on Heavy Metals Accumulation in the Food Chain and Modeling, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 011464 Bucharest, Romania.*

*Correspondence: ana.butcaru@qlab.usamv.ro.

Brassica oleracea L. var. italica Plenck is a popular vegetable in the Brassicaceae family and is becoming more recognized for its bioactive compounds, such as antioxidants and phytochemicals; for this reason, it can be considered a functional food. This trial evaluated one genotype called 'Broccolo Nero' a Sicilian landrace producing fortified pasta. The pasta was made with Durum wheat semolina from Italy and was partially substituted by 5% freeze-dried powder. Two types of tagliatelle were produced: the first one was the Control pasta (100% durum wheat semolina, 70 ml of water, and 2 g of salt), and the second one was pasta with 5% Broccoli. The obtained tagliatelle was analyzed for quality traits during dough formation, drying, and cooking. Raw and cooked tagliatelle were evaluated for their rheological, biochemical, organoleptic, and sensorial properties. The most performing pasta was dried with broccoli, which showed a higher amount of total polyphenol content (6.87 mg/g) and total Flavonoid Content (0.14mg/g). In broccoli, pasta also found carotenoids (β-carotene, the amount was 31.07 per g); instead, in the pasta control, no presence was found. In terms of antioxidant compounds, the broccoli pasta amount was better than the control, even if in cooking pasta, this amount decreased (from 5.71 mg/g to 3.3 mg/g g). For those concerned with the sensory property, a panel test was done. The result shows that the consumer preferred control pasta because the smell of broccoli was unpleasant.

Keywords: Brassica crops, pasta, antioxidants, polyphenols, sensory properties

S10-O-VII-8

An exploratory study of local food purchasing by restaurants in France

Joseph Chouard[1]*, Peter J. Batt[2]

[1]IESEG School of Management, Paris, France

[2]University of Western Australia, Perth, Australia

*Correspondence: joseph.chouard@gmail.com

As consumers become more conscious of the adverse impact food production is having on the environment, the demand for local food is increasing. Local food is perceived to be of superior quality, to be fresher, to taste better, to be more healthy and to have a lower environmental impact. For restauranteurs in Paris, France, purchasing local food products was perceived to offer a distinct communication and marketing advantage as the purchasing of local food ingredients provided an opportunity for the restaurant to differentiate its product offer and to demonstrate its commitment to sustainability. For the restauranteur, the purchase of local food ingredients enabled them to align their personal values and ethics with the variety and type of food they offered to patrons. Most restaurants had an enduring long-term relationship with their preferred local suppliers. This relationship was important in that in provided a platform for dialogue between the parties, whereby local suppliers could advise restauranteurs of any difficulties associated with the supply and availability of the product, product quality and seasonality. However, local food ingredients were seldom available all year round, hence restauranteurs needed to seasonally adjust their menus. Local food ingredients were perceived to be more expensive, and additional administrative costs were incurred in transacting with multiple small suppliers.

Keywords: sustainability, competitive advantage, procurement

S10: POSTHARVEST AND HORTICULTURAL PRODUCTS QUALITY; BUCHAREST, EHC2024, MAY 12-16

POSTER PRESENTATIONS

POSTER SESSION I:
ADVANCED POSTHARVEST TECHNOLOGIES OF FRUITS, VEGETABLES AND ORNAMENTALS

S10-P-I-1

Fresh basil preservation with *Cypriot oregano* extracts

Nikolaos Tzortzakis*, Panayiota Xylia, Antonios Chrysargyris

Department of Agricultural Sciences, Biotechnology and Food Science, Cyprus University of Technology, 3036 Limassol Limassol, Cyprus

*Correspondence: nikolaos.tzortzakis@cut.ac.cy

Basil (*Ocimum basilicum*) is used fresh and dry as a flavoring agent in food. However, it is a particularly perishable product, with a very short shelf life. Nowadays, the use of natural products such as essential oils (EOs), plant extracts and natural compounds for the preservation of fresh produce (including herbs) is gaining interest. The present study aimed to evaluate the effects of Cypriot oregano (*Origanum dubium*) EO and hydrosol applications on fresh basil's quality attributes during storage at 4 oC for six days. During this study, the investigated products were applied (via dipping) at different concentrations (0, 0.001, 0.01 and 0.1%) for different time (0, 1, 5 and 10 min). The results revealed increased weight loss with 0.001%-1min, 0.01%-10min and 0.1%-10min EO application, whilst hydrosol 5 min (all concentrations), 0.01%-10min and 0.1%-10min also increased basil's weight loss. A less aromatic (not pleasant aroma) and less marketable product was observed with higher EO concentration and time of application, while hydrosol application (except 0.1%-5 min and 0.001%-10 min) preserved basil's aroma even after six days of storage. Moreover, total phenolic content, antioxidants, flavonoids and ascorbic acid content increased with the application of 0.01%-10 min EO. On the other hand, the application of hydrosol 0.001%-1 min decreased phenols and antioxidants, while 0.1%-5 min and 0.001%-10 min also decreased product's total flavonoids. The preservation of basil's sensory attributes (i.e. aroma, appearance) as well as the increase in phytochemicals (i.e. antioxidants, ascorbic acid) indicate product of higher nutritional value. However, further investigation is needed for the examined products and their application on fresh produce (i.e. concentration, time, method of application, product).

Keywords: basil; essential oils; hydrosols; postharvest quality

S10-P-I-2

Effect of MAP liners, hydrocooling, calcium and source on the shelf life and quality of the autochthonous sweet cherry cultivar 'Mokahal'

Yolla Ghorra Chamoun[1], Rémie Hamzo[1], **Lamis Chalak[2],** Maya Kharrat[1]

[1]ESIAM-USJ, Ecole Supérieure d'Ingénieur d'Agronomie Méditerranéenne, Saint-Joseph University of Beirut, Lebanon

[2]Faculty of Agronomy, The Lebanese University, Dekwaneh, Beirut, Lebanon

*Correspondence: lamis.chalak@gmail.com

Traditional post-harvest techniques pose a major constraint to enhancing the Lebanese sweet cherry (*Prunus avium* L.) value chain. This research project evaluates the impact of various post-harvest treatments on the shelf-life of the indigenous variety "Mokahal". Each treatment is considered a factor, encompassing: (i) Fruit source with cherries taken either directly from farmers or from the wholesale market; (i) Package type testing conventional plastic container, modified atmosphere bag (MAP), and MAP combined with a humidity absorbent and SO_2 gas releaser; (iii) Pre-conditioning treatments with cherries subjected to hydro-cooling with or without dipping in calcium chloride. Results revealed a significant effect of cherries source on weight loss and pedicel color, with cherries from the wholesale market notably affected. Conversely, hydro-cooling, with or without calcium, significantly reduced weight loss, slowed skin color degradation, lowered decay rate, and minimized sugar content increase. For packaging, both MAP options, with or without the additional features, delayed weight loss, slowed sensory quality decline, and mitigated sugar content increase. Based on these findings, it would be highly recommended to consider fresh cherries from orchard sources for a pre-conditioning treatment with hydro-cooling and calcium treatment, followed by a MAP packaging with SO_2 gas releaser, for an optimal sweet cherry shelf life.

Keywords: postharvest, sweet cherries, shelf life, quality, *Prunus avium* cv.

S10-P-I-3

Effect of 1-MCP and MAP on cold storage of plum

Nga Thanh Thi Ha[1,3], Tung Thanh Pham[1,4], Hoa Xuan Mac[1,3], Lien Le Phuong Nguyen[1,2], Zsuzsanna Horvath-Mezofi[1], Zoltan Sasvar, Monika Gob[1], Tamas Zsom[1], Gergo Szabo[1], Geza Hitka[1]

[1]Institute of Food Science and Technology, Hungarian University of Agriculture and Life Sciences, 1118 Budapest, Hungary

[2]Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh City, Ho Chi Minh 700000, Vietnam

[3]Faculty of Food Science and Technology, Ho Chi Minh City University of Industry and Trade, Ho Chi Minh 700000, Vietnam

[4]Faculty of Chemical and Food Technology, Ho Chi Minh City University of Technology and Education, Ho Chi Minh 700000, Vietnam

*Correspondence: Nguyen.Le.Phuong.Lien@uni-mate.hu

Plum was stored at 1± 0.5 °C for 28 days in modified atmosphere packaging (MAP). Polyethylene foil was punctured to make 2 or 3 perforations while control fruit was stored in an open tray. The initial gas mixture in the package consisted of 85 % nitrogen, 10 % oxygen and 5 % carbon dioxide. Half of the samples were treated with 625 ppb gaseous 1-MCP (1-methylcyclopropene) before packaging. Weekly measurements acquired the percentage of decay, weight loss, and flesh firmness. Data shown that 1-MCP treated fruit suffered less decay, in terms of mold development, and lower weight loss as well. Control fruit in open tray decreased quality rapidly. Micro-perforated film packaging had benefit in preventing microbial growth and weight loss. However, the number of perforations did not significantly affect observed weight loss and decay among MAP stored samples. The effect of perforation in MAP packages did not show significant difference in flesh firmness.

Keyword: stone fruit, packaging, quality, 1-methylcyclopropene, postharvest

S10-P-I-4

Changes in the physical and sensory traits of apple cultivars during long-term cold storage

Boris Rilak, Jelena Tomic, Svetlana M. Paunovic, Zaklina Karaklajic-Stajic, Marijana Pesakovic, Tatjana Andjelic

Fruit Research Institute, Čačak, Republic of Serbia

*Correspondence: brilak@institut-cacak.org

The effects of long-term cold storage on physical properties and sensory characteristics of three apple cultivars ('Golden Delicious Reinders®', 'Granny Smith' and 'Red Chief') at harvest time and after storage (0, 2, 4, 6 and 8 months) were assessed. Fruit weight, weight loss, firmness, titrable acidity (TA), total sugars (TS) and TS/TA ratio were evaluated. The highest fruit weight and loss of fruit weight were found in the cultivar 'Granny Smith'. Cultivars 'Granny Smith' and 'Red Chief' recorded higher and similar values of fruit firmness compared to cultivar 'Golden Delicious Reinders®'. Fruits of all tested cultivars at harvest had the highest values of weight and firmness, which continuously decreased, and after eight months of storage were the lowest. Significant differences in weight loss were recorded among storage periods, and fruits of all three cultivars stored for eight months recorded the highest weight loss. TS values were the highest and similar in the cultivar 'Red Chief' after four, six and eight months of storage. In contrast, the cultivar 'Granny Smith' during the harvest period contained the highest TA and the lowest TS/TA ratio. Cultivar 'Golden Delicious Reinders®' had the highest and similar value of TA and the lowest ratio TS/TA after six and eight months of storage. Through a comprehensive analysis, it can be concluded that cultivars 'Red Chief' and 'Golden Delicious Reinders®' are suitable for long-term cold storage, bearing in mind that there was no significant change in the physical properties and sensory characteristics of the fruits during storage.

Keywords: *Malus domestica;* long-term storage; weight loss, sugars, acids.

S10-P-I-5

Effect of methyl salicylate on quality changes of ‘Namdokmai Sithong’ mango during cold storage

Somsak Kramchote*, Supaporn Khumthongwattana

School of Agricultural Technology, King Mongkut’s Institute of Technology Ladkrabang, Bangkok 10520, Thailand

*Correspondence: somsak.kr@kmitl.ac.th

'Namdokmai Sithong' mango is a commercial fruit crop for export and it makes income for Thai farmers and it prefers by international markets. However, 'Namdokmai Sithong' mango is a climacteric fruit and therefore, tends to lose quality easily. The fruit has a high respiration rate and ripens quickly and resulted a short shelf life. Therefore, the objective of the research to study the effect of methyl salicylate on the quality change of 'Namdokmai Sithong' mango during storage. The experiment was conducted in Completely Randomized Design (CRD) with two treatments and four replications. The mango fruit were dipped with methyl salicylate (MeSA) at various concentrations of 0 (control) and 1 mM and then stored at 6±2 ºC, 85±5% RH for 25 days. The results showed that the use of MeSA had no effect on weight loss. On the other hand, it can help to delay the changes in peel color (L b C and h°), firmness, titratable acidity, total soluble solids and carotenoids with significantly different. Therefore, the use of MeSA at a concentration of 1 mM was effective in delaying the quality change of 'Namdokmai Sithong' mango during storage.

Keywords: fruit quality, shelf life, volatile organic compound, mango

S10-P-I-6

Effect of pre-cooling and temperature storage differences on the physical and chemical qualities of *Wolffia arrhizal*

Intira Lichanporn*, Nanchanok Nanthachai, Palida Tangnaurat

Faculty of Agricultural Technology, Rajamangala University of Technology Thanyaburi, Phathum Thani, Thailand

*Correspondence: intira_l@rmutt.ac.th

The study of the effect of pre-cooling and temperature storage differences on the physical and chemical qualities of *Wolffia arrhiza* was examined. The pre-treated *W. arrhiza* is submerged in cold water at 2°C for 5 min and stored at 3 temperatures: room temperature (27°C; control), 10°C, and 4°C. Appearance, weight loss, electrolyte leakage, peroxidase activity, carotenoid content, antioxidant activity, and total phenolic content were evaluated during the storage period. The result showed that the *W. arrhiza* stored at a temperature of 4°C after 8 days of storage is still of good quality and delays weight loss, while the *W. arrhiza* stored at 10°C had poor quality, and the *W. arrhiza* stored at room temperature cannot be consumed or sold. The *W. arrhiza* stored at a temperature of 4°C had more carotenoid, antioxidant activity (DPPH assay), and total phenolic content than the *W. arrhiza* stored at 10°C and 27°C. The *W. arrhiza* stored at a temperature of 4°C had less electrolyte leakage and peroxidase (POD) activity; therefore, this indicated a better appearance evaluation of color, smell, and soaking than the *W. arrhiza* stored at 10°C and 27°C. The pre-cooling in cold water at 2°C for 5 min and storage at 4°C proved efficient in maintaining the quality of *W. arrhiza* for 8 days.

Keywords: *Wolffia arrhiza*, pre-cooling, peroxidase activity

S10-P-I-7

Implementing short-term anoxic conditions as a straightforward and effective postharvest technique to preserve the quality of 'Sucrier' bananas

Chairat Techavuthiporn[1]*, Wasetthee Sittiprasert[2], J. Phakawan[3], Suriyan Supapvanich[1]

[1] *Department of Agricultural Education, School of Industrial Education and Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand*

[2] *Innovative Tropical Agricultural Program, International Office of Industrial Education and Technology, School of Industrial Education and Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand*

[3] *Department of Food Science and Technology Management, Faculty of Science and Technology, Rajamangala University of Technology Thanyaburi, Prathumthani, Thailand*

*Correspondence: chairat.te@kmitl.ac.th

The aim of this study was to examine the impact of an oxygen limitation, so-called anoxic conditions, on the ripening process and the physicochemical characteristics of 'Sucrier' bananas during storage. A preliminary experiment was conducted to determine the optimal duration of anoxia treatment, ranging from 0 to 20 h. The experiment determined that subjecting the fruit to anoxic condition for a duration of 16 h resulted in the most successful treatment for delaying the development of fruit skin color at room temperature for a period of 8 d. Furthermore, the reduction in moisture content of the peel and the rise in weight loss, pulp and peel ratio, and moisture content of the pulp exhibited a notable disparity compared to the other treatments. Therefore, the duration of 16 h of anoxic conditions was chosen to further examine the responses of fruit after storage for 18 d at 15 °C, in comparison to the control fruit which had no exposure to anoxic conditions. Bananas treated with anoxia exhibited a decrease in the developed peel color, as indicated by decreased Δa^* and ΔH values. The treatment also demonstrated greater fruit firmness in comparison to the untreated fruit. In addition, the peel of treated bananas exhibited a greater relative value of firmness, whereas the relative values of electrolyte leakage, malondealdehyde, and H_2O_2 were lower. This is likely caused by the application of anoxia treatment, which might stimulate the activity of DPPH scavenging.

Keywords: low oxygen condition, pre-storage treatment, 'Sucrier' banana, peel damage

S10-P-I-8

Effect of edible coating on stiffness of plum

Sao Mai Dam[1], Thanh Tung Pham[2,3], T.M. Pham[1], **Nga Thanh Thi Ha[2,4],** H.X. Mac[2,4], Laszlo Baranyai[2], Le Phuong Lien Nguyen[2]

[1]Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh City, Ho Chi Minh 700000, Vietnam

[2]Institute of Food Science and Technology, Hungarian University of Agriculture and Life Sciences, 1118 Budapest, Villányi út 29-43, Hungary

[3]Faculty of Chemical and Food Technology, Ho Chi Minh City University of Technology and Education, Ho Chi Minh 700000, Vietnam

[4]Faculty of Food Science and Technology, Ho Chi Minh City University of Industry and Trade, Ho Chi Minh 700000, Vietnam

*Correspondence: damsaomai@iuh.edu.vn

The firmness of fruit significantly affects the perception of customers. Postharvest technology could extend the shelf life of fruit and maintain the quality of produce during storage. The aim of this work was to evaluate the effect of edible coating in retaining the firmness of plum during 4 weeks of storage at 10°C. Samples were coated with 2, 3 and 4% of cassava starch solution and then stored for 28 days at cold temperatures. The results showed that the coating retained the firmness of plum compared to the control samples. Acoustic firmness (stiffness) was measured over the storage period. The stiffness values decreased monotonously for all sample groups, but groups were separated. The significant effect of treatment ($F= 33.3$, $p < 0.001$) was detected in two-ways ANOVA analysis, what also revealed different kinetics ($F= 7.1$, $p < 0.001$) depending on the applied concentration. Nonlinear curve fitting estimated measurements successfully up to $R^2 = 0.909$, while RMSE was below 0.483. The kinetic constant of the fitted models increased from 2.314 to 5.304 with increasing concentration of the treatment.

Keyword: stone fruit, packaging, quality, 1-methylcyclopropene, postharvest.

S10-P-I-9

The effects of melatonin application on the quality characteristics of edible white button mushroom fresh cuts

Mahtab Moradi Digehsara[1], Aidin Shekari[2], Rahim Naghshiband Hassani[2]

[1]*Department of Horticultural Sciences, Faculty of Agriculture, University of Tabriz, Tabriz, Iran*

[2]*Department of Agriculture, Tabriz University, Tabriz, Iran*

*Correspondence: mmoradiedigehsara@yahoo.com

Button mushroom is one of the most consumed products due to its good taste and health benefits. However, the shelf life of fresh mushrooms is limited due to the loss of water, color change, texture change, loss of taste, and nutritional value, so the use of postharvest treatments such as melatonin can lead to maintaining the quality and improving the shelf life of button mushrooms. In this experiment, four melatonin concentrations (1, 10, 100, and 1000 µM) were used with three repetitions and the control treatment (distilled water). After the treatment, the mushrooms were packed and stored in a refrigerator with a temperature of 4ºC and a relative humidity of 90±5%. Sampling was done on days 0, 5, 10, and 15 after treatment. The results showed that the concentration of 10 µM melatonin had a higher effect on reducing the browning, ion leakage, and malondialdehyde deposition of button mushroom fresh cuts than other concentrations. The high activity of the phenylalanine ammonia-lyase enzyme in mushrooms treated with 10 µM melatonin caused an increase in the accumulation of phenolic compounds, which was accompanied by a decrease in the activity of the polyphenol oxidase enzyme. Also, an increase in antioxidant capacity and DPPH radical inhibition was observed in button mushroom fresh cuts treated with 10 µM melatonin, accompanied by a significant increase in ascorbic acid accumulation. In general, the results of this experiment showed that the use of melatonin at a concentration of 10 µM can be used as a safe and effective method to increase the shelf life and maintain the nutritional quality of button mushroom slices.

Keywords: *Agaricus bisporus*, slices, browning, shelf-life, marketability

POSTER SESSION II:

POSTHARVEST BIOCHEMISTRY AND PHYSIOLOGY OF FRUITS, VEGETABLES AND ORNAMENTALS

S10-P-II-1

Quality improvement of degreened oranges and mandarins by reducing the post-harvest exposure to ethylene

Anna Velliou[1,2], Mina Kafkaletou[1], Miltiadis Christopoulos[2], **Ioannis Lycoskoufis**[3]*, Athanasios Spyropoulos[2], Eleni Tsantili[2]

[1]Laboratory of Pomology, Crop Science, Agricultural University of Athens,75 Iera Odos St., 11855, Botanikos, Athens, Greece

[2]Institute of Technology of Agricultural Product, Hellenic Agricultural Organization-DEMETER, S. Venizelou 1 St., Lycovrysi, 14123 Attica, Greece

[3]Departmentof Agriculture, University of Peloponnese, Antikalamos, Messinias, 24100, Kalamata, Greece

*Correspondence: i.lykoskoufis@uop.gr

Early-season citrus fruit cultivated in the Mediterranean areaare often subjected to degreeningtreatment, including the application of exogenous ethylene, when they have obtained the minimum standards of internal maturity,while their peel is still green. However, the post-harvest use of ethylene has been associated withfruit disorders, such as calyx drop, pitting and brown spots on peel and alteration of taste and aroma.The aim of the present work was to evaluate the effect of a 24hlow temperature storage before degreening process (DP) toreduce the exposure time of fruit to ethylene.'Navel' orangesand 'Clementine' mandarins were harvested with peel color index -4.3and 0.55, respectively, while both had reached total soluble solids / titratable acidity (TSS/TA)values > 7.5/1. After harvest, fruit wasdivided into two groups, fruit of the first groupwere submitted to degreening treatment under commercial conditions for 72 h and 48 h, for oranges and mandarins, respectively. Fruit of the second group were stored at 4oC for 24h before DP and therefore were subjected to a reduced time exposure (by 24h) to ethylene. Changes on peel color (assessed by L*, a*, b*, ho, C* and CI) and main quality parameters (such as TSS, TA, pH and% juice) were evaluated after post-harvest treatments and during cold storage at 8oC for oranges and at 12oC for mandarins, for up to a month.'Navel' oranges subjected to 24h cold storage followed by reduced time DPdeveloped similar peel color to fruit subjected to commercial degreeningand no differences between the two treatments were observed during storage.Regarding 'Clementine' mandarins, fruit subjected to commercial degreening process had higher CI values compared to fruit of all other treatments. However, 'Clementines' exposed to 4oC for 24h and then to commercial DP developed higher CI values at the beginning of the storage compared to controls.

Keywords: oranges, mandarins, ethylene exposure, cold storage

S10-P-II-2

Epigenetic regulation of anthocyanin biosynthesis in blood oranges during cold storage: first results on bisulphite sequencing

Scialò Emanuele, Sicilia Angelo, Taranto Concetta Simona, Russo Riccardo, **Lo Piero Angela Roberta***

Department of Agriculture, Food and Environment, University of Catania, Via Santa Sofia 98, 95123, Catania, Italy

*Correspondence: rlopiero@unict.it

Epigenetic modifications, including DNA methylation, influence plant responses to the environment. Studies on fruit ripening in various species, including climacteric and non-climacteric fleshy fruits, indicate the occurrence of diverse DNA methylation dynamics. Hence, tomato fruit ripening involves a decrease in DNA methylation, whereas a ripening-associated DNA hypermethylation was observed in the blonde Newhall sweet orange variety. The effect of cold temperature upon the DNA methylation status of the promoter regions of two genes involved in anthocyanin biosynthesis (DFR and Ruby) has been investigated in blood orange varieties indicating that DNA methylation decreases in those fruit areas in which the amount of anthocyanin is higher. The purpose of this work is to deeply understand the epigenetic mechanism underlying the colour variegation occurring inside the blood oranges at the beginning and during the cold induction of anthocyanin biosynthesis. Therefore, the amount of anthocyanins and the DNA methylation status by bisulphite sequencing have been monitored in either high-pigmented (HP) or not/low-pigmented (NP) segments of the same fruit at time 0 (T0) and after the storage at 4 °C for a total experimental period of 15 days (T15). The results indicate that anthocyanin content was higher in the HP areas and increased during cold storage. Differential methylation analysis reveals low methylation levels both at T0 and T15 in the HP areas of the fruits compared to NP areas (T0HP vs T0NP and T15HP vs T15NP comparisons). Moreover, elevated levels of anthocyanins are reached in those fruit areas where the mCHH context is hypomethylated.

Keywords: *Citrus sinensis*, WGBS, DNA methylation, anthocyanin, sweet orange, cold.

S10-P-II-3

Starch degradation during storage and ripening in ‘Bartlett’ and ‘La France’ pears

Hideki Murayama, Masaki Totsukawa, Daiki Matsumoto

Faculty of Agriculture, Yamagata University, 1-23 Wakabamachi Tsuruoka, Yamagata 997-8555, Japan

*Correspondence: mhideki@tds1.tr.yamagata-u.ac.jp

In pears, starch degradation occurs during ripening, and soluble sugars such as glucose are produced. Amylase is involved in this turnover in plants. The mechanism in pear fruits, however, is unclear. In this study, we investigated changes in starch content, changes in amylase gene expression, and enzyme activity during ripening in 'Bartlett' and 'La France' pears. Fruit were harvested and ripened at 20℃, and some fruit were stored at 1°C. The genes expressions were analyzed by RNA-seq. Enzyme activity was measured using an assay kit. As a result, the starch content in both 1°C and 20°C in 'Bartlett' pears decreased at the same rate in the initial stage of ripening, then rapidly decreased at 20°C compared with at 1°C. In RNA-seq analysis, 50 amylase genes were expressed. Among them, the expression levels of 16 amylase genes were confirmed by real-time PCR. The expression of the α-amylase genes increased in the late stage during ripening. At the same period, α-amylase activity also increased in 'La France' fruit. Taken together, it was found that the expression patterns of starch degradation and amylase genes in pears differed depending on the storage temperature. In addition, α-amylase might be involved in starch degradation especially in the late stage during ripening in pear fruit.

Keywords: amylase, pear fruit, ripening, starch degradation

S10-P-II-4

Re-evaluation of the melting flesh (M) locus in association with flesh texture in peach fruit

Ryohei Nakano[1], Takashi Kawai[2], Daisuke Takata[3], Fumio Fukuda[2], Koichiro Ushijima[2]

[1]Experimental Farm, Graduate School of Agriculture, Kyoto University, Kyoto 6190218, Japan

[2]Faculty of Environ., Life, Natural Sci. and Tecnol., Okayama University, Okayama 7008530, Japan; tkawai@okayama-u.ac.jp, ffukuda@okayama-u.ac.jp

[3]Faculty of Food and Agricultural Sciences, Fukushima University, Fukushima 9601296, Japan

*Correspondence: nakano.ryohei.3r@kyoto-u.ac.jp

Peach flesh texture is controlled by a single Melting Flesh (M) locus and melting flesh (MF) is dominant over non-meting flesh (NMF). M locus is located at 3.5 cM interval on the bottom of linkage group 4 of the peach map, the position within which a genomic region with clusters of endoPG genes exists. Two tandem endoPG genes in that region, Pp-endoPGM (PGM) and Pp-endoPGF (PGF), corresponding to sequences Prupe.4G262200 and Prupe.4G261900 were found to be responsible for determining the MF/NMF phenotypes. The existence of three haplotypes, the first one with both genes, the second one with only PGM, and the third one lacking both genes, and the dominant control of MF trait expression by the first and second haplotypes have been reported (Gu et al. 2016). DNA-seq analysis showed that some Japanese peaches possessed an unidentified M haplotype involved in determining MF phenotype. Structural identification of the unknown M haplotype, designated as M0, through comparison with previously reported M haplotypes, revealed distinct differences between PGM on M0 haplotype (PGM-M0) and PGM on other haplotypes (PGM-M1). Peach M haplotypes were classified into four main haplotypes: M0 with PGM-M0; M1 with both PGM-M1 and PGF; M2 with PGM-M1; and M3 lacking both PGM and PGF. Re-evaluation of M locus in association with MF/NMF phenotypes in more than 400 accessions by using whole genome shotgun sequencing data on database and/or by PCR genotyping demonstrated that M0 haplotype was the common haplotype in MF accessions, and M0 and M1 haplotypes were dominant over M2 and M3 haplotypes and co-dominantly determined the MF trait. Based on the structural comparison of M haplotypes among Prunus species, it was also assumed that the ancestral haplotype of M0 diverged from those of the other haplotypes before the speciation of Prunus persica.

Keywords: peach; melting flesh; fruit softening; polygalacturonase

S10-P-II-5

The post-harvest development of apples' physico-chemical and organoleptic properties

Buțerchi Ioana, Irimia Liviu Mihai*

Iasi University of Life Sciences "Ion Ionescu de la Brad", Aleea Mihail Sadoveanu no. 3

*Correspondence: liviuirimia2005@yahoo.fr

Apples (*Malus domestica*) are among the most consumed fruits globally. The specific aroma, the sweet-sour taste, the high nutritional value makes them highly appreciated for fresh consumption. However, maintaining the nutritional value and their sensory characteristics in optimal intervals until the moment of consumption, requires optimized storage technologies. The aim of the present study is to highlight the influence of different types of packaging on the physico-chemical and organoleptic characteristics of apples, which are in the commercial sale stage. The study was carried out on different products, namely 3 apple varieties packaged as follows: Granny Smith in modified atmosphere packaging (aam); Bulk-packed Granny Smith (av); Golden Delicious in modified atmosphere packaging (aam); Golden Delicious packed loose (av); Red Delicious in modified atmosphere packaging (aam), Red Delicious in bulk packaging (av). The following physico-chemical determinations were performed: average weight (g), total dry matter (T.D.M.), total soluble solids (T.S.S.), firmness (kgf/cm2), titratable acidity (g malic acid / 100 g), index of starch, pH and gluco-acidimetric index (IGA). The organoleptic analysis of the fruits was carried out by the point method, the averages obtained being represented graphically. The results indicate that packaging influences to an important extent the physico-chemical composition and organoleptic characteristics of apples, regardless of the variety, apples packed in modified atmosphere having superior chemical composition and organoleptic characteristics than those packed in bulk**.**

Keywords: apples, packaging, modified atmosphere, chemical composition, sensory characteristics.

S10-P-II-6

Phytochemical analysis of *Melaleuca cajuputi* Powell leaves for the development of herbal tea

Nattaya Montri[1]*, S. Chalornsiri[2], N. Pato[2], N. Kueasakun[2], Rujira Deewatthanawong[3], W. Chintakovid[4]

[1]*Department of Plant Production Technology, School of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand*

[2] *Department of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Chumphon Campus, Chumphon, Thailand*

[3] *Thailand Institute of Scientific and Technological Research, Pathum Thani, Thailand*

[4] *Mahidol University Kanchanaburi Campus, Kanchanaburi, Thailand*

*Correspondence: mnattaya@hotmail.com

The plant *Melaleuca cajuputi* Powell, commonly known as cajuput, is found in coastal swamp forests in Thailand. Traditional knowledge suggests using cajuput tea, derived from its leaves, for treating peptic ulcers. This research aimed to assess the chemical composition of dried leaves at various stages of maturity and using different drying methods. The research was conducted to evaluate the chemical composition of the dried leaves from different stages of leave ages and drying methods. The young, immature, and mature leaves were picked for the tree. Leaves were cleaned and dried in a hot air oven at 40, 45, and 50 degrees. The tea extracts were then analyzed for acid concentration and phenolic content. The study revealed that drying young leaves using the acid concentration varied significantly with leaf age, the drying methods did not exhibit a notable effect. While the highest levels of citric acid, malic acid, and tartaric acid were observed in young leaves. Hot air oven at 40ºC resulted in the highest total phenolic content at 137.55mg GAE. g DW^{-1}.

Keywords: tea, medicinal plants, cajuput, *Melaleuca*

S10-P-II-7

Monitoring changes in plum fruit quality during post-harvest storage

Zinabu Hailu Siyum[1,2], Tung Thanh Pham[1], Hitka Geza[1], Maria Höhn[3], Lien Le Phuong Nguyen[1,4], Laszlo Baranyai[1]

[1]*Institute of Food Science and Technology, Hungarian University of Agriculture and Life Sciences, 1118 Budapest, Villányi út 29-43, Hungary*

[2]*College of Engineering and technology, Chemical Engineering department, Adigrat university, Adigrat, Ethiopia*

[3]*Institute of Agronomy, Hungarian University of Agriculture and Life Sciences, 1118 Budapest, Villányi út 29-43, Hungary*

[4]*Industrial University of Ho Chi Minh City, Ho Chi Minh, Vietnam*

*Correspondence: Nguyen.Le.Phuong.Lien@uni-mate.hu

Plums, as climacteric fruits, undergo significant physiological changes during postharvest storage, primarily influenced by ethylene production and respiration kinetics. This study aimed to investigate the effect of storage temperature and duration on ethylene production, respiration rate, and microscopic structure in both ‘Stanley’ and ‘Elena’ plum samples. The plum samples were stored at temperatures of 1°C, 5°C,10°C, and 15°C for 20 and 24 days, respectively. The results revealed that ethylene production and respiration rate increased with storage temperature, accelerating the ripening process. In addition, the microscopic images after storage showed an increase in epicuticular wax, damaged cells, and remaining open stomata. This may be related to the ripening and softness of the plums. Therefore, the quality changes of plums can be assessed using microscopic techniques along with measurement of ethylene and respiration rates at different storage temperatures and times.

Keywords: plum, postharvest storage, ethylene, respiration rate, microscopic structure.

POSTER SESSION III:

Effects OF PREHARVEST MANAGEMENT ON POSTHARVEST QUALITY OF FRUITS, VEGETABLES AND ORNAMENTALS

S10-P-III-1

Pulp browning reduction by different solutions after induced bruising in fruits of 'Ascolana tenera'

Enrico Maria Lodolini, Francesco Belluccini, Veronica Giorgi, Samuele Crescenzi, Davide Neri

Università Politecnica delle Marche, via Brecce Bianche, 10, 60131 Ancona, Italy

*Correspondence: f.belluccini@staff.univpm.it

'Ascolona Tenera' is the main table olive cultivar of the Marche region in central Italy. The lack of manpower and high costs of manual harvest are a big threat for this particular production. A solution to these problems might be the adoption of mechanical harvest systems, but this variety is very easy to damage by manipulation. This may lead to pulp browning that make the fruits not suitable to produce table olives. Therefore, investigation is needed to implement the harvesting system and reduce the incidence of fruit bruising and the subsequent deteriorating phenomena. In this work application of different solutions to reduce fruit browning in the field, as a post-harvest treatment, is investigated. After inducing bruising by fall from a fixed height the olives have been dipped in solutions of ascorbic acid, citric acid, sodium hydroxide, in tap water and left open air as a control. After 2h and 4h the olives have been analyzed to evaluate the incidence of browning. The results obtained suggest a reduction in fruits browning after fruit immersion in all the utilized substances.

Keywords: table olive, fruit damage, post-harvest treatment, ascorbic acid, citric acid, sodium hydroxide

S10-P-III-2

Influence of extreme orchard elevations on ripening, storability and quality of apple cv. ‘Golden Delicious‘

Angelo Zanella, Nadja Sadar, Stefan Stürz

Research Centre Laimburg, 39040 Ora Posta, Italy

*Correspondence: nadja.sadar@laimburg.it

In recent years, owing to increasing land scarcity in certain European areas, apple cultivation has been progressively expanding into ever-higher elevations. The climate warming of the past few decades, especially in the European Alps, might provide the unique opportunity of turning the challenge into chance. While, compared to the low-land-grown fruit, apples grown at higher mountainous areas have often been reported to develop better quality characteristics, hardly any studies have been conducted that evaluated fruit quality of apples grown at elevation above 1000 m (asl) in temperate regions. In light of the above, the objectives of the 3-year study were to compare the productivity and quality of apple fruits cv. ‘Golden Delicious’, stemming from different orchards at moderate (≈600 m asl) and high (≈1000 m asl) elevations in South-Tyrol (northern Italy). The results revealed a slightly lower productivity of the high elevation orchards compared to the moderate elevation orchards, with an accelerated fruit development but not ripening. The duration of fruit development cycle at higher elevations was by up to 10 days shorter than at moderate elevations, with high elevation fruit reaching optimal maturity with, on average, 260 to 330 lower amount of growing degree hours (GDH ≥10°C) compared to the moderate elevation orchards. Nevertheless, both fruit of moderate and of high elevation orchards exhibited excellent quality. Certain gustatory-relevant quality attributes, such as firmness and acidity, were superior in high elevation fruit, whereas, apart from the over accumulation of the epicuticular wax in the coldest of the investigated seasons, no worsening of any of the observed quality parameters was seen with increasing elevation. Fruit from the higher elevation retained the better overall quality even after 4 months of storage in controlled atmosphere.

Keywords: high altitude, apple (*Malus x domestica*), firmness, greasiness, color

S10-P-III-3

Effect of growth regulators on the qualitative parameters of onion bulbs during storage

Danguole Juskeviciene, Audrius Radzevicius, Rasa Karkleliene

Kaunas distr., Kaunas str.30, LT-54333 Babtai, Lithuania

*Correspondence: danguole.juskeviciene@lammc.lt

Abstract: The efficacy of plant growth regulators containing 270 g/kg of the active substance maleic hydrazide to the qualitative parameters of onion bulbs was investigated at the Lithuanian Research Centre for Agriculture and Forestry in 2022–2023. On the trial site, the sets of onion cultivar Stutgarten Riesen were planted in the first decade of May 2022. Three different doses (rates 6,3; 8,9; 17,8 l/ha) were applied in July when plants reached BBCH 47-48. Onion bulbs were harvested in the second decade of August and placed in the storage camera where the temperature reached 4+0,6oC, as well as the humidity - 65-75%. Two assessments of the bulb's qualitative parameters were performed during storage 120 and 180 days after harvesting. Internal and external germination was assessed visually, and the sprout number was counted. It was determined, that increasing the storage time of onion bulbs increased their germination, especially in the internal part. At the 1st assessment after 120 days of storage, no external germination was observed, while internal germination reached 2% in the variants, where maleic hydrazite was applied. It is more than twice as effective compared with the untreated variant. A similar tendency was observed after 180 days of storage. The second assessment showed that internal germination reached up to 50% in the untreated variant, and up to 25% of germination was reached in the treated variants. One sprout per germinated bulb was counted usually. The obtained results showed that a dose of 8.9 l/ha of maleic hydrazite was the most effective in the onion during storage.

Keywords: bulbs, germination, maleic hydrazite, onion, sprout number, storage

S10-P-III-4

Effectiveness of companion planting on organic strawberry fruit quality

Liliana Bădulescu[1], Oana-Crina Bujor[1], Violeta Ion[1], Andrei Petre[1], Mihai Frîncu[1], Sabina Pintila[2], Cristina Rădeanu[2], Cristian Nedelcu[2], Bogdan Mihalcea[3], Roxana Ciceoi[1]

[1]Research Center for Studies of Food Quality and Agricultural Products, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăşti Boulevard, District 1, Bucharest, 011464, Romania

[2]Faculty of Biotechnology, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăşti Boulevard, District 1, Bucharest, 011464, Romania

[3]Cooperativa agricola Rodagria produce, Sat Ogoru, str. Islazului nr. 9, Constructia C1, Calarasi, 917059, Romania

Correspondence: oana.bujor@qlab.usamv.ro

Berries production and quality are affected by a variety of abiotic and biotic stressors, especially problems associated with pests and diseases. Implementing companion plants as an organic intercropping strategy with berries has been shown to offer numerous advantages, including increased productivity, enhanced fruit quality and improved taste. Consequently, a trial plot was set up at the Rodagria Agricultural Cooperative in Southeastern Romania on Amandine® strawberry variety, in polytunnels, using organic cultivation methods. *Borago officinalis* L. Flower strips were sown alongside the pole lines of the polytunnels. Strawberries harvested in June 2022, September 2022 and June 2023 were assessed for the quality parameters (fruit weight, size, dry matter, titratable acidity, soluble solid content as Brix, total anthocyanin content, total phenolic content, antioxidant activity, and sugars) to determine the effects of these cultivation practices. The results show that the intercropping system with companion plants did not significantly influence the weight, size, dry matter, titratable acidity of strawberry fruits. However, the 2023 season showed a slight increase of the soluble solid content of the strawberries. More importantly, the integration of companion plants like borage in strawberry cultivation notably enhanced the total phenolic content and antioxidant activity in both the 2022 and 2023 seasons compared to the control. This finding suggests that borage as a companion plant positively influences the content of antioxidant compounds in strawberries. Fourier-transform infrared (FTIR) fingerprinting, used for the identification of sugars, showed the specific bands for fructose (1074 cm^{-1}), glucose (1034 cm^{-1}), sucrose (1010 cm^{-1}) and fructans (954 cm^{-1}). These results offer valuable insights for organic berry farmers and growers, offering innovative techniques to grow berries with improved nutritional and antioxidant qualities.

Keywords: strawberries, *Borago officinalis* L., nutritional quality, organic system, intercropping

S10-P-III-5

Influence of intraspecific tomato rootstocks on the ability to maintain eggplant quality during storage

Marian Bogoescu[1], Nicole Petculescu[1], Madalina Doltu[2]

[1]*ASAS Bucharest Romania*

[2]*HORTING Institute for Research, Development, Industrialization and Marketing of Horticultural Products, Bucharest, Romania*

*Correspondence: bogoescumarian@gmail.com

A positive financial result requires that the production of eggplants intended for fresh consumption is optimally managed also through storage. Due to the unfavorable conditions created by extreme abiotic factors and the need to replace some chemical treatments necessary to prevent and combat soil diseases and nematodes, the culture of grafted eggplants is increasingly common. Among the rootstocks used, intraspecific tomato rootstocks have a significant share in Europe. The purpose of this research was to highlight the response of eggplants grafted on interspecific tomato rootstocks for the optimal preservation of fruit quality during storage in different storage conditions. The research activity was carried out in the Laboratory to maintain the fresh horticultural products quality within the Research and Development Institute for the Industrialization and Marketing of Horticultural Products, Bucharest. The biological material consisted of plants from grafted and ungrafted eggplants. The grafted plants were obtained from a black eggplant cultivar, “Classic F1”(*Solanum melongena* L.), and two interspecific hybrids of tomato as rootstocks (*Solanum lycopersicum* x *Solanum habrochaites*), “Kaiser F1” and “Emperador F1”. Grafted and non-grafted eggplants were stored for 14 days, in plastic crates, under controlled conditions. The results of this research show that the intraspecific tomato rootstocks positively influenced the quality of eggplants stored under controlled microclimate conditions.

Keywords: abiotic factors, grafted, ungrafted, cultivar, controlled conditions

S10-P-III-6

Assessing fruit quality in two raspberry cultivars during distinct harvest periods relating to the origin of the plants

Tatjana Andjelic[1], Tatjana Vujovic[1], Jelena Tomic[1], Boris Rilak[1], Dragan Radivojevic[2]

[1]Fruit Research Institute, Kralja Petra I no. 9, 32000 Čačak, Republic of Serbia

[2]University of Belgrade, Faculty of Agriculture, Nemanjina no. 6, 11080, Belgrade – Zemun, Republic of Serbia

*Correspondence: tandjelic©institut-cacak.org

High-quality planting material is crucial for a robust yield and desired fruit quality, serving as tangible proof of success in agriculture. Its indispensable role is evident throughout the cultivation process, emphasizing its significance in achieving high agricultural standards. This research comprehensively analyzed the fruit quality of tissue-cultured and plants derived from traditional propagation methods two raspberry cultivars 'Meeker' and 'Willamette' during 2019. Fruit quality parameters were monitored during three harvest times (early, mid and late). The analyzed parameters included soluble solids content (SSC), total acids (TA), total sugars (TS), vitamin C, total phenols (TP), total anthocyanins (TAC) and antioxidative activity [DPPH-2.2-diphenyl-1-picrylhydrazyl and ABTS- 2.2'-azinobis (3-ethylbenzothiazoline-6-sulfonic acid) test]. The cultivar 'Meeker' stood out with superior values for SSC and TS, whereas the cultivar 'Willamette' exhibited higher TA reaching a value of 1.55%. A gradual increase in TP was recorded throughout the harvest, with tissue-cultured plants reaching a value of 228.95 mg GAE (gallic acid equivalent) 100 g^{-1} FW. In the early harvest, TAC in in vitro-propagated 'Willamette' plants was 39.78 mg C3G 100 g^{-1} FW, while the highest TP level was observed at the late harvest period, amounting to 227.73 mg GAE 100 g^{-1} FW. The results from both antioxidant activity tests, indicated a higher values in tissue-cultured plants, emphasizing their potential significance in nutrition and health preservation. This study highlights the potential advantages of using tissue-cultured plants for establishig commercial orchards and offers important insights into the qualitative variations between plants of different origin in both raspberry cultivars.

Keywords: 'Meeker', 'Willamette', tissue culture plants, traditionally propagated plants, antioxidants

S10-P-III-7

The effects of nanosilicon on yield, fruit quality and fruit cracking of sweet cherries

Dragan Milatović[1], Djordje Boškov[1], Ivana Radović[1], Aleksandar Radović[2], Gordan Zec

[1]*University of Belgrade, Faculty of Agriculture, Belgrade, Serbia*

[2]*University of Niš, Faculty of Agriculture, Kruševac, Serbia.*

*Correspondence: mdragan@agrif.bg.ac.rs

Silicon is not an essential element for most plants, but has many positive effects on growth, yield and fruit quality, especially under stress conditions, including biotic and abiotic stress. Although the positive effects of silicon on plants are well known, there are few reports on the effects of silicon when applied in the form of nanoparticles. The effects of nanosilicon application on yield, leaf pigment content and fruit quality of two sweet cherry cultivars: 'Grace Star' and 'Black Star', were investigated. The foliar treatment was applied four times during the growing season. In the 'Grace Star' cultivar, the application of nanosilicon resulted in a statistically significant increase in yield and yield efficiency. In this cultivar nanosilicon also had an effect on higher flavonol content in the leaf, lower fruit weight and fruit diameter, and higher soluble solids and ascorbic acid content in the fruit. In both cultivars, nanosilicon caused an increase in the total acid content in the fruit, an increase in antioxidant activity and a decrease in the fruit cracking index.

Keywords: *Prunus avium*, silicon nanoparticles, leaf pigments, fruit size, chemical composition of fruit, fruit cracking index

S10-P-III-8

Optimizing pre-harvest treatments and postharvest methods to preserve apricot maturity during storage

Maja Milović[1], **Nenad Magazin[1]**, Jasna Mastilović[2], Žarko Kevrešan[2], Biserka Milić[1], Renata Kovač[2], Bajić Aleksandra[2]

[1]University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, Novi Sad, maja.miodragovic@polj.uns.ac.rs

[2]University of Novi Sad, Institute of Food Technology, Bulevar Cara Lazara 1, Novi Sad

*Correspondence: maja.miodragovic@polj.uns.ac.rs

The study aimed to investigate the effectiveness of combining pre- and post-harvest treatments in reducing fruit maturation during storage and shelf life of apricot cv. 'NS-4'. Two foliar preharvest treatments, urea (46% N in amide form) and calcium (Ca - Wuxal®Calcium), applied three times during the growing season and postharvest treatments included modified atmosphere packaging (MAP) and 1-methylcyclopropene (1-MCP), applied to chilled fruits (IAD index 0.4-0.8) were compared. Measurements of fruit weight loss, chlorophyll content, and loss of firmness were conducted at harvest (0 day), after 15 days of cold storage, and after 3 days of shelf life (15+3). The urea treatment exhibited reduced fruit weight loss and DA index after 15+3 days compared to other foliar treatments. Combining foliar treatments with MAP reduced the loss of fruit firmness and DA index after cold storage and shelf life. 1-MCP treatment showed superior efficacy in reducing fruit firmness loss compared to MAP after shelf life (15+3 days). These findings shows potential of combining specific pre- and post-harvest treatments to preserve apricot fruit quality during storage and shelf life.

Keywords: foliar treatment, calcium, nitrogen, weight loss, chlorophyll, firmness, cold storage, shelf life

S10-P-III-9

Influence of the substrate on the yield and chlorophyll content of selected species of microgreens plants

Ivana Mezeyova, Ivana Kollarova, Ján Mezey, Marcel Golian, Alena Andrejiová, , A, Jahodník, T. and Poláčiková, A.

Institute of Horticulture, Faculty of Horticulture and Landscape Engineering, Slovak University of Agriculture, Nitra, Slovakia

*Correspondence: ivana.mezeyova@uniag.sk

The importance of peat-free cultivation has recently been increasing, and testing the possibilities and procedures for improving it is in line with modern research trends. The aim of the experiment was to determine the influence of commercially available substrates (rock wool and coconut fibre) on the qualitative and quantitative parameters of selected species of microgreens plants (*Eruca sativa*, *Lepidium sativum*, *Brassica rapa* var. japonica, *Raphanus sativus* and *Ocimum basilicum*). The evaluated parameters were fresh biomass yield, dry yield, and chlorophyll a and b content. The experiment was conducted in January 2021 in the climatic chamber with phytotron system KK 750 FIT P. When the cotyledon leaves were fully formed, microgreens were harvested, weighed, and analysed. Results show that the substrate had a significant effect on the amount of fresh matter, when on average 7.77 g of FW was cultivated on coconut fibre and 8.94 g of FW was cultivated on rock wool. The substrate also had a significant effect on chlorophyll content. Results from variants grown on rock wool were significantly higher (428.606 mg.kg-1 FW chl a, 169.03 mg.kg-1 FW chl b) compared to coconut fibre (391.152 mg.kg-1 FW chl a, 158.84 mg.kg-1 FW chl b).

Keywords: rock wool, coconut fibre, basil, arugula, cress, mizuna, radish

S10-P-III-10

Development a multiresidue ASE-DLLME fast GC-MS method for the determination of pesticides in agricultural soil samples

Agnesa Szarka, Anna Fruzsina Fehér, Nicolette Viktoryová, Svetlana Hrouzková

Institute of Analytical Chemistry, FCHPT, STU, Radlinského 9, Bratislava, Slovak Republic

*Correspondence: agnesa.szarka@stuba.sk

Pesticides are widely used in agricultural production systems to control unwanted pests. In particular, the current horticultural production system is highly reliant on those agents. The pesticide-use regime employed is primarily influenced by the different threats faced by the vegetables being produced, with each production unit having multiple crops being cultivated simultaneously. Pesticides, fertilizers, and other products containing contaminants are often applied directly to crops or soils in which they grow. Since many contaminants exhibit the affinity to bind to soil particles rapidly, the accumulation of contaminants occurs in the soil underlying the crops. Sampling crop production areas and adjacent waterways can, therefore, provide an improved understanding of the extent of environmental impact from industrial agriculture, whereas pesticide residues may not undergo rapid degradation and can become persistent environmental pollutants. Accumulation and overexposure of pesticides within the natural environment can cause wildlife and human health decline. A proper sample preparation technique is required to isolate and concentrate the target compounds to determine pesticide residues in environmental samples, such as soils. Increased concern about the usually toxic solvents discarded and their impact on the environment has led to the development of “greener” extraction methods. A new, rapid, and ecologically friendly method for the determination of pesticide residues in agricultural soil samples has been developed combining accelerated solvent extraction (ASE) and dispersive liquid-liquid microextraction (DLLME), which is characterized by the use of significantly low amounts of organic solvent and high enrichment factors. There are many factors, which affect the performance of DLLME, such as the type and volume extraction and dispersive solvent, and the volume of water. These factors were studied and the satisfactory extraction conditions were selected. The extracts were analyzed by fast gas chromatography-mass spectrometry. The method was fully validated under the optimized extraction parameters. The optimized method was employed for the determination of pesticide residues in real samples.

Keywords: pesticide analysis, combined extraction method, GC-MS, ASE-DLLME

S10-P-III-11

Preharvest calcium chloride sprays improving physicochemical quality of mulberries (*Morus alba* L.) cv. 'Chiang Mai 60' during refrigeration

Suriyan Supapvanich[1], Pra-kaiykarn Sangchan[2], **Pannipa Youryon[2,*]**, Anjana Junpatiw Ahuja[2]

[1]Department of Agricultural Education, School of Industrial Education and Technology, King Mongkut's Institute of Technology Ladkrabang, Chalongkrung Road, Ladkrabang, Bangkok, 10520 Thailand

[2]Department of Agricultural Technology, Prince of Chumphon Campus, King Mongkut's Institute of Technology Ladkrabang, Pathio District, Chumphon Province, Thailand

*Correspondence: pannipa.yo@kmitl.ac.th

The aim of this work was to investigate the efficiency of preharvest $CaCl_2$ sprays on quality of mulberries cv. 'Chiang Mai 60' during refrigeration. The mulberries at the stage of 40 days after anthesis were sprayed with water (control), 0.5 % or 1 % $CaCl_2$. The fruits were then harvested after spraying for 5 days and refrigerated at 5 ºC for 6 days. The visual appearance, texture, total soluble solids (TSS) content, total acidity (TA), antioxidant activities and certain secondary metabolites of the mulberries were monitored. Both $CaCl_2$ sprays had no effect on the visual appearance during storage. Both $CaCl_2$ sprays enhanced fruit firmness and delayed the fruit softening during refrigeration. Both $CaCl_2$ treatments delayed the increased TSS content and maintained the TA content. Total phenols, ascorbic acid and anthocyanin contents of the mulberries were enhanced by the $CaCl_2$ sprays. Both $CaCl_2$ sprays delayed the decreased antioxidant capacity and enhanced the free radical scavenging activity during the refrigeration. The efficiency of 0.5 % $CaCl_2$ and 1 % $CaCl_2$ preharvest sprays on improving postharvest quality of the mulberries was not different. These indicate that $CaCl_2$ preharvest sprays improved postharvest quality of the mulberries which 0.5% $CaCl_2$ is the suggested concentration.

Keywords: Mulberries, $CaCl_2$, firmness, secondary metabolites

S10-P-III-12

The application of bioregulators and the selection of rootstock aim to improve the quality of apricot fruit

Nenad Magazin[1], Biserka Milic[2], Zoran Keserovic[2], Maja Milovic[2], Jelena Kalajdzic[2], Gordana Barac[2]

[1]*Faculty of Agriculture, Department for fruitgrowing, Trg Dositeja Obradovica 8, 21000 Novi Sad, Serbia*

[2]*Trg Dositeja Obradovica 8, 21000 Novi Sad, Serbia*

*Correspondence: nmagazin@polj.uns.ac.rs

The correct choice of cultivar and rootstock, as well as the selection of appropriate pre-harvest treatments, can greatly improve the quality of the fruits. In intensive fruit production, the use of bioregulators regulates numerous physiological processes in fruit trees. This achieves better fruit quality, regulates fruitfulness, and controls tree vigor. The aim of the research was to examine the impact of bioregulator application on apricot fruit quality depending on the rootstock. In apricot cultivar 'Big Red', grown on rootstocks *Prunus cerasifera* Ehrh. (myrabolan)/Stanley and *Prunus domestica* L. (belošljiva), treatments with NAA 10 and 20 ppm, BA 50 and 100 ppm and GA3 200 ppm applied four weeks after full flowering (average fruit diameter 13 mm). The effect of the treatment on fruit quality depended on the choice of rootstock. A better impact of the treatment on fruit weight was achieved on the rootstock *Prunus cerasifera*. For all treatments, except GA3, greater fruit weight was achieved compared to the fruits from the control. For the belošljiva rootstock, only the application of NAA 20ppm resulted in a greater fruit weight. A positive impact on fruit firmness was achieved through the application of BA treatments for both rootstocks. Based on the obtained results, it can be assumed that bioregulators could find application in intensive apricot fruit production with the proper selection of cultivar and rootstock.

Keywords: plant growth regulators, *Prunus cerasifera* Ehrh., *Prunus domestica* L., fruit weight, fruit firmness

S10-P-III-13

Volatile compounds profile of 'Xenia' pears as affected by harvest date, storage atmosphere and 1-methylcylopropene treatment

Felix Büchele[1], Roger Wagner[2], Fabio Rodrigo Thewes[2], Daniel A. Neuwald[1], Adriana Lugaresin[1]

[1]*Research institute in Ravensburg, 88213 - Ravensburg, Germany*

[2]*Department of Food Technology and Science, Federal University of Santa Maria, Santa Maria, Brazil; rogerwag@gmail.com, fthewes@yahoo.com.br*

*Correspondence: felix.buechele@kob-bavendorf.de

This study investigated the volatile profile of 'Xenia' pears as affected by harvest date and storage conditions. The fruit material was harvested in September at two different orchards, one week apart, and subsequently stored for 8 months at 0°C under cold storage (RA), controlled atmosphere (1.0 kPa O2 and < 0.7 kPa CO2), and dynamic controlled atmosphere based on CO2 (DCA-CD), all with and without 1-MCP application. Volatile compounds (VC) were analyzed at harvest and after storage plus 7 days at 20 °C by HS-SPME-GC-MS. Advanced fruit ripening due to later harvest date or long-term storage resulted in a higher total abundance of VCs. Three-way ANOVA suggests a significant interaction of harvest date, atmosphere and 1-MCP for alcohol, ester and ketone levels after storage. With an earlier harvest date, atmosphere and 1-MCP had a minor influence on the total abundance and the composition of VCs in 'Xenia' pears compared to the later harvest date. CA and DCA reduced the aroma formation in later harvested pears, presumably due to a delayed ripening. Additionally, the effects of 1-MCP on alcohol and ester concentrations were found to be highly dependent on the atmosphere settings. In RA, 1-MCP lowered alcohols and increased ester levels, while in CA and DCA lower concentrations of both alcohols and esters were measured, which could also be associated with the greater ripening-inhibition of CA and DCA, when compared to RA + 1-MCP. Hierarchical cluster analyses, carried out independently for each harvest date, indicate that fruit maturity at the time of harvest has a more significant influence on the total profile of volatiles related to fruit aroma of 'Xenia' pears following storage, than the established storage conditions of atmosphere and 1-MCP application itself.

Keywords: *Pyrus communis* L.; volatile compounds (VC); low oxygen; DCA; GC-MS

S10-P-III-14

Influence of genotype on quality characteristics of sweet pepper fruits under organic management

Otilia Cristina Murariu[1], Florin Daniel Lipșa[1]*, Vasile Stoleru[2]*, Marius Marian Ciobanu[1], Gabriela Frunză[1], Alessio Vicenz Tallarita[3], Gianluca Caruso[3]

[1]*Department of Food Technology, "Ion Ionescu de la Brad" University of Life Sciences, Iasi, Romania*

[2]*Department of Horticulture Technologies, "Ion Ionescu de la Brad" University of Life Sciences, Iasi, Romania*

[3]*Department of Agricultural Sciences, University of Naples Federico II, Portici, Italy*

*Correspondence: florin.lipsa@iuls.ro; vasile.stoleru@iuls.ro

Organic vegetables are being increasingly appreciated by consumers due to their sustainability in terms of environmental and human health impact, and also the appearance of the edible plant parts represents an attraction aspect. The selection of cultivars with high quality performances under eco-compatible management represents a key tool to improve the food market success. The present research was aimed to compare six pepper (*Capsicum annuum* L.) genotypes grown under organic management at the experimental field of Iasi University of Life Sciences, Romania, in terms of quality (dry matter, soluble solids, pH, titratable acidity) and antioxidants (carotenoids, lycopene, vitamin C, chlorophyll a and b, xanthophyll) characteristics of fruits. The highest content of dry matter in pepper fruits was recorded in the genotypes G3 and G6, whereas the highest level of soluble solids in G2. G3 had the highest pH and the highest total acidity was found in G5 fruits. β-carotene reached the highest content in G4 fruits, lycopene in G2 and vitamin C in G5 fruits. The content of both chlorophyll a and b was the highest in G5 and xanthophyll in G3. The selection of pepper genotypes best fitting the organic management, thus showing high nutraceutical properties of fruits, represents a strategy to meet the growing consumers' demands of safe and premium quality food.

Keywords: *Capsicum annuum* L., ecocompatible system; soluble solids; carotenoids; vitamin C

S10-P-III-15

Morphological comparison of aconitum seeds by subgenus

Jinki Kim

National Botanic Garden of Korea Native Plant, Gangwon-do, Republic of Korea

*Correspondence: jkkim94@koagi.or.kr

Seed characteristics were evaluated by examining the morphology and anatomy of the seeds by scanning electron microscopy and light microscopy. This study included seeds from 12 species of the genus *Aconitum*, collected from Korea, and was composed of two subgenus: *Aconitum* and *Lycoctonum*. All the seeds studied were brown and obovoid, and the length, width and weight of the seeds were significantly different in all species. The wings on the seed surface were classified into three types: (1) fluttering to one side, wide wings; (2) enclosing the entire seed, but narrow wings; (3) skewed to one side, but few wings. Microsculpture features of seed surface were categorized into four types: (1) striate; (2) sulcate; (3) ribbed; and (4) coliculate; characteristically, fine granulated microsculpture was observed on the wrinkled wing surface of all seeds, except seeds of *A. puchonroenicum*. Anatomical observations revealed that all species had exotesta in common, and various layers were observed according to the species. As a result of principal component analysis (PCA) and cluster analysis, the genus *Aconitum* was classified into three groups: group 1 included six species of subgenus *Aconitum*, group 2 included three species of subgenus *Lycoctonum*, and group 3 had members of two subgenera (*Aconitum* and *Lycoctonum*). The results of this study confirmed that seed characteristics—morphological and anatomical structures—were characteristic indicators of the species, but did not strongly support the clear division in subgenera.

Keywords: seed morphological characteristics*, Aconitum* L., seed anatomy

S10-P-III-16

AI+ColourBox: an AI-assisted image analysis system to quantify tomato colour

Silvia Langer[1]*, Lin Jiahui[1], Rob Schouten[2], Julian Verdonk[2]

[1]Horticulture and Product Physiology, Wageningen University & Research, Droevendaalsesteeg 1, 6708PB Wageningen, Netherlands

[2]Food and Biobased Research, Wageningen University & Research, Stippeneng 4, 6708WE Wageningen, Netherlands

*Correspondence: silvia.langer@wur.nl

Colour is an important characteristic of the overall quality of tomato fruits. Rapid and accurate measurement of tomato colour is essential for quality control in production and for high-throughput phenotyping in research. Computer vision has emerged as a promising technique for such tasks. This study aimed to explore the ColourBox image analysis system for evaluating tomato colour. In this work, we developed a new image analysis pipeline using state-of-the-art deep learning models, namely YOLOv8 for object detection and Mask2Former for semantic segmentation, to extract colour information from individual tomatoes from images obtained using the ColourBox. We used this analysis method to study the effect of postharvest light on tomato quality. Different LED light spectra (Red: R, Blue: B, White: W, White + Red: W+R, White + Far-red: W+FR) were applied to mature green tomatoes (cv 'Perimo') at a constant light intensity of 120 µmol m-2s-1 for 30 days during storage at 20 °C. Colour (a* a*/b*, and Hue), firmness index, and weight loss were measured. The results showed that R light accelerated colour change compared to other spectra. In addition, the firmness index of LED-treated tomatoes was significantly reduced. The cumulative weight loss increased in all LED-treated tomatoes compared to tomatoes kept in the dark, except for the W+R group. The combination of YOLOv8 and Mask2Former models accurately detected individual tomato flesh. Unlike the ColourBox prototype, AI+ColourBox recognized individual tomatoes, regardless of fruit image overlap. Our new image analysis pipeline allowed simultaneous colour measurement of multiple samples with minimal error. Furthermore, the AI+ColourBox offered the examination of colour changes in tomato flesh and calyx. In conclusion, the deep learning-based image analysis pipeline showed great advantages over the traditional Konica Minolta colourimeter in tomato phenotyping. We recommend using a*/b* or Hue as the tomato ripening index for practical needs.

Keywords: deep learning, image analysis, tomato, LED, postharvest quality

POSTER SESSION IV:

TRENDS IN QUALITY OF HORTICULTURAL PRODUCTS (PRESERVATION, MANAGEMENT, SAFETY)

S10-P-IV-1

Optimizing indoor spinach cultivation: a study on the influence of blue light and vapor pressure deficit on carotenoid content in spinach leaves

Mark Melchior*, Jan van den Berg, Carmen Padilla-Díaz

Maastricht University, Innovalaan 1, 5928 RC Venlo, Netherlands

*Correspondence: mark.melchior@maastrichtuniversity.nl

Spinach contains several micronutrients, including carotenoids, which provide benefits to the plant and to human health. Carotenoids are pigments, which are present in the chloroplasts of leaves and act as antioxidants to protect the photosynthetic apparatus against radiation and reactive oxygen species. Excess radiation energy can induce photo-oxidative stress to the photosystem and potentially damage plant cells. Carotenoids in the leaf defend against this stress by a process called non-photochemical quenching, in which the excess energy is released as heat. Different wavelengths of light radiation affect plants differently, and blue light has been shown to have the potential to increase the carotenoid content in microgreens. In addition to light quality, vapor pressure deficit (VPD) is another environmental factor that affects photosynthesis. Specifically, under high VPD, the stomatal conductance decreases, in contrast to blue light which leads to stomatal opening. We hypothesize that blue light and high VPD conditions cause an increase in the carotenoid content of spinach leaves. To test our hypothesis, four spinach varieties will be grown under four different treatments in a phytotron, with three biological replicates per experimental unit. Two light treatments with the same intensity will be applied: standard light (77% red, 10% blue, 7% green, and 6% far-red) and high blue light (57% red, 30% blue, 7% green, and 6% far-red). Additionally, for both light treatments, there are two VPD treatments as well (0.66 and 1.11 kPa). High-performance liquid chromatography (HPLC) will be utilized to qualitatively and quantitatively assess the carotenoid of the spinach leaves. To assess the physiological status of the plants, other variables including photosynthesis rate and stomatal conductance will be measured as well. We expect to find a higher concentration of total carotenoids in the spinach leaves grown under high blue light treatment with a high VPD.

Keywords: light spectrum, antioxidants, micronutrients, photosynthesis, reactive oxygen species, controlled environment agriculture

S10-P-IV-2

The use of plant growth regulators in pre-harvest and their influence on fruit quality of five plum cultivars (*Prunus salicina* L.)

Filipa Queirós*

Instituto Nacional de Investigação Agrária e Veterinária, INIAV, I.P. ENFVN, Estrada de Leiria, 2460-059 Alcobaça, Portugal

*Correspondence : filipa.queiros@iniav.pt

Plant growth regulators (PGRs) are applied during fruit cultivation in the field to influence both vegetative and fruit growth, with effects on quality traits at harvest and after storage. Plums are one of the summer fruits most appreciated by consumers due to their organoleptic characteristics and health-promoting properties. Small fruit size is one of the limiting factors in marketing fruit of Japanese plums and the application of PGRs, such as auxins and gibberellins, has been tested to alleviate this problem. However, the fruit quality effects depend on the concentration, chemical formulation and plant developmental stage at the time of treatments. In order to evaluate the effects of auxin (NAA) and gibberellin (GA3) applications on the fruit quality at harvest and after one week under shelf–life conditions, a study was carried out in the experimental orchard of the National Institute for Agrarian and Veterinary Research (INIAV), in Alcobaça, Portugal, which included early-, mid- and late-season maturing plum cultivars. The NAA and GA3 treatments delayed fruit maturity, particularly for late ripening cultivars (“TC Sun”). NAA application was evident in preventing the premature fruit drop close to harvest, contributing to a higher yield at harvest. The heaviest and largest fruits corresponded to pre-harvest treatments with GA3, both at harvest and after shelf-life, while the use of NAA led to an increased flesh firmness, but not in all studied cultivars. PGRs treatments did not affect total soluble solids content, but the acidity levels were higher in PGR-treated fruits, especially in GA3-treated fruits from “Sapphire” e “TC Sun”. Moreover, preharvest applications of NAA and GA3 induced the lowest fruit weight loss after shelf-life. Based on our results, PGRs treatments can be beneficial in preventing preharvest fruit drop and on fruit quality parameters at harvest as well as after shelf-life, although the effects depend on the cultivar.

Keywords: auxins, gibberellins, harvest, shelf-life, total soluble solids content, titratable acidity

S10-P-IV-3

Research on the yield and physico-chemical characterization of various tomato genotypes grown in conventional and organic greenhouses

Andreea Antal Tremurici[1]*, Creola Brezeanu[1], Alexandru Bute[1], Mariana Calara[1], Dan Ioan Avasiloaiei[1], Marian Petre Brezeanu[1], Vasile Stoleru[2]

[1]Vegetable Research Development Station, 220 Barlad Street, 600388 Bacau, Romania

[2]Department of Horticulture Technologies, "Ion Ionescu de la Brad" University of Life Sciences, 700490 Iasi, Romania

*Correspondence: antal_andreea97@yahoo.com

Producing high-quality, nutritious meals requires an understanding of how the environment, crop management, and other factors, particularly soil fertility, affect the composition and quality of food crops. This kind of research is essential in establishing genotypes that grow in particular circumstances as well as for comprehending the effects of production techniques on tomato crops. Tomato production, both in an organic and conventional system, are highly demand, in addition to being one of the most consumed foods after potatoes, they are also regarded as functional foods because of their significant benefits to human health and nutrition. In this context, the current study assesses the effectiveness of managing organic and conventional systems in greenhouse conditions on the quality and productivity characteristics of ten (LP ÷ LP10) distinguished tomato genotypes. For each genotype and cultivation method was measured and recorded the key yield parameters, such as the number of fruits per plant, fruit weight, and total yield per plot. We also highlight some morphological characteristics such as diameter and height of the fruits, total soluble solids, content of water, minerals, beta-carotene and lycopene, and titratable acidity. Total and soluble solids were significantly higher in organic tomatoes. Results from this study show that the same tomato cultivar exhibits significant differences in nutritional, qualitative, and quantitative factors depending on the genotype and its cultivation technique. Further research can conduct to an impact collateral of long-term organic vs. conventional cultivation on sustainability, or the genetic basis of fruit quality traits in different tomato genotypes an also, can help improve tomato production practices and support sustainable agriculture.

Keywords: carotenoids, genotype, chemical composition, fruit yield, growth

S10-P-IV-4

Study on the fruits of certain tomato varieties within the ICDIMPH germplasm fond- Horting

Bogdan Iordache[1], Marian Vintila[1], Cristina Vapor[1,2], Daniela Veringa[1], Andrei Sterian[1,2]

[1]*Institute of Research-Development for the Processing and Marketing of Horticultural Products – 'Horting', 5N Drumul Gilaului Street, District 4, Bucharest, Romania*

[2]*University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Avenue, District 1, Bucharest, Romania*

**Correspondence: ibogdan975@gmail.com*

The conducted research focused on the characterization of fruits collected from 23 tomato varieties, cultivated in protected spaces, within the germplasm fond of ICDIMPH - Horting. The applied cultivation technology was the same for all the considered variants. The fruits obtained on the three harvest dates were studied in terms of: weight and geometric dimensions; structural-textural firmness; dry matter content; mass of harvested fruit. The structural and textural firmness at harvest ranged from min. 2.7 (N) for variant V19 to max. 9.18 (N) for variant V4. The dry matter recorded a minimum value of 4^0R for variants V17 and V18 and a maximum value of 10^0R for variant V13. The average mass of harvested fruit ranged from 1.24 kg for variant V18 to 10.33 kg for variant V4. The measurement of fruit weights and geometric dimensions sought to determine the geometric shape of the fruit according to variety.

Keywords: tomatoes; mass of fruit; fruits formed; firmness

S10-P-IV-5

Quality attributes of sweet pepper varieties grown under different irrigation regimes and cultivation systems

Saad Masood Abd Elhawary[1,2], Jose Luis Ordóñez-Díaz[2], Jose Carlos Montenegro-Gómez[2], Jose Manuel Moreno-Rojas[2], Florentina Nicolaie[1], Alexandru Cojocaru[1], **Vasile Stoleru**[1]

[1]Department of Horticultural Technologies, Faculty of Horticulture, "Ion Ionescu de la Brad" University of Life Sciences, 3 M. Sadoveanu Alley, 700490 Iasi, Romania.

[2]Department of Agrifood Industry and Food Quality, Andalusian Institute of Agricultural and Fisheries Research and Training (IFAPA), Alameda del Obispo, Avda Menéndez Pidal s/n, 14004 Córdoba, Spain

**Correspondence: vstoleru@uaiasi.ro*

Sweet pepper is economically significant since they are widely grown and consumed around the world. As a high-value crop, they provide a substantial contribution to horticulture economy. They have a diverse market demand since they are used in a variety of culinary dishes, food processing, and as fresh product, all of which contribute to the agriculture industry's earnings. Sweet peppers are high in critical nutrients such as vitamins C, A, and B6. They contain antioxidants including carotenoids (particularly beta-carotene) and flavonoids, which help to reduce oxidative stress and promote overall health. These veggies are low in calories and high in nutritional fibre, making them ideal for a well-balanced and healthful diet. Sweet peppers have been linked to a variety of health advantages. By battling free radicals in the body, antioxidants help to reduce the risk of chronic diseases such as heart disease and some malignancies. The overall quality characteristics of sweet peppers can be impacted by the cultivation practices, such as organic or conventional. In this work, we evaluated the impact of different farming systems (organic and conventional) and irrigation regimes on three cultivars (Kornelia, Kaptur and Napoca). The results revealed a notable similarity in outcomes between the organic and conventional kinds. However, a slight but intriguing difference emerged, necessitating a full explanation of the nuances noticed. This research provides compelling insights into the impact of cultivation methodologies and irrigation systems on the quality attributes of sweet pepper varieties, shedding light on subtle differences that could significantly contribute to understanding optimal agricultural practices for improving vegetable quality and nutritional value.

Keywords: Sweet pepper; organic cultivation; conventional cultivation; irrigation system; antioxidant capacity; total phenolic content; pigments; tannin content

S10-P-IV-6

Sweet corn nutritional characteristics under farming technology

Saad Masood Abd Elhawary[1,2], Jose Luis Ordóñez-Díaz[2], Jose Carlos Montenegro-Gómez[2], Jose Manuel Moreno-Rojas[2], Razvan Hutuliac[1], Oana Raluca Rusu[1], Georgiana Radeanu[1], Cristina Precupeanu[1], Petru Liviu Nicorici[1], **Vasile Stoleru[1]**

[1]Department of Horticultural Technologies, Faculty of Horticulture, "Ion Ionescu de la Brad" University of Life Sciences, 3 M. Sadoveanu Alley, 700490 Iasi, Romania

[2]Department of Agrifood Industry and Food Quality, Andalusian Institute of Agricultural and Fisheries Research and Training (IFAPA), Alameda del Obispo, Avda Menéndez Pidal s/n, 14004 Córdoba, Spain

**Correspondence: vstoleru@uaiasi.ro*

Sweet corn is economically and nutritionally significant all over the world. In terms of economics, it is a staple crop utilized for human consumption. It is a good source of carbs, fibber, vitamins, and minerals, which contribute to a healthy diet and provide energy for both humans and livestock. Its adaptability and broad cultivation make it an important component of global food security and a variety of enterprises. This study examines the quality characteristics of three varieties of sweet corn grown under different farming systems. 35 samples were collected from the University of Life Sciences farm in Iasi, Romania. The farming procedures included the use of cutting-edge modern fertilization and irrigation systems, with samples classified as organic or conventional. The evaluation includes characteristics such as antioxidant activity as determined by ABTS and DPPH assays, total polyphenols, chlorophyll content (a and b), lycopene, and β-carotene, and tannin as well as the isotopic ratios of nitrogen and carbon. The results of the comparison investigation between organic and conventional types initially revealed a high degree of similarity. However, following closer inspection, a minor inconsistency arose, which necessitates a full explanation in this research study. This disparity will be thoroughly investigated, providing insights into the complex distinctions identified between these variations, despite their apparent similarity in early assessments. The findings of this study are important in determining the complex variations within sweet corn varieties grown using different farming and irrigation methods. The clarification of these distinctions is critical for improving agricultural techniques and enabling the cultivation of sweet corn with increased nutritional profiles and health benefits. This research adds a core understanding that can potentially impact future agricultural tactics, with the goal of optimizing the quality features of sweet corn and fostering sustainable farming practices.

Keywords: Sweet corn varieties, Farming systems, Antioxidant activity, Polyphenols, Chlorophyll content, Lycopene, β- Carotene.

S10-P-IV-7

Influence of ripening and storage conditions on the postharvest behaviour of 'Moneymaker' tomato

Adrian Chira, **Liliana Aurelia Bădulescu***, Elena Delian, Lenuța Chira, Elena Săvulescu

Faculty of Horticulture, University of Agronomical Sciences and Veterinary Medicine of Bucharest, Romania, 59 Mărăşti Blvd.

*Correspondence: liliana.badulescu@usamv.ro

The consumption of fresh tomatoes, both in Romania and worldwide, has an important place as far as the vegetable category is concerned. This paper presents the results of the studies carried out for the technological and economic characterization of the 'Moneymaker' tomato in the marketing process in fresh state. The duration of maintaining the quality depends on the ripening stage at harvesting and on the temperature during storage. The limit for the fresh fruit marketing is of 7-9 days at a temperature of 23-24 degree C and of 18-22 days at a temperature of 7-10 degree C. It was also as certained that over 97% of the output of the 'Moneymaker' tomato corresponds to the specific quality standard. The fruits harvested from greenhouse or plastic tunnel have a homogenous structure by quality categories, the value of quality category coefficient (Q) having values between 2.64 and 2.60.

Keywords: postharvest, storage period, quality preservation, economic

S10-P-IV-8

New trends regarding the improvement of the nutritional values of dehydrated apples

Bușterchi Ioana, Ciurlă Lucescu Liliana, Enache Iuliana-Maria, Tucaliuc Angela-Roxana, Patraș Antoanela Irimia, Liviu Mihai*

Iasi University of Life Sciences "Ion Ionescu de la Brad", Aleea Mihail Sadoveanu no. 3

*Correspondence: liviuirimia2005@yahoo.fr

Different preservation methods are used to extend the shelf life and maintain the nutritional value of fruits and vegetables. One of the oldest preservation methods is dehydration, because it is easy to do, safe, cheap and maintains a high percentage of the nutritional content of the products. The nutraceutical qualities of dried fruits are widely known and are given by the presence of organic acids, polyphenols, potassium, iron and copper, sugars and vitamins A, C, B2, B3, or B9. There is a variety of dehydrated fruits and vegetables in the trade, but the quality of some of them is low, which affects the demand, consumption and overall value of this group. The present study aimed to increase the nutritional value of dehydrated apples by including in the production technology some natural ingredients, such as fresh lemon juice, beetroot peel powder and cinnamon powder. The samples were analyzed from a physicochemical and sensory point of view, according to the experimental protocol. Dehydrated apple slices were highlighted by a high antioxidant activity (151.90 mMol TE g D.M.) due to the nutritional value of beet peel, lemon juice and cinnamon powder that contributed to obtaining the final product appreciated by consumers. Also, due to the increased content of vitamin C (44.88 mg/100 g product) and the balanced sweet and sour taste, the product represents a healthy and attractive alternative from a sensory point of view.

Key words: beetroot peel, cinnamon powder, sensory characteristics, quality.

S10-P-IV-9

Research on the first Kumato tomato variety bred in Romania at BRGV Buzău

Camelia Bratu[1]*, Costel Vînătoru[1], Bianca Muşat[1], Gianina Negosanu[1], Rodica-Mihaela Dinica[2]

[1]*Plant Genetic Resources Bank for Vegetables, Floriculture, Aromatic and Medicinal Plants, Buzau-Romania*

[2] *Dunarea de Jos" University of Galati*

*Correspondence:cameliaboteabratu@gmail.com

The first Kumato tomato variety in Romania was obtained at BRGV Buzău and is in the process of being approved and patented under the provisional name Rapsodia. Although most of the hybrids carried out at BRGV Buzău were intraspecific, this variety was obtained by interspecific hybridization. The plants show indeterminate growth and can reach a height of 210 cm and form more than 8-10 inflorescences. The leaves are compound imparipinate, formed of small leaflets. The average leaf length is 35 cm. Inflorescences are forked and compound, with more than 15 fruits per inflorescence. The variety is distinguished by its tricolor, green fruit with light green and yellow stripes when the fruit is immature, and red stripes with green and golden yellow when ripe, with a specific aroma and a special taste. The average fruit weight is 20 g. The fruit has a characteristic gloss, high firmness of 2.8 N, and concentrated ripening, allowing both individual fruit and the entire inflorescence to be harvested. The fruit has a diameter of 3.5 cm and an average height of 3.6 cm. In cross-section, the fruit has 2 loci and a pericarp thickness of 5.5 mm. The variety can be grown both in protected areas and in the field in a palisade system. It is intended for fresh consumption, in salads, or various culinary preparations, with a balanced sugar: acidity ratio, total soluble substances being 11.8° Brix.

Keywords: *Solanum lycopersicum*, Rapsodia, genebank, genotypes, hybridization

S10-P-IV-10

Correlation of the ability to maintain cabbage quality with some technological, physiological and biochemical quality indicators

Marian Bogoescu, Nicole Petculescu, Ioan Burzo

Academy of Agricultural and Forestry Sciences Bucharest, Romania

*Correspondence: nicole.petculescu@asas.ro

The research carried out in the period 2017-2020 at the Institute for Research and Development for the Industrialization and Marketing of Horticultural Products, followed the evolution of some quality indicators in the growth and maturation process of autumn white cabbage, respectively the most widespread cultivar in Romania "De Buzău", correlated with the time of harvesting, to record total losses as low as possible in the process of keeping under refrigeration conditions. For this purpose, the main quality indicators, technological and physiological-biochemical, were determined in dynamics at four times of harvesting, as follows: respiratory intensity, peroxidase activity, chlorophyll content, electrical conductivity, the permeability of cell membranes in juice, soluble carbohydrates, titratable acidity, carbohydrate ratio /acidity and the specific weight of the heads of cabbage, so that after 160 days of storage under refrigeration conditions, to be registered the lowest total losses.

Keywords: storage, refrigeration, quality indicators, white autumn cabbage

S10-P-IV-11

Selection of cherry, peach, and nectarine biotypes based on fruit quality indicators for the diversification of fruit trees collections

Mihaela Iordachescu[1], Corina Gavat[2], Silvia Nicolae[3], Mihai Chivu[3], Gheorghe Lamureanu[3], Adelina Stan[3]

[1]*Research Center for Study of Food Quality and Agricultural Products, University of Agronomical Sciences and Veterinary Medicine of Bucharest, Romania*

[2]*Research Station Valu lui Traian, Romania*

[3]*Research Institute For Fruit Growing Pitesti, Romania, Maracineni, Romania*

*****Correspondence: mihaela.iordachescu@qlab.usamv.ro

Nowadays, sweet cherries, peaches, and nectarines are valued for their nutritional content, diverse flavours, culinary versatility, economic impact, and contribution to job creation and sustainable agriculture. To create new varieties adapted environmental conditions, plant breeders need to identify and select biotypes resistant to limiting factors, of moderate or low vigour, early or late ripening, with increased productivity and superior fruit quality. Additional characteristics of each studied species, such as natural fertility, beginning and end of flowering, harvest maturity, duration of the vegetation period, should also be taken under consideration. Present work analysed 15 biotypes, five for sweet cherry, six for peach and four for nectarine, to select promising biotypes that would increase the diversity of fruit trees collections and be used in breeding programs. For sweet cherries, the determinations were made between 2018 and 2020 in a competition microculture at Research Institute for Fruit Growing Pitești-Mărăcineni, Romania. Sweet cherries under study are grafted on mahaleb rootstock planted in 2010. Peaches and nectarines analysed are hybrids resulting from seeds planted in 2014 at Research Station for Fruit Growing Constanța, Romania, and observations were made between 2020 and 2022 at SCDP Constanța. Sweet cherry fruit quality indicators analysed were average weight, calibre, pulp firmness, soluble dry matter, pH, acidity, and colour. Peach and nectarine fruit quality indicators analysed included fruit size, skin and pulp colour, consistency, juiciness, aroma and taste, pit size, easy detachment from pulp, dry matter content, and total acidity. For cherries the biotype HC 7/34 stands out for fruit quality, for nectarines noteworthy biotypes are HST R7P15 and R3P2 with very late fruit ripening, and for peach the VTR4P1 biotype with medium fruit ripening showed promising fruit quality indicators.

Keywords: *P. avium*, *P. persica*, hybrids, fruit quality.

S10-P-IV-12

Some aspects regarding the storage of some varieties of carrots

Daniela Veringă, Lucian Ionel Dumitrescu, Mariana Toma, Angela Mohora, Lucian Iliescu

Institute for Research, Development, Industrialization and Marketing of Horticultural Products, HORTING, Bucharest, Romania

*Correspondence: veringa.daniela@yahoo.com

This paper aims to establish the influence of the variety and storage conditions on the storage capacity of carrots. The results obtained in 2018 with three varieties of carrots furnished by ICDLF Vidra and stored at Horting Institute of Bucharest, under different temperatures are presented, as follows: 20-22°C (ambient storage), 10-12°C (refrigeration storage) and 3-5°C (cold storage). The initial values and evolution during storage of the main biochemical indicators of carrots were determined: total soluble solids, titratable acidity, total sugar and vitamin C. After storage, total and mass losses, as well as spoilage loss were determined.

Key words: biochemical indicators, carrot, quality maintaining, storage conditions

S10-P-IV-13

Comparative study: freeze-drying vs. freezing for long-term storage of organic Regina cv. strawberries

Andrei Cătălin Petre, **Mihai Frîncu**, Andreea Barbu*, Violeta Ion, Liliana Aurelia Bădulescu

Research Center for Studies of Food Quality and Agricultural Products, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania

*Correspondence: andreea.stan@qlab.usamv.ro

Strawberries are a valuable source of nutrients and antioxidant compounds. There is an increasing interest in organic fruit production; therefore, strawberries grown in these systems are becoming increasingly popular due to the absence of harmful chemicals and pesticides. Strawberries, being seasonal fruits with delicate skin and soft flesh, typically have a limited shelf-life of approximately 7 days. Given their perishable nature, there is a demand for novel long-term storage methods without compromising their nutritional qualities. This study aims to investigate the effectiveness of storing 'Regina' cultivar strawberries under two conditions: freeze-dried and frozen at -80 °C. Prior to analysis, the frozen samples have been freeze-dried so that they could be analyzed in the same conditions. The analysis was performed at harvested (before processing and storage) and at 2, 4, 6, 8, 10, and 12 months after harvesting. The results obtained indicated that both storage conditions yielded comparable results regarding the pH, total titratable acidity (TTA), dry matter content (DM), ascorbic acid content, total phenolic content (TPC), and antioxidant activity (AA) of organic strawberries over the 12-month study period. Specifically, it was observed that the freeze-drying storage method (22.90 mg GAE/g DM for TPC, 144.35 mg Trolox/g DM for AA) presented similar efficiency to storage at -80 °C (21.15 mg GAE/g DM for TPC, 125.93 mg Trolox/g DM for AA) after 12 months. Differences in ascorbic acid content appeared after 12 months, with freeze-drying storage registering a total amount of 3.35 mg ascorbic acid/g DM, compared to 5.03 mg ascorbic acid/g DM for storage at -80 °C. These findings suggest that freeze-drying and storage in freeze-dried form represent a more economical and practical alternative for long-term storage of organic strawberries compared to storage at low temperature (-80 °C) followed by periodic freeze-drying. These conclusions could be valuable for the organic food industry in their efforts to develop efficient and cost-effective storage strategies for their products.

Keywords: organic, strawberries, long-term storage, nutritional composition, quality assessment

S10-P-IV-14

Biochemical comparison of pawpaw (*Asimina triloba* L. Dunal) fruits from several genotypes over five years

Andrei Florin Tabacu, Ioana Mihaela Mihalcioiu, Luis Olteanu, Ana Cornelia Butcaru, Florin Stanică

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59, Marasti blvd, Bucharest, Romania

*Correspondence: tabacuflorin11@gmail.com

Pawpaw (*Asimina triloba* L. Dunal) is a species with great potential for fruit growing in Romania. These species have been studied at the Faculty of Horticulture in Bucharest for over 20 years. During these years, the pawpaw plantations within the faculty expanded with new varieties and a field of hybrids. These years of research concluded with the homologation of the first Romanian cultivars of pawpaw: Artemis, Asirius, and Asteria. This article aims to present the results in characterizing fruits from a biochemical point of view from genotypes in the didactic field of the Faculty of Horticulture. The data comparison was made for five years. The rate of sugars, glucose, fructose, total dry matter, and acidity were compared. Cluster analysis was used for similarities between genotypes.

Keywords: *Artemis*, *Asirius*, *Asteria*, quality, sugars, acidity

S10-P-IV-15

Primary metabolites in the fruits of plum cultivars grown in Western Serbia

Paunović, S. M.[1], Mira Milinković, M[2], Karaklajić-Stajić, Z[1], Tomić, J[1] and Rilak, B.[1]

[1]*Fruit Research Institute, Čačak, Republic of Serbia*

[2]*Institute of Soil Science, Belgrade, Republic of Serbia*

*Correspondence: svetlana23869@gmail.com

The objective of this study was to examine the content of the primary metabolites (soluble solids, total sugars, invert sugars, proteins, sucrose, titratable acidity and pH) in the fruits of 10 introduced plum cultivars ('Katinka', 'Opal', 'Viktorija', 'Hanita', 'Jubileum', 'Valor', 'Stanley', 'Jojo', 'Presenta and 'Tegera'), 13 plum cultivars developed in a breeding program at the Fruit Research Institute, Čačak ('Čačanska Rana', 'Boranka', 'Čačanska Lepotica' 'Valerija', 'Timočanka', 'Čačanska Najbolja', 'Zlatka', 'Valjevka', 'Mildora', 'Nada', 'Krina', 'Pozna Plava' and 'Čačanska Rodna') and myrobalan plum (*Prunus cerasifera* Ehrh.). In the present results, significant differences were observed in the biosynthesis of primary metabolites between fruits from the various cultivars. The synthesis of soluble solids was the most intensive in the fruit of cultivar 'Mildora' (23.97%), and the lowest in *Prunus cerasifera* (12.15%). The highest values of total sugars (14.25%) and pH (4.18), and the lowest level of titratable acidity (0.49%) were also recorded in 'Mildora', while the highest level of invert sugars was determined in 'Krina' (9.51%) and 'Hanita' (9.45%). The difference between the cultivars exhibiting the highest and the lowest in the content of proteins was 1.89-fold, while the difference in the sucrose contents was 2.89-fold. Generally, the highest protein content was found in myrobalan plum (1.15%), and sucrose in 'Stanley' (5.54%) and 'Mildora' (5.49%). The present results showed that tested cultivars are rich in primary metabolites and the genetic background of cultivars is an important factor in determining the composition and content of primary compounds in plum fruits.

Keywords: *Prunus domestica* L., cultivar, chemical properties

S10-P-IV-16

Influence of preservation methods on Romanian pawpaw, jujube, and kiwifruits quality parameters

Elena Gabriela Stan, Lavinia Udrea Iliescu, Florin Stanică

University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, 59, Marasti blvd

**Correspondence: stanelenagabriela@yahoo.ro*

The aim of this study was to investigated the influence of various preservation methods on the quality parameters of three Romanian new fruit species: pawpaw, jujube and kiwifruits. The methods investigated include freezing, dehydration and lyophilization, aiming to transform perishable fruits into stable products for extended storage and availability throughout the year, even out of season. Research indicate that freezing emerges as the most effective preservation method for asimina fruits, while dehydration proves optimal for jujubes. Interestingly, both freezing and lyophilization demonstrate effectiveness for preserving kiwi fruits. Importantly, none of the three storage methods exhibit negative influences on the fruit's quality parameters.

Keywords: dehydration, freezing, fruit, lyophilization, storage

S10-P-IV-17

Comparative study of jujube fruits (*Ziziphus jujuba* Mill.) pericarp textural parameters

Laura Pop (Carpescu)[1], Florin Stanică[1], Ana Butcaru[1], Andreia Chitimia[1], Adrian Asănică[1], Stelian Cristea[1], Dana Tapaloaga[1] and Liliana Tudoreanu[1,2]

[1]*University of Agronomic Sciences and Veterinary Medicine of Bucharest, Bucharest, Romania*

[2]*Interdisciplinary Laboratory for Heavy Metals Accumulation in the Food Chain and Modelling, Department of Animal Production and Public Health, Faculty of Veterinary Medicine Bucharest, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Bucharest, Romania*

**Correspondence: laurapop_22@yahoo.com*

Ziziphus jujuba fruits are delicious and highly nutritional with large health benefits. In the experimental orchard of the USAMV Bucharest several jujube cultivars were evaluated: Xuan Chen Jiang Zao, Hongan, Dong Zao (V2), Ping Zao, R1P6 Yu-Jiao, Hu Ping Zao, Dong Zao (V1), which differ in shape and fruits size. Jujube fruits are known to have a short shelf-life (up to 10 days in non-controlled environment). The consumption period can be extended through processing, drying being the most common method. One of the main problems in consumer acceptance for jujube fruits is the thin pericarp hardness. The present research presents the results on testing some jujube cultivars pericarp hardness in order to identify the cultivar with the lowest skin/pericarp hardness which can be the mostly appreciated by consumers. Although the dried fruits for each cultivars presented large pericarp hardness variability, the jujube cultivars had significantly different pericarp hardness (P = 0.000003), the lowest hardness was observed for the Hu Ping Zao cultivar (0.7699+/- 0.3323N). We believe that Hu Ping Zao cultivar will be mostly appreciated by consumers for its softness.

Keywords: dried jujube, pericarp hardness, consumer acceptance

POSTER SESSION V:

POSTHARVEST MANAGEMENT (TECHNICAL, ECONOMIC AND ADMINISTRATIVE ISSUES)

S10-P-V-1

Dry lenticel rot – an emerging postharvest disease on apples in Northern Italy

Stefanie Maria Primisser, Sabine Oettl

Josef-Daney 15, 39028 Silandro, Italy;

Laimburg 6, Pfatten Vadena, 39040 Bolzano, Italy

*Correspondence: *stefaniemaria.primisser@laimburg.it*

The initial occurrence of symptoms associated with dry lenticel rot, also known as Ramularia spots, was observed in 2012 within two northern Italian regions—South Tyrol and Piedmont. Unlike in the field where the fungal infection remains asymptomatic, the disease has been observed on apples after long-term conservation in the cold storage. However, since 2017, incidence of dry lenticel rot has been increasing in both regions and, recently, occurrence of similar symptoms has been reported from other apple growing areas in Austria and France. Molecular analysis based on several genetic loci identified Ramularia mali as causative agent of this postharvest disease in South Tyrol. First epidemiological studies by means of real-time PCR were performed to elucidate the occurrence of the fungus within the apple orchards. This study contributes to an enhanced comprehension of the Ramularia spp.-apple pathosystem, and, in turn, might serve as the foundation to develop targeted containment measures in the affected orchards.

Keywords: dry lenticel rot, post-harvest, apple pathogen

S10-P-V-2

Thermal treatments applied to bean seeds

Eliza Teodorescu, Barcanu, E., Manea, V.

Vegetable Research and Development Station Buzău, Romania

**Correspondence: teodorescu.eliza@gmail.com*

In Romania, bean weevil (*Acanthoscelides obtectus* Say) represents a great danger in what it concerns bean seeds, the pest presenting a high degree of specialization toward this species. In 2020, the bean germplasm collection (over 450 accessions) from Vegetable Research and Development Station (V.R.D.S.) Buzău had been heat treated and dried at 60°C for 3 days, having great results in what it concerns pest control (bean weevil). In 2022, there were cultivated 22 accessions – which were protected by the same treatment. For this study there were selected the seeds of 10 accessions. The main objective of this paper it was the comparative study of *Acanthoscelides obtectus* Say in various development stages, after the seeds that have been kept for 3 days at different temperatures (-20°C, 60°C, 80°C and 100°C). The control variant was represented by untreated seeds (chemical, thermic or physical – inert materials). Under laboratory conditions, the emergence was ~100% for all the seeds kept at -20°C, and 0% for the seeds kept at 100°C. In what it concerns V2 and V4 there was observed an 100% emergence at 60°C, 80°C and -20°C temperatures.

Keywords: *Acanthoscelides obtectus* (Say), bean seeds, *Phaseolus vulgaris* L., dry thermal treatment

S10-P-V-3

Pre and post storage dynamics of apple surface microbial communities

Larisa Gustavsson[1], Marina Kuzmenkova[1], Samrat Ghosh[1], Firuz Odilbekov[2], Ramesh Vetukuri[1]

[1]Department of Plant Breeding, Swedish University of Agricultural Sciences, Alnarp, Sweden

[2]Lantmännen, Stockholm, Sweden

**Correspondence: larisa.gustavsson@slu.se*

Apple, an important fruit crop globally, makes a vital contribution to Sweden's fruit industry, but it only fulfills less than 30% of the domestic demand with local produce. This study focuses on the apple microbiota, which, aside from well-studied pathogens, remains largely unexplored, especially concerning how its dynamics are influenced by cultivar, environmental factors and cropping system. We investigated the microbial communities on the surfaces of three commercially important apple cultivars ('Aroma,' 'Frida,' and 'Santana') from conventional orchards, and two of them ('Aroma' and 'Frida', designated as 'Aroma-Krav' and 'Frida-Krav') - from organic orchards in southern Sweden. Using an amplicon-based metagenomic approach, temporal changes were examined in the microbiota at harvest, post-storage and after shelf life. Overall, 856 bacterial and 1475 fungal amplicon sequence variants (ASVs) were detected. The leading genera among the bacterial community were *Sphingomonas* and *Pseudomonas* and among fungi *Cladosporium, Aureobasidium* and *Vishniacozyma* regardless of the specific storage conditions and cultivar. These dominant microbes constituted the core microbiome. Different storage conditions caused variations in the community composition. However, diversity analyses indicated no significant differences in microbial communities across different storage stages. In contrast, variety-specific variations were significant. This comprehensive profiling of the apple microbiome in Sweden has practical implications. Understanding the microbiome composition may aid growers to implement measures to mitigate damage and enhance economic efficiency. Additionally, this research paves the way for developing synthetic microbial communities for improved disease management in apple production.

Keywords: *Malus domestica*, microbiome, apple fruit, postharvest

S10-P-V-4

Uses of mineral oils from commercial formulas in controlling oriental fruit fly (*Bactrocera dorsalis* (Hendel)) and Mealybug (*Pseudococcus jackbeardsleyi* Bimpel&Miller)

Jarongsak Pumnuan*, Thanaporn Doungnapa, Anuwat Lakyat, Kamronwit Thipmanee

School of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand

*Correspondence: jarongsak.pu@kmitl.ac.th

Effectiveness of mineral oils (MOs) from commercial formulas, the petroleum oil (PO: 83.9% EC, reccomened dose at 0.26%) and white oil (WO: 67% EC, reccomened dose at 0.34%) in controlling insect pest of fruit tree in laboratory conditions was evaluated. The insecticidal propoties of those MOs were tested against the oriental fruit fly (*Bactrocera dorsalis* (Hendel)) in form of oviposition inhibition occuring in mango fruit, whie the killing activity was tested to mealybug (*Pseudococcus jackbeardsleyi* Bimpel&Miller) on okra fruit. All tests of MOs were presented at the concentration of 0.2, 0,4 and 0.6% to compare with chemical insecticides (CIs; positive control), mixere of MOs and CIs, and water (negative control). The CIs used for oriental fruit fly was malathaion insecticide (MI; 83% EC, reccomened dose at 0.17%), while for mealybug was triazophos insecticide (TI; 40% EC, reccomened dose at 0.08%). The experimental design was completely randomized, with three replicates. The result demonstrated that all treatments of MOs showed highly oviposition inhibition to oriental fruit fly with significantly different compared with positive and negative controls. Remarkably result of MI that could completely control the fruit fly. As for test to mealybug, MOs had low effect to this insect (< 25% at 0.4% MOs). Beside, 0.1% of TI was moderately effective in controlling the mealybug, showed < 65% mortality. Interestingly the TI had higher effect when mixed with MOs, as 0.1% of TI mixed with 0.2% of MOs could control the mealbug up to 90% at 24 hrs.

Keywords: mineral oil, petroleum oil, white oil, insecticidal, oviposition inhibition

S10-P-V-5

A mobile tool for postharvest treatment and preservation of bananas using ozone

Frédéric Violleau[1], Cyndel Berger[2], Marielle Pagès-Homs[3], Léa Volmerange[2], Pierre Brat[4], Joel Grabulos[4], Alain Normand[5], Luc De Lapeyre de Bellaire[6], Sylvain Gerbaud[7], Olivier Hubert[4], Victoria Bancal[4], Aurélien Pugeaux[5]

[1]*Ecole d'Ingénieurs de Purpan, 75 voie du Toec, 31076 Toulouse, France*

[2]*Plateform TOAsT, University of Toulouse, INP-PURPAN, 31076 Toulouse, France*

[3]*Plant Physiology, Pathology and Genetics, University of Toulouse, INP-PURPAN, 31076 Toulouse, France*

[4]*UMR- Qualisud, Dpt Persyst Qualisud, Univ Montpellier, Avignon University, CIRAD, Institut Agro, IRD, University of Reunion, 34398 Montpellier, France*

[5]*Compagnie Fruitière, 33 Bd Ferdinand de Lesseps, 13014 Marseille, France*

[6]*GECO, Univ Montpellier, CIRAD, 34398 Montpellier, France*

[7]*Absoger, 82100 Les Barthes, France*

*Correspondence: frederic.violleau@purpan.fr

Because of its oxidizing and antimicrobial properties and its low persistence, ozone is an interesting alternative to conventional plant protection products. It can be used for preserving fruits in an ozonated atmosphere and in post-harvest treatment. The TOAsT platform team (Oxidative technologies applied to agriculture and agrifood in Toulouse), through the ATMOZFR project, has built a laboratory in a container to study this subject on different fruits such as banana. It is equipped with a cold room with four independent modules for which it is possible to regulate oxygen (O2), carbon dioxide (CO2) and ozone (O3). An on-board technical room allows the generation and control of the different gases. In addition, there is a laboratory part composed of a skid for the treatment of fruits with ozonated water or ozone gas for quick applications. Finally, a module allows the water treatment by ultrafiltration combined with ozone in conditioning stations. This tool is quasi autonomous since it only needs to be connected to water and electricity. It is mobile and navigable in order to be installed as close as possible to the needs. Within the framework of the ATMOZFR project, this container was sent and installed in Ivory Coast in a banana plantation to carry out tests directly after harvest. The aim is to study the possibility of using ozone in post-harvest treatment and during the transport of bananas to improve their preservation and extend their green life. First results showed a 40% reduction in crown rot of banana artificially inoculated with Colletotrichum musae during storage in an ozonated atmosphere. Furthermore, ozonated water treatments appear to extend the green life of fruits.

Keywords: ozone gas, ozonated water, container, crown-rot of banana

S10-P-V-6

The influence of storage conditions on quality of oilseeds and crude oil

Ramona Capruciu, Daniela Dolores Cichi

[1]*Faculty of Horticulture, University of Craiova, Romania*

*Correspondence: ramonacapruciu@yahoo.com

The improper storage conditions of oilseeds are responsible for significant quantitative and qualitative losses. The study consists in establishing the quality of sunflower oil from seeds with different physico-chemical characteristics given by improper storage conditions (temperature and humidity) as well as find the most effective methods of obtaining in this context. The seeds were stored in rooms with different temperature (20°C and 40°C) and different relative air humidity (20%, 40% and 60% respectively) for a storage period of 4 months, the samples being taken and analyzed from two in two months. In this sense, the main physico-chemical characteristics of the batch of sunflower seeds studied (moisture (% max.), the germination grad of seeds and oil content) were monitored. From the oil obtained by pressing, it was determined: relative density (g/cm3 at 200C), moisture (% max.) and free acidity (% oleic acid). This study is valuable and could be applied to horticultural oilseeds like pumpkin seeds, grape seeds, walnuts, hazelnuts, almonds, etc.

Keywords: quality, storage condition, oilseeds, physico-chemical characteristics, crude sunflower oil

S10-P-V-7

Changes in physico-chemical and sensory properties of cider enriched with grape marc

Mirabela Ioana Lupu[1,*], Alina Maier[1], Cristina Maria Canja[1], Geronimo Raducu Brănescu[1], Vasile Pădureanu[1], Oana Crina Bujor[2]

[1]*Food and Tourism Faculty, Transilvania University of Brasov, Romania,*

[2]*Research Center for Studies of Food Quality and Agricultural Products, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania*

*Correspondence: lupu.mirabela@unitbv.ro

Sustainability is the challenge facing the food business going forward, a subject that has garnered a lot of attention lately. One of the numerous strategies advocated to support the establishment of a sustainable food system is the recovery, recycling, and valuation of food by-products. Fruits and vegetables are the most plentiful sources of bioactive compounds and by-products that can be utilized to make novel functional food ingredients. This paper assessed the viability of employing wine industry by-products. One of the by-products generated during the wine-making process, grape marc, is usually not used. The aim of this study was to evaluate the quality and sensory parameters of apple cider (Jonathan) enriched with the addition of 2%, 3%, and 4% grape marc, respectively. In comparison with the control samples, the bioactive compounds (total phenolic content) and sensory attributes of the enriched products were studied, as well as acidity, density, soluble content, turbidity, and pH. All analyses were performed at different time intervals: 2 hours, 24 hours, and 10 days. Overall, the results showed that the addition of grape by-products to apple cider enhanced its bioactive compounds, chromatic characteristics and turbidity without lowering consumer acceptance. According to the sensory analysis, the ciders without pomace and with 2% grape marc were the most appreciated, since the grape marc aroma was much more intense in the other samples. It is conceivable to draw the conclusion that these instances could act as a springboard for making use of industrial waste and creating livable food with advantageous qualities in a more sustainable way.

Keywords: cider, sustainability, grape marc, bioactive compounds, sensory analysis

S10-P-V-8

The potential of Jerusalem artichoke (*Helianthus tuberosus* L.) as a component of canned vegetables

Lucian Ionel Dumitrescu*, Daniela Veringă, Simona Popescu, Cristina Vapor, Andrei Sterian

HORTING Institute for Research, Development, Industrialization and Marketing of Horticultural Products, Bucharest, Romania

*Correspondence: lucian.dumitrescu59@gmail.com

Producing a wide range of food products based on vegetables can reduce risk and increase food security. Diversified diets based on a range of crop species are essential for nutritional security. Vegetables are an excellent source of vitamins and micronutrients; increasing vegetable consumption can help alleviate malnutrition in unbalanced diets wherever it occurs, in both developing and developed countries. Currently, Jerusalem artichoke is grown mainly for the production of inulin, used as a dietary fibre in food manufacturing, although chicory is the main crop for inulin production. Inulin is a linear polysaccharide consisting of β(2 → 1)-linked D-fructose which is terminated by a D-glucose molecule linked to fructose by a β(2 → 1) linkage. In addition to being a dietary fibre, inulin has prebiotic effects by stimulating the activity and growth of beneficial intestinal bacteria in the colon. In addition to inulin, Jerusalem artichoke contains proteins (lysine, histidine, cystine, ascorbic acid, tryptophan) and enzymes (inulinase, proteinases). At the HORTING institute, a product based on Jerusalem artichoke puree mixed with a vegetable sauce has been developed which meets the body's energetic, plastic and catalytic requirements and provides a supply of calorific nutrients, targeting a broad segment of consumers.

Keywords: culture, ground apple, puree, processing, nutrition.

S10-P-V-9

Chestnut post-harvest by-products: the case of episperm as an innovative agri-food source of phenolic compounds for human health

Dario Donno[1,2], Federica Turrini[3], Emanuele Farinini[3], Maria Gabriella Mellano[1,2], Raffaella Boggia[3], Gabriele Loris Beccaro[1,2], **Giovanni Gamba**[1,2*]

[1] *Department of Agricultural, Forest and Food Sciences, University of Turin, Italy*

[2] *Chestnut R&D Center – Piemonte. Chiusa di Pesio (CN). Italy*

[3] *Department of Pharmacy. University of Genoa. Genoa, Italy*

*Correspondence: giovanni.gamba@unito.it

Chestnut processing has increasingly grown in the last few years. High levels of by-products with several disposal issues and environmental impacts are involved in the Castanea spp. nut post-harvest supply chain. For example, chestnut processing produces a high number of episperm, an agri-food processing by-product that may be considered an excellent source for the extraction of health-promoting compounds, such as phenolics. This study developed a sustainable protocol for the extraction of the main polyphenols from chestnut episperm (cv Marsol, C. sativa × C. crenata) by ultrasounds. The polyphenolic characterization of different extracts was performed using high-performance liquid chromatography (HPLC) to i) define the amounts of specific phenolic compounds selected for their healthy properties and ii) evaluate some important features, such as the antioxidant capacity. Total polyphenolic content (TPC) ranged between 90 and 150 mg GAE/g of dried weight (DW). Moreover, the Ferric Reducing Antioxidant Power (FRAP) assay confirmed the great TPC levels, highlighting that all the extracts contained excellent amounts of substances with antioxidant properties (about 470–515 mmol Fe2+/Kg of dried weight for the best extracts). The proposed protocol allowed for obtaining preparations characterized by high amounts of castalagin (20–80 mg/100 g DW), chlorogenic acid (15–25 mg/100 g DW), vescalagin (40–75 mg/100 g), and ferulic acid (80–120 mg/100 g DW). This study showed the potential of chestnut episperm as an innovative source of phenolics to be extracted by sustainable technologies and utilised in pharmaceutical and/or food applications to valorise a low-impact reuse strategy of agri-food wastes and reduce the environmental impacts.

Keywords: agri-food post-harvest wastes; *Castanea* spp.; sustainable extraction; phenolics; HPLC

S10-P-V-10

Research on genes identification for antiseptic action in some basil genotypes

Madalin Vasile Chiouaru, Maria Adochitei, Ioana Klee, **Ligia Ion**, Liliana Aurelia Bădulescu

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59, Marasti blvd., Bucharest, Romania

**Correspondence: ionnagyligia@yahoo.fr*

The results and speed of response obtained by applying phenotypic selection depended, among other factors, on the possibility of distinguishing and capitalizing the genetic variations, taking into account the fact that the most important characters are polygenic and therefore strongly influenced by the environment. The PCR method allowed rapid screening in populations of 100 individuals. For this, the quality and quantity of genomic DNA is important. DNA isolation methods have as basic criteria the purity, integrity and quantity of DNA obtained. DNA purity has been demonstrated to be one of the most important factors in the reproducibility of the RAPD method. The use of DNA template with a high purity ensures reproducibility by the RAPD method. These methods aim at the elimination of polyphenols and polysaccharides that determine the isolation of some DNA extracts with a brown color, inaccessible to restriction enzymes. The genomic DNA isolated from the basil genotypes, “Aromat de Buzau”, “BZ 1”, “Hofigal 2”, “Geea”, “LBRS 2”, “LBVS 1”, was used to test two types of molecular marker SSR and RADP to highlight the genes that controls antiseptic action. The most effective remains the SSR method.

Keywords: PCR, DNA genomic, genotypes, genes, basil

S10-P-V-11

The integration of apple peels into sourdough for bread production

Florin Daniel Lipșa[1], **Otilia Cristina Murariu**[*1], Anca Calistru[*2], Alessio Vincenz Tallarita[*3], Petru M. Cârlescu[1], Florin Murariu[1], Anca Tulbure[4], Gianluca Caruso[3]

[1]*Department of Food Technology, "Ion Ionescu de la Brad" University of Life Sciences, Iasi, Romania*

[2]*Department of Pedotechnics, Ion Ionescu de la Brad Iasi University of Life Sciences, Romania*

[3]*Department of Agricultural Sciences, University of Naples Federico II, Portici, Italy*

[4]*Department of Food Industry and Environmental Protection, Lucian Blaga University of Sibiu, Romania*

*Correspondence: anca.calistru@iuls.ro, alessiovincenzo.tallarita@unina.it

The valorization of industrial apple by-products is important to decrease the volume of food waste addressed to landfills but also to obtain an economic added value, achieving beneficial effects for the environment and economy. The present research is aimed to obtain sourdough naturally from the fermentation of the by-products resulting from the industrial processing of apples of the Idared, JonaPride and JonaGold varieties and to identify sustainable solutions regarding their use in various quality bakery products under a circulary economy perspective. The experimental protocol was based on the comparison between sourdough with and without (control) fruit peel addition per each of the 3 apple cultivars used (Idared, JonaPride and JonaGold), to assess their effects on the chemical, porosity, colour and rheological characteristics of bread. Total and open porosity were significantly higher in the control treatments compared to the peel application, while the number of closed pores and closed porosity depended on both yeast type and cultivar. The addition of peels associated to yeast 1–Idared and yeast 2–JonaPride had a positive effect on the bread acidity and colour component 'a'. The apple residue utilization represents an interesting strategy to valorize the waste, producing a positive impact in terms of environmental and economic sustainability, in compliance with the circular economy concept.

Keywords: *Malus domestica* Borkh, sourdough bread, porosity, mineral profile, textural properties.

S10-P-V-12

Durian waste processing and its influence on product quality

Sineenart Polyorach[1]*, Nahathai Vijitrothai[1], Vongprasith Chanthakhoun[2], Chunya Kongrith[1] and Luepong Luenam[3]

[1]Department of Animal Production Technology and Fisheries, Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520

[2]Department of Animal Science, Faculty of Agriculture and Forest Resource, Souphanouvong University, Laos.

[3]Scool of Agricultural technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520

**Correspondence: sineenart.po@kmitl.ac.th*

The purpose of this experiment was to develop a high-quality animal feed product from Durian waste using microorganisms. A completely randomized trial (CRD) was planned to study the solid-state fermentation periods of 0, 1, 2, 3, 4, and 5 days. Three replicates of the study were performed. It was found that fermentation periods affected the physical characteristics, microbial populations, and chemical composition of products, and the optimal period was 3 days for the highest crude protein content (30.6% CP), optimal smell, color, and pH (2.6, 3.8, and 4.95, respectively). In addition, this could improve lactic acid bacteria (4.5×10^6 cells/ml) and yeast (8.9×10^5 cells/ml) populations. In conclusion, durian waste could be improved by using microorganisms as high-quality feed for animals.

Keywords: durian-waste, microorganism, high quality feed products, agricultural by-products