5TH INTERNATIONAL SCIENTIFIC CONFERENCE

CHALLENGES IN TEMPERATE CLIMATE. SUSTAINABLE HORTICULTURE: FROM PLANT TO PRODUCT

Organized and hosted

INSTITUTE OF HORTICULTURE

20–22 August, 2025, Riga

SCIENTIFIC PROGRAM AND BOOK OF ABSTRACTS

SCIENTIFIC PROGRAM AND BOOK OF ABSTRACTS

SCIENTIFIC COMMITEE:

ORGANIZING COMMITEE:

SECRETARY:

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Sustainable Practices in Vegetable Production and Advacements in Knowledge for Smart Farming and Plant Protection

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15:00 – 15:05	**E. Rubauskis:** Influence of inorganic substances and the orchard systems on apple scab incidence
15:05 – 15:10	**L. Lepse:** Influence of substrate on vegetable biochemical content in urban gardening system
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15:25 – 15:30	**D. Siliņa:** The effect of cultivation technology on blueberry pollination
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Biodiversity and Innovations in Horticultural Crop Breeding	
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19:00	Bus to the Social dinner, departs from the Wellton Riverside SPA Hotel
19:30	Guided Tour of the University of Latvia Botanical Garden (https://www.botanika.lu.lv/en/)
20:30-22:00	Social dinner, at the Botanical Garden, University of Latvia
22:00	Bus departure to the Wellton Riverside SPA Hotel

Thursday, August 21

8:30 – 8:35	Welcome Day 2
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8:35 – 9:15	**H. Flachowsky:** Status, difficulties and visions for improwing resilience in apple cultivation by breeding resistant varieties
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9:30 – 9:45	**B. Frercks:** Molecular identification and phylogenetic analysis of promising Lithuanian grapevine genotypes
9:45 – 10:00	**L. Ikase:** The actualitie of apple breeding in Latvia
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10:15 – 10:30	**M. Sitarek:** Characterisation of peaches and apricots gathered in the RIH collections in Skierniewice using UPOV test gudielines
10:30 – 10:45	**K. Soneji:** Development of gametophytes of temperate climate Blechnaceae species with an example of *Austroblechnum penna-marina* in *in vitro* cultures
10:45 – 11:15	**Coffe break**
Sesson 5 – Green Chemistry and Sustainable Food Processing	
11:15 – 11:55	**S. Mildner-Szkudlarz:** Mitigation strategies against Maillard reaction in food
11:55 – 12:10	**R. Anggriawan:** Field-based green chemistry using herbal extracts for sustainable winter wheat yields
12:10 – 12:25	**V. Čepulienė:** Antioxidant activity, phenolic and chlorophyll content of perennial *Allium* species grown in Lithuania
12:25 – 12:40	**D. Lazdiņa:** Effect of pH on Japanese quince seed protein extraction and technological properties
12:40 – 12:55	**V. Radenkovs:** Edible plates from wheat bran and blackcurrant pomace: A multidisciplinary approach to by-product valorization
12:55 – 13:10	**K. P. Rutkowski:** Organic apples – how to improve their storability
13:10 – 14:10	**Lunch**

15:00	Departure to Dobele from the Wellton Riverside SPA Hotel
17:00 – 19:00	Welcome to the Institute of Horticulture (LatHort) with guided tours of laboratories and field trials
19:00 – 21:00	BBQ style dinner in the orchard
21:00	Departure to Riga, to the Wellton Riverside SPA Hotel

Friday, August 22

Technical tour	
09:00	Departure from Riga, the Wellton Riverside SPA Hotel
10:30 – 18:00	Organic vegetable farm “Eicēni”
	Farm “Baltic Seaberry Ltd.”
	Farm “Rāmkalni”, lunch
	Farm “Bračas”
	Farm “Pīlādži” and winery “Zilver”
20:00	Return to Riga, to the Wellton Riverside SPA Hotel

Sustainable Practices in Vegetable Production

Keynote presentation

Recent research for water use efficiency on advanced production in totally controlled environment agriculture

Silvana Nicola and Cosimo Matteo Profico
University of Turin, Department of Agricultural Forest and Food Sciences, *Inhortosanitas* Lab, Italy
silvana.nicola@unito.it

Controlled Environment Agriculture (CEA) is continuously evolving to face current challenges and constrain in open field production. Totally Controlled Environment Agriculture (TCEA) is in addition evolving to cope with even more extreme conditions, such as tropical hot areas or urbanized low-land availability scenarios. Soilless Cultivation Systems (SCS) are increasingly adopted to improve water and nutrient use efficiency, especially in areas facing climate-driven constraints such as water scarcity, reduced arable land, or low soil fertility. Hydroponics and ultra-density growing systems allow advanced production, full control of the inputs, and limited use of substrates. Resource Use Efficiency (RUE) is a key aspect in advanced production: energy, soil, pesticide, nutrient, and water are *inter alia* the main aspects to consider. Water Use Efficiency (WUE) has been evaluated considering different SCS technologies—Floating Growing System (FGS), Nutrient Film Technique (NFT), and New Growing System (NGS®)—under CEA and TCEA. Preliminary results indicate that the integration of TCEA platforms with advanced SCS enables a significant increase in WUE, particularly in culinary herbs and baby-leaf vegetables. The use of multispectral dimmable LED lighting and micro-scale plant factory configurations allows for high-density cultivation with a substantial reduction in water inputs. Comparative assessments between open field, greenhouse, and TCEA conditions suggest that the application of fully controlled parameters leads to a notable optimization of water consumption per unit of fresh biomass. The implementation of standardized, reproducible, and scalable platforms supports the definition of precise agronomic protocols and offers new opportunities for resource-efficient cultivation in urban, peri-urban, or climatically constrained areas. The contribution aims to highlight how the synergy between system design, input regulation, and crop-specific management can enhance the resilience, adaptability, and sustainability of horticultural production, in line with current global priorities in agricultural innovation and water resource management.

Key words: water resource optimization; controlled environment agriculture (CEA); hydroponic systems; floating growing system (FGS); nutrient film technique (NFT); culinary herbs and baby leaf crops

Sustainable Practices in Vegetable Production

Oral presentations

Responses of leaf vegetables to variations in LED light composition

Ina Alsiņa, Māra Dūma, Laila Dubova, Tetiana Harbovska, Gustavs Uplejs-Griķis, Reinis Alksnis, Uldis Gross
Latvia University of Life Sciences and Technologies, Latvia
ina.alsina@lbtu.lv

Experiments were conducted to investigate the effects of different light spectra on the morphological and biochemical parameters of lettuce, leaf mustard, and arugula. The plants were grown under LED lamps with a 16 h/8 h photoperiod, receiving equal total photosynthetically active radiation (150 ± 10 µmol $m^{-2}s^{-1}$) and a consistent red-to-blue light ratio (1:1), but differing in light intensity within the 500–600 nm range (L2 > L3 > L1). Plant weight, dry matter content, plant height, and biochemical parameters—including chlorophyll, carotenoids, phenols, flavonoids, anthocyanins, and ascorbic acid content—were measured at three stages during cultivation. Leaf reflectance spectra were also recorded. The results showed that different leafy vegetables respond uniquely to variations in light spectral composition. Lettuce produced the highest yield under L2, while arugula and leaf mustard yielded best under L3. Plant height was only slightly influenced by light spectrum. The highest soluble dry matter content in leaf mustard was observed under L1. L3 enhanced the accumulation of phenolic compounds. Chlorophyll content increased in arugula under L2, and in leaf mustard under L3. The chlorophyll a/b ratio was minimally affected by spectral differences. Anthocyanin synthesis was promoted in lettuce and leaf mustard under L3. The findings show that with light spectral composition is possible to optimize both yield and nutritional quality in different leafy vegetable species.
This research was supported by project “Strengthening the Institutional Capacity of LBTU for Excellence in Studies and Research”, funded by The Recovery and Resilience Facility.

Key words: lettuce; leaf mustard; arugula; phenols; flavonoids; pigments

Sustainable Practices in Vegetable Production

Oral presentations

Water use efficiency of twelve microgreen species from seven plant families in totally controlled environment agriculture

Cosimo Matteo Profico and Silvana Nicola
University of Turin, Italy
cosimomatteo.profico@unito.it

Microgreens are young seedlings harvested at the first true leaf stage, valued for concentrated flavour and phytonutrients. Their short growth cycle and high planting density make them well-suited to Totally Controlled Environment Agriculture (TCEA), which shields crop performance from external weather and water scarcity. However, species-specific water footprints for these juvenile crops remain limited, inhibiting accurate sustainability claims. This study evaluated twelve culinary microgreen species representing *Amaryllidaceae, Apiaceae, Asteraceae, Brassicaceae, Cucurbitaceae, Fabaceae* and *Lamiaceae*, cultivated in a micro-TCEA unit under two LED spectra with contrasting red:blue ratios (5.08 vs 2.33; 255 µmol m^{-2} s^{-1}; 14 h photoperiod). Daily irrigation volumes were recorded; harvest at first true leaf provided fresh yield, total chlorophyll, nitrate and total phenolic concentrations. Ranking species by days to harvest and cumulative water use produced a multidimensional efficiency matrix linking physiology to resource demand. Three agronomic clusters emerged: Group A (13 days, 6.4 L m-2), Group B (15 days, 8.8 L m-2), and Group C (17 days, 15.2 L m-2). These intakes translated into mean water-use efficiencies of 38, 90 and 43 g biomass L^{-1}, respectively. Spectral treatment did not alter biomass, WUE, nitrate, and phenolic contents, confirming nutritional parity across light regimes. When normalised per square metre, annual irrigation demand ranges from 0.13 to 0.42 m^3. The clear separation of species by cycle length and water budget shows that early-stage demand is physiology-driven; adopting cluster-specific irrigation set-points offers a high-leverage route to maximise yield while minimising water withdrawal, delivering a practical framework for cultivar choice, scheduling and climate-adaptive strategy in precise horticulture.

Key words: vertical farming; irrigation; LED spectra; phenolic profile; nitrate; soilless cultivation; resource optimization

Sustainable Practices in Vegetable Production

Oral presentations

Onion deficit irrigation - impact of drought stress

Ingunn M. Vågen, Andrii Volovyk, Pia Heltoft Thomsen
NIBIO - Norwegian Institute of Bioeconomy Research, Norway
ingunn.vaagen@nibio.no

Drought stress can occur during onion production. During dry periods, growers are often forced to prioritize which crops are most urgently in need of irrigation. Knowing how drought stress during different plant developmental stages impacts plant growth and subsequent yield is important to be able to make this prioritization.

Key words: onion; *Allium cepa*; plant stress; drought; deficit irrigation; crop physiology

Sustainable Practices in Vegetable Production

Oral presentations

Sustainable nutrient management in field vegetable cultivation in Latvia: aligning fertilisation strategies with the sustainable growing practices

Līga Lepse, Solvita Zeipiņa, Marija Gailīte
Institute of Horticulture (LatHort), Latvia
liga.lepse@lathort.lv

From 2021 to 2025, in the Institute of Horticulture is performed research with the main objectives to evaluate the current nutrient supply status in vegetable production systems and to develop fertilisation guidelines for the most widely cultivated field vegetables in Latvia – cabbage, carrots, onions, and beets – in accordance with the goals of the European Green Deal. Field trials are conducted both at the Institute of Horticulture and on ten commercial farms across Latvia, representing both integrated and organic farming systems. To calculate nutrient balances and nutrient use efficiency (NUE), soil and plant nutrient content, crop yields, and biomass were measured. Fertiliser input and yield data were collected from farmer reports. Year-to-year variability in weather and soil conditions is recognised as a significant factor influencing both yield and NUE. Based on data collected from 2021 to 2024, current fertilisation practices indicate a trend of over-fertilisation, particularly with phosphorus. Phosphorus use efficiency was found to be critically low across all studied crops, on average for all crops ranging between 3.6% and 7.5%, and in some cases as low as 0.5%. Potassium use efficiency on average for all crops varied more widely, from 5% in cabbage to 38% in carrots. Nitrogen use efficiency was highest, on average for all crops, ranging from 79% to 139%. The nitrogen using efficiency may exceed 100% due to the highly dynamic nature of nitrogen in the soil, influenced by factors such as organic matter content, microbial activity, soil moisture, and temperature. During the growing season, nitrogen mineralisation from crop residues can significantly alter the amount of plant-available nitrogen, complicating interpretation based on single sampling events. These findings highlight the need for more precise and environmentally sustainable fertilization strategies in Latvian vegetable production. However, reducing phosphorus and potassium fertilisation should be considered.

Key words: cabbage; carrot; onion; red beet; yield; NUE

Sustainable Practices in Vegetable Production

Oral presentations

Influence of substrate on vegetable biochemical content in urban gardening system

Solvita Zeipiņa, Līga Lepse, Inta Krasnova, Linda Ieviņa
Institute of Horticulture (LatHort), Latvia
solvita.zeipina@lathort.lv

Urban agriculture presents a viable strategy to mitigate several critical challenges encountered by conventional agricultural systems, including the reduction of arable land, diminishing water and nutrient resources, accelerated population growth, soil degradation and contamination, intensified urban expansion, and the adverse effects of climate change. It enhances urban food security by providing access to fresh, locally grown produce and reducing dependence on long supply chains. Among its methods, container-based urban gardening allows efficient use of limited space on rooftops, balconies, and terraces. The choice of growing substrate is critical, influencing plant development, yield, and the nutritional quality of crops. This study was conducted in 2023 and 2024 at the Institute of Horticulture (Lathort) and the Institute of Agricultural Resources and Economics (AREI), Latvia, within the project "Influence of agroecological conditions on the quality of vegetables in urban horticulture (Roof2Fork)". Vegetable crops (radish, peas, lettuce, basil, tomatoes) were grown in wooden containers using peat-based substrates with alternative materials to reduce peat use: peat:perlite (4:1), peat:coconut fiber (1:1), peat: hempseed sheaves (1.5:1) in 2023, and peat:leaf compost (4:1) in 2024. Biochemical parameters of the harvested crops were analyzed. Lettuce vitamin C content ranged from 104–573 mg/100 g, with higher values in 2023. Polyphenol and flavonoid contents were higher in 2024. Tomato vitamin C ranged from 319–720 mg/100 g, with lycopene levels between 2–124 mg/100 g. Basil showed higher polyphenol and flavonoid levels in the Lathort trials, with vitamin C ranging from 104–184 mg/100 g. Radish vitamin C content reached up to 744 mg/100 g, lowest in the peat:coconut fibre mix. Peas showed notably higher biochemical values in 2024, likely due to increased moisture content. Overall, no consistent trend was observed across substrates regarding higher biochemical compound accumulation.

Key words: wooden containers; peat alternative; polyphenol and flavonoid; moisture content

Advancements in Knowledge for Smart Farming and Plant protection

Keynote presentation

Challenges and pathways in land sector based climate mitigation in temperate climate region

Andis Lazdiņš
Latvian State Forest Research Institute "Silava", Latvia
andis.lazdins@silava.lv

This presentation explores the role of land use in national greenhouse gas (GHG) inventories, focusing on the methodological structure and data sources underpinning Latvia's Land Use, Land-Use Change, and Forestry (LULUCF) sector reporting. Emphasis is placed on the specific challenges and opportunities of climate change mitigation in Latvia, where biogeophysical and socio-economic conditions complicate the achievement of the mitigation targets. The presentation provides an overview of current progress, outlines Latvia's trajectory towards 2025, 2030, and 2050 climate targets, and discusses the implications of EU climate policy, including the European Climate Law and LULUCF Regulation, for land management and GHG accounting. It also reflects on improvements in data collection, modelling approaches, and sectoral integration required to enhance the robustness of reporting and inform effective mitigation strategies in the land use sector and, particularly, organic soils.

Key words: greenhouse gas inventories; climate target; modelling approaches; organic soils; land management

Advancements in Knowledge for Smart Farming and Plant protection

Keynote presentation

The agri benchmark Horticulture Network: economic analysis of fruit production systems - the case of apples in Europe

Hildegard Garming, Anika Muder, Mandes Verhaagh
Thünen Institute of Farm Economics, Germany
hildegard.garming@thuenen.de

Across Europe, fruit growers are struggling with ever increasing costs of production and high variability in yields and output prices affecting farm level profits. Competitive pressure on fruit growers is high, resulting from international trade and from different framework conditions in fruit producing countries with respect to environmental legislation, wage levels or public support for risk management. Farm level profitability is a condition for sustainable fruit production and for the competitiveness of the fruit sector in a given region and country. Yet, data on the costs of fruit production and the profitability of fruit farms is scarce and rarely comparable between different production regions or countries. In the agri benchmark Horticulture network, the typical farm approach is applied for the economic analysis of fruit production systems, as a harmonized common methodology to compare cost of production and profitability on farm level between farm types, production regions and countries. Following a standard operating procedure (SOP), typical farms are established as economic models, that represent the prevailing farm structure, production technology and input-output relations in a specific production region. Data sources include agricultural statistics and census data, interviews with farmers and other experts and a focus group discussion with fruit growers and technical advisors to define and validate the specific typical farm parameters. Based on results from typical apple farms in Germany, Poland, Spain and Italy, we compare the cost structure and farm level profits in major producing regions and identify drivers for future development of production systems and farm structures.

Key words: *Malus*; profitability; cost structure; typical farm

Advancements in Knowledge for Smart Farming and Plant protection

Keynote presentation

Enhancing crop load management in apple orchards: sensor-based data collection for tree-specific treatments

Moritz Wilhelm Hentzschel, Frederick Blome, David Berschauer, Dr. Dirk Köpcke, Dr. Karsten Klopp
Obstbauversuchsring des Alten Landes e.V., Germany
moritz.hentzschel@esteburg.de

Position-based chemical thinning is a crucial approach for regulating fruit set in apple trees (*Malus domestica*) with the goal of improving fruit quality and uniformity in heterogeneous orchards. Varieties such as 'Elstar' and 'Boskoop' particularly benefit from targeted application, as they exhibit strong biennial bearing tendencies. Implementing tree-specific treatments not only optimizes fruit yield but also reduces in pesticide usage. To enable such tree-specific applications, the creation of precise prescription maps is essential. This study introduces a methodological framework for accurately pinpointing individual tree locations and automating the image-based assessment of flowering intensity to generate effective prescription maps. Currently, tree positions are manually recorded using Real-Time Kinematic Global Navigation Satellite System (RTK-GNSS) handheld devices. Tree-related information, such as flowering intensity, are collected using a multi-sensor carrier platform mounted on the tractor's three-point hitch. This platform integrates various sensors, including RTK-GNSS, inertial measurement unit (IMU) sensor, high-resolution RGB cameras, and a LiDAR (Light Detection and Ranging) sensor, to collect comprehensive data on tree structure and characteristics. By fusing RGB image data with GNSS measurements, precise allocation of recorded tree attributes to specific tree locations can be achieved. The findings of this study serve as a foundation for generating precise prescription maps that enable tree-specific treatments in fruit production. This advancement represents a significant progress toward sustainable and efficient orchard management in pome fruit cultivation.

Key words: prescription maps; position-based; digital; thinning; SAMSON

Advancements in Knowledge for Smart Farming and Plant protection

Keynote presentation

Models of a multifactorial approach to predict apple orchard productivity

Edgars Rubauskis, Gunārs Lācis, Daina Feldmane, Toms Bartulsons, Uladzimir Bury, Indra Borisova
Institute of Horticulture (LatHort), Latvia
edgars.rubauskis@lathort.lv

For planning technological actions in orchards, the labour load, storage capacity, and marketing strategy, predicting the yield in the early stages of fruit development becomes important. Within the research supported by the project "Development of autonomous unmanned aerial vehicles based decision-making system for smart fruit growing", No. lzp-2021/1-0134, the multiple regression analysis approaches applied. For inclusion in multiple regression analysis, qualitative and quantitative factors are coded in a manner where the arithmetic means of all independent variables equal zero. For quantitative factors, the deviations of the mean are used. The quadratic degree was used to find the optimum of its influence. Using the model for several uniform datasets of research, and turning the model more universal, is necessary to accept that the mean for coding does not follow trial data, but reflects common practices and knowledge. Taking as base elements the flowering intensity of apples, the number of fruitlets per tree, cultivar character, orchard system elements – planting density, tree height, performed canopy type, alternating of yielding and flowering, and age of the orchard, some models for predicting productivity have been developed. In the model orchards, yields of two seasons were collected, and average fruit weight was determined. The highest determination coefficients were obtained when the incidence of spring frost in the model was included. Using the flowering intensity for the prediction model, with a high statistical significance for the determination coefficient and all independent variables, R2 was 0.67. Similar to the observed number of fruitlets, the obtained determination coefficient (R2) was 0.69. The models could become more practically applicable if the flowering and number of fruitlets are observed as variables by unmanned technologies like autonomous unmanned aerial vehicles and imagery.

Key words: multiple regression; orchard systems; flowering intensity; fruitlets

Advancements in Knowledge for Smart Farming and Plant protection

Keynote presentation

Studies on viruses infecting *Ribes* and their potential role in severe form of reversion disease

Neda Zuļģe[1], Ineta Baka[1], Vilnis Šķipars[2], Inga Moročko-Bičevska[1]
[1] Institute of Horticulture (LatHort), Latvia; [2] Latvian State Forest Research Institute "Silava", Latvia
neda.zulge@lathort.lv

Nepovirus ribis (Blackcurrant reversion virus; BRV) is a widespread viral pathogen that affects plants of the genus *Ribes*. It is efficiently transmitted by the eriophyid blackcurrant gall mites (*Cecidophyopsis* spp.). BRV poses a major problem for blackcurrant production due to its negative impact on plant growth and berry yield. Many blackcurrant and redcurrant cultivars in genetic resource collections exhibit severe leaf and flower distortion, which may be attributed to a severe form of reversion disease or the presence of other, undefined virus. To determine the virome of Ribes plants, long-read sequencing by Nanopore technology was performed on both symptomatic and asymptomatic plants representing different Ribes species, including blackcurrants, redcurrants, golden currants, and gooseberries. Preliminary sequence data analysis was performed using Seed 2.0 software with a constructed local BLAST database containing the identified *Ribes*-infecting virus sequences. Sequence analysis revealed the presence of BRV in five tested plants, and coinfection with BRV satellite virus was detected in three samples. No virus-related sequences were found in the gooseberry sample. Although satellite viruses are typically associated with reducing symptoms of their helper viruses, no clear relevance was observed between the presence or absence of BRV satellite virus and the severity of reversion disease symptoms in the plants.

Key words: *Ribes*; blackcurrant reversion disease; nanopore sequencing; satellite virus

Flash presentations: Sustainable Practices in Vegetable Production and Advacements in Knowledge for Smart Farming and Plant Protection

Effect of air temperature on flower buds of sweet cherry rootstock-cultivar combinations

Gundega Sebre, Daina Feldmane, Dace Siliņa
Institute of Horticulture (LatHort), Latvia
gundega.sebre@lathort.lv

The variable winter weather of recent years has a significant impact on the winter hardiness of sweet cherries, increasing the risk of bud damage and reducing the potential yield. The aim of the study was to determine the tolerance of flower buds to sub–zero air temperatures during winter dormancy period for cultivars 'Arthur' and 'Iputj' grafted on the rootstocks Prunus mahaleb and Prunus avium. Samples of annual shoots were collected in February (endo-dormancy) and March (eko-dormancy) in 2022, 2023 and 2024. Samples collected in February were tested in a climate chamber at three different temperatures −20, −25, −30 °C. The shoots with buds overwintered in natural conditions were used as control samples. The samples were kept for 5 hours at the test temperature, five annual shoots were used in each variant. In March, the collected samples were tested at the temperatures −10, −15, −20 °C and control (natural temperature). After freezing treatments, the buds were cut and visually evaluated, the proportion of damaged buds was calculated. For the bud variant kept at −20 °C, both cultivar combinations with the rootstock *P. mahaleb* with the lowest percentage of damaged buds showed the best results in the three-year comparison. In the −25 °C and −30 °C variants, the cv. 'Arthur' grafted on *P. avium* rootstock performed better. Similarly, the trees grafted on P. avium showed higher level of undamaged buds also in the control variant.

Key words: sweet cherry; flower buds

Flash presentations: Sustainable Practices in Vegetable Production and Advacements in Knowledge for Smart Farming and Plant Protection

Advancing horticultural practices through geospatial technologies

Toms Bartulsons
Institute of Horticulture (LatHort), Latvia
toms.bartulsons@lathort.lv

Geospatial technologies—including Geographic Information Systems (GIS), remote sensing, Global Positioning Systems (GPS), and data management tools—are transforming modern agriculture by enabling spatially informed decision-making and resource optimization. In horticulture, GIS facilitates a range of spatial tasks, including study area delineation, field boundary digitization, and the integration of remotely sensed data for model development. These capabilities support key functions, including yield prediction, water demand forecasting, and soil nutrient assessment. The growing availability of spatially tagged data allows for detailed visualization of crop conditions, pest and disease incidence, irrigation zones, and sensor placements. GIS is also essential for land suitability analysis, allowing for the combination of soil, topography, and climate data to generate thematic maps that guide crop selection and land use planning. Spatial statistical tools integrated with GIS, such as spatial autocorrelation, cluster analysis, and kernel smoothing, further enhance their utility by identifying non-random spatial patterns in biological and environmental processes. Advancements in digital imaging and remote sensing technologies, when combined with GIS, have significantly enhanced horticultural assessments by enabling fine-scale monitoring and spatial analysis of fruit quality, canopy characteristics, and overall crop health.

Key words: geographic information systems (GIS); horticulture; spatial analysis; data-driven agriculture; sustainable horticulture

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Assessment of leaf microstructure in apple cultivars 'Gala' and 'Edite' grafted on different rootstocks in relation to scab resistance

Olga Sokolova
Institute of Horticulture (LatHort), Latvia
olga.sokolova@lathort.lv

Apple scab, caused by *Venturia inaequalis*, remains a major threat to apple (*Malus domestica*) production worldwide, often requiring intensive chemical control. While rootstocks are widely used to influence tree vigour and growth characteristics, their role in modifying the susceptibility of scion leaves to scab—particularly through changes in leaf anatomy—has not been thoroughly explored. In this study, we examined the leaf microstructure of two apple cultivars with contrasting resistance to scab: the susceptible 'Gala' and the resistant 'Edite' (carrying the Rvi6 gene). Both cultivars were grafted onto ten different rootstocks and grown under field conditions over two consecutive growing seasons (2023–2024). Using stereomicroscopy and scanning electron microscopy, we analysed key structural traits of the leaves, including the thickness of epidermal layers, stomatal and trichome density, cuticle morphology, and tissue moisture content. Scab symptoms were assessed visually using a standardized 9-point rating scale. Our observations suggest a link between certain anatomical features—such as upper epidermis thickness, stomatal density, and surface texture of the cuticle—and the development of scab lesions with conidial sporulation in compatible host-pathogen interactions. Although the disease incidence was relatively low during the study period, the data indicate that differences in leaf structure—both cultivar-specific and rootstock-induced—may influence the plant's passive defense capacity.

Key words: apple scab; rootstocks; *Malus*

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Cultivar and rootstock effect on sweet cherry fruit drop

Daina Feldmane, Gundega Sebre, Edgars Rubauskis
Institute of Horticulture (LatHort), Latvia
daina.feldmane@lathort.lv

The yield formation of sweet cherries occurs in relatively short time and has been influenced by variable factors. Shortly after flowering, the incompletely fructified fruits drop off the trees. Later, the second fruit drop mostly is related to resource availability and sink-source relations in the trees. The aim of the study was to evaluate the fruit drop for five sweet cherry cultivars on different rootstocks and the impact of abiotic factors. Fruit density on a sample branches was detected in 2022 – 2024 after the initial fruit drop and second fruit drop. Generally, the number of fruits reduced by 1.9 – 3.4 times during their development and it was affected mainly by the cultivar. The lowest level of fruit drop was shown by the cultivars 'Paula'. Fruit drop was significantly less for the trees grown on the rootstock 'Latvijas Zemais' (*Prunus cerasus*) comparing to the trees on the rootstocks P7 and Prunus mahaleb.

Key words: *Prunus avium*; *Prunus mahaleb*; *Prunus cerasus*; flowering

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Development of a bug vacuum and an automated monitoring trap to improve pest control on strawberry

Anne Nissinen, Aleksi Sirkka, Dmitrii Lepilin
Natural Resources Institute Finland (Luke), Finland
anne.nissinen@luke.fi

The first pyrethroid-resistant strains of *Anthonomus rubi* were detected in the Suonenjoki region about 10 years ago. Subsequent increase of *A. rubi* numbers has resulted in substantial crop losses on strawberry, while the selection of the chemical control measures has declined rapidly. The aims of this project are to develop a modern tractor operated bug vacuum to control common strawberry pests such as *A. rubi*, and to further develop cost effective, open-source machine imaging technologies utilizing trap, Sticky Pi, for more effective monitoring of *A. rubi*. To get Sticky Pi trap to function the open-source code originally developed in a Canadian project had to be updated for the current versions of the trap components such as Raspberry Pi Zero 2 W, Sticky Pi HAT and power supply was upgraded to reserve an option of a later addition of 4G LTE SIM HAT. The tractor operated bug vacuum was designed by a local strawberry farmer. The bug vacuum consists of a fan set in the vertical plane, which is producing the suction power applied to three rows simultaneously. The fan is followed by a collection tank made of steel mesh with a 1.8-millimetre perforation and is seamed to increase the filter surface. The suction power is passed through 300 mm diameter pipes to the lateral nozzles. By shaping the nozzles and throttling the inlet, air flow measurements reached 23-25 m/s in the side's nozzles. Performance testing of the bug vacuum as well as the trap will start in May 2025.

Key words: plant protection; *Anthonomus rubi*; strawberry; bug vacuum; Sticky Pi

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Evaluation of frost resistance of apricot cultivars in artificial climate conditions

Monta Krista Jansone and Ilze Grāvīte
Institute of Horticulture (LatHort), Latvia
monta.jansone@lathort.lv

In today's volatile climate, often marked by sharp temperature fluctuations, the frost resistance of fruit tree flower buds is crucial. On January 30, 2025, after apricots had exited their deep dormancy period, the Institute of Horticulture initiated a study on flower bud frost resistance. The research examined ten apricot cultivars and hybrids, including new Latvian cultivars 'Boriss,' 'Gundega,' 'Evelīna,' 'Dimaija,' as well as previously registered cultivars 'Velta' and 'Lāsma.' Additional cultivars included 'Dzintars,' 'Spicā,' hybrid AP-11-9-26, and the Canadian cultivar 'Harowstar.' Winter hardiness was assessed under artificial conditions using a climate chamber (MKFT 240; BINDER GmbH, Tuttlingen, Germany), with temperature lowered at a rate of 2°C per hour. At the beginning of the study, the condition of the buds and woody tissues was documented before freezing (control variant). Temperature regimes tested: -10°C, -15°C, -20°C, -25°C, -30°C. The plant parts under study included buds on annual branches, buds on fruit twigs, annual branches, and perennial branch wood (2- or 3-year-old sections of fruit branches). In the control variant, wood tissues remained undamaged across all samples, and flower buds remained intact in cultivars 'Dimaija,' 'Gundega,' 'Dzintars,' 'Spicā,' and hybrid AP-11-9-26. However, the proportion of partially damaged buds varied from 9% to 53%. The highest percentage of intact buds on annual branches in the control variant was recorded in cultivar 'Gundega' (84%), whereas 'Dimaija' had the highest rate on fruit twigs (91%). At -25°C, 100% of buds were damaged in the cultivars 'Dimaija,' 'Gundega,' 'Spicā,' and 'Harowstar.' However, the wood tissue of older branches remained intact in 'Spicā' and hybrid AP-11-9-26. According to scientific literature, 25% of fertilized flower buds are required to ensure a normal yield in stone fruit trees. This suggests that none of the tested genotypes would produce a sufficient yield if air temperature dropped to -25°C after the deep dormancy period. Only cultivar 'Dzintars' maintained 25% healthy buds on annual branches at -20°C. Based on the 2025 results, 'Dzintars' exhibited the highest flower bud resistance, while hybrid AP-11-9-26 had the most winter-hardy wood tissue.
The study was conducted with the support of the project "Fruit Crop Breeding Program for the Development of Breeding Material to Promote the Implementation of Conventional, Integrated, and Organic Agricultural Cultivation Technologies."

Key words: *Prunus armeniaca* L.; climate chamber; Latvian breeding program

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Influence of inorganic substances and the orchard systems on apple scab incidence

Edgars Rubauskis[1], Regīna Rancāne[2], Guna Bundzēna[2], Indra Borisova[1]
[1] Institute of Horticulture (LatHort), Latvia; [2] Institute for Plant Protection Research "Agrihorts", Latvia
edgars.rubauskis@lathort.lv

In apple production, reducing synthetic pesticides may be possible using inorganic substances in the second part of the season against secondary scab infection. An investigation was conducted within the project „Research-based solutions for sustainable agri-food system addressed to the European Green Deal objectives (GreenAgroRes)" to evaluate apple scab control strategies in two orchard systems, to reduce the use of synthetic fungicides. The trial has treatments: synthetic fungicides on manually pruned slender-spindle canopy trees on dwarf rootstock (planting density 1666 trees per ha); synthetic fungicides during primary scab infection period and inorganic substances during secondary period or only synthetic fungicides during primary scab infection period for the mechanically pruned apple trees of vertical axis canopy on dwarf rootstock (planting density 2500 trees per ha). Scab incidence on the very scab susceptible cultivar 'Ligol', observing every three weeks, were considerably higher in the treatment where synthetic fungicides were used only during the primary scab infection period, reaching 96% on leaves and 63% on fruits in late August. Treatments with synthetic fungicides during the primary and secondary scab infection period and replaced by inorganic substances during the secondary infection period significantly decreased fruit disease incidence compared with the treatment where fungicides were not used during the secondary scab infection period. There was no significant difference in leaf disease incidence between the treatments during the last assessment in late August. These preliminary results, converting the orchard process to different alternatives of plant protection strategies, were not related to the productivity and fruit size in the early stage. The most productive was 'Ligol' on B.396 in a vertical axis orchard system, in a background of inorganic substances during the second part of the season. It will result in a biennial yield in the following season. Among other late ripening time cultivars, 'Rubin' (Kazakh), 'Gita', and 'Antei' showed no significant differences in yield.

Key words: *Malus*; *Venturia*; synthetic fungicides; rootstocks; canopy

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Irrigation management for better water use efficiency, yield and quality of white strawberry

Elena Grancharova, Blagoj Elenov, Petya Ivanova, Miladin Nazarkov
Institute of soil science, agrotechnologies and plant protection „Nikola Poushkarov", Bulgaria
eveha@abv.bg

Water management is become a hot point in tackling of challenges to find the balance between efficient water uses and crop productivity increasing and taking steps to reduce environmental impacts of these activities. The aim of this paper is to present the effects of the applied regimes of fertilization and irrigation on the water use efficiency (WUE), yield and quality of white strawberry cultivar. A two-factor experiment was conducted during 2023-2024 in unheated greenhouse in the Chelopechene experimental field, Sofia, Bulgaria with drip irrigated and fertigated strawberry cultivar Fragaria x ananassa 'Snow White'. The irrigation and the fertilization factors were applied in two rates: I1 - 75% (ETc) I2 - 50% (ETc), F1: optimal fertilization N8.09P12.76K15.62; F2 – suboptimal fertilization - 75% (F1). Five treatments were tested: control: I0F0:100% (ETc) without fertigation; I1F1; I1F2; I2F1; I2F2. The highest mean yield (6652.45 kg/ha) for 2023-2024 period was found for I1F1 treatment and the highest WUE (2.57 kg/m3) was found for I2F1 treatment.

Key words: white strawberry; WUE; NUE; greenhouse; Bulgaria

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Strawberry flower bud development from planting till dormancy

Ieva Kalniņa and Kitija Bičuša
Institute of Horticulture (LatHort), Latvia
ieva.kalnina@lathort.lv

In Latvia, strawberries are still mostly grown in open field. Traditionally, a new planting in the open field is established with bare-root plants in autumn. The cultivars most often grown in Latvia have been bred more to the south, where the growing season is longer. Yields are not very high, so it is assumed that these cultivars do not reach their yield potential here because of the short growing season. In this study, we look at what happens to strawberry bare-root plants and the development of their flower buds. The assumption is that our autumns are not as long and warm, so strawberry flower buds do not develop as much as they could if suitable temperatures were present for a longer period of time. The plants were planted in August. The root collar sizes of the strawberry plants varied widely, even within the same cultivar. The assumption is that the larger the root collar, the higher the potential yield. It was difficult to assess whether the root collar of strawberry plants increases with the development of the inflorescence, as different plants were looked at each time. But it is clear that a larger root collar does not necessarily mean a higher yield potential. We included two strawberry cultivars 'Sonata' and 'Rumba' in the study. We studied these in depth for one autumn, assessing the diameter of the root collar and the stage of top flower bud development, and the point at which this bud development ceases and goes dormant, every week from September until the beginning of winter.

Key words: *Fragaria* × *ananassa*; Rumba; Sonata

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Strawberry productivity and fruit quality using intercropping

Valda Laugale, Līga Lepse, Solvita Zeipiņa
Institute of Horticulture (LatHort), Latvia
valda.laugale@lathort.lv

Technological solutions for growing crops to improve soil fertility and reduce the use of nitrogen fertilizers and plant protection products are very relevant in order to implement the goals set by the European Green Deal. In order to address the issues of implementing sustainable technologies in horticulture, in 2021, the Institute of Horticulture (LatHort) launched an ERDF co-funded project "Elaboration of environment-friendly crop growing technologies identified by the Green Deal and their implementation in horticultural production in Latvia" (GreenHort, No. 1.1.1.1/20/A/169), where one of the research directions was related to intercropping strawberry with agroecological service crops and vegetables. In this trial, the possibility of using strawberry interrows for soil improvement, as well as additional cultivation of crops to fully utilize soil resources and increase land use equivalent, was evaluated. The study assessed the impact of various companion plants on strawberry yield, fruit quality and healthiness. Strawberries were planted in rows at 0.4 × 1.2 m spacing. Cultivar 'Malwina' was used. Companion plants were grown in every second interrow, while the remaining row spacings and around the strawberries were mulched with straw. In total, three different treatments of intercropping were evaluated. In the year of planting, annual clover (*Trifolium incarnatum* L.) was grown in every second row in all three treatments of intercropping. In the second year of cultivation, marigolds (*Calendula officinalis* L.) were grown as a companion plant in treatment 1, peas for pod crop in treatment 2, and winter garlic (*Allium sativum* L.) in treatment 3, which was planted in the autumn of the previous year. For the third season in all three treatments, winter rye was sown in the interrows in autumn. In the third year of cultivation, Tagetes were grown as a companion plant in treatment 1, coriander (*Coriandrum sativum* L.) in treatment 2, and cabbage (*Brassica oleracea* var. *capitata*) in treatment 3. Growing of annual clover in strawberry interrows in the first year of cultivation did not significantly affect strawberry yield and quality, while the strawberry plants were healthier. Similarly, growing various companion crops in the second and third years of cultivation did not significantly affect strawberry yield and quality, which confirms that strawberries can be grown in mixed plantations by choosing appropriate companion crops, thus economically using the space between rows and gaining the opportunity to obtain additional yield or agroecological service from companion crops.

Key words: *Fragaria* x *ananassa* Duch.; companion plants; yield; fruit size; pests and diseases

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The effect of cultivation technology on blueberry pollination

Dace Siliņa and Viola Remse
Latvia University of Life Sciences and Technologies, Institute of Soil and Plant Sciences, Latvia
dace.silina@lbtu.lv

Blueberries are self-fertile, but larger and higher-quality berries are obtained as a result of cross-pollination. To reduce environmental risks, various types of covers are used in the cultivation of fruit plants. A study was conducted to determine the effect of cultivation technology on the pollination of two blueberry varieties. Two cultivars 'Bluecrop' and 'Patriot' were used, and two types of substrates: peat and peat with bark mulch mixture (1:1) and two cultivation technologies (in the open field and under VOEN cover). The trial was set up in the territory of the LBTU LPTF Institute of Soil and Plant Science, in Jelgava. The plantation was established in 2018, planting two-year-old blueberry plants. VOEN cover was installed at the beginning of 2019. The experiment was conducted in 2021 and 2022. To determine pollination, isolators (air-permeable white net, 17 g m-2) were placed on a certain number of shoots. Flowers and berries were counted, and fruit set was determinate. The yield was counted. The number of seeds from the marked shoots (with / without isolator) was counted, and the mass of the berries was determined. According to the results obtained, the cultivation technology did not significantly affect the pollination of bush blueberries in either the control or isolated variant. For the cultivar 'Patriot' fruit set was above 95% (very high) in both years of the study. For the cultivar 'Bluecrop', the fruit set was above 95% in 2021, in 2022 it ranged from 76.6 to 91.9%, but it was still high. The number of seeds per berry and the weight of one berry were significantly affected by the type of pollination for both cultivars. According to the results obtained, 'Patriot' had an average of 48 seeds per berry in the control variant and 11 seeds in the variant with an isolator. 'Bluecrop' had an average of 69 seeds (control) and 21 seeds (isolator) per berry. The average weight of one berry for the 'Bluecrop' was 1.07 g (control) and 0.71 g (isolated). The average weight of one berry for the 'Patriot' was 1.22 g (control) and 0.80 g (isolated). After two years of research, it can be concluded that the cover does not affect the pollination of both blueberry varieties, it was significantly affected by the type of pollination.

Key words: 'Patriot'; 'Bluecrop'; VOEN cover; open field pollination; isolators

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The impact of dwarf rootstocks on the growth and yield of plum cultivars

Ilze Grāvīte and Monta Krista Jansone
Institute of Horticulture (LatHort), Latvia
ilze.gravite@lathort.lv

Growing fruit trees in Northern Europe presents many challenges. One of the most significant is identifying suitable rootstocks that reduce tree height while maintaining crop quality, exhibiting high winter hardiness, and demonstrating resilience to sharp temperature fluctuations in spring. In Latvia, domestic plums are primarily grown for fresh consumption, making fruit quality and manual harvesting essential. Lower-growing trees with a smaller crown would simplify harvesting. Since 2015, a trial has been conducted at the Institute of Horticulture to evaluate the performance of plum cultivars 'Victoria' and 'Jubileum' on various rootstocks, including *P. cerasifera*, VVA-1, Weiwa, S766, and M633. The planting material was sourced from the Lithuanian Horticultural Institute in Babtai. For 'Victoria,' no combinations with Weiwa or M633 were included in the trial. The experiment consists of six replications, with two trees per plot. The most resilient rootstocks were *P. cerasifera*, Weiwa, and M633. The rootstock M633 produces a significant number of suckers, receiving the highest rating (5 out of 5 points). The rootstock S677 scored 3–4 p., while *P. cerasifera* received 3 p. (with tendency to develop suckers becoming more pronounced after adverse winter conditions). Rootstocks VVA-1 and Weiwa scored up to 1 point. Tree growth dynamics varied significantly. Among the 'Victoria' trees, those grafted onto *P. cerasifera* and Weiwa exhibited the strongest growth, while those on S766 displayed moderate growth. Trees on M633 and VVA-1 were notably smaller. For 'Jubileum,' significant differences were observed among all rootstocks. Trees on VVA-1 formed small crowns, making them unsuitable for commercial planting, as they failed to fill the allocated space. Over the past three years, spring frosts have affected crop formation, making it difficult to assess the potential influence of rootstocks on yield periodicity. Average yield per tree varied considerably among rootstocks. Both cultivars showed significantly higher yields on *P. cerasifera* ('Victoria' – 11.3 kg; 'Jubileum' – 5.2 kg). Among the dwarf rootstocks, 'Victoria' had higher yields on Weiwa (11.3 kg), while 'Jubileum' performed best on S766 (4.8 kg). Additionally, fruit weight was significantly higher for both cultivars on S788 ('Victoria' – 42.6 g; 'Jubileum' – 56.9 g).

Key words: *Prunus domestica* L.; fruit weight; root suckers; winterhardiness; crown; productivity

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White-fruited strawberry growth and development under drip irrigation and fertigation

Elena Grancharova, Blagoj Elenov, Elena Dimitrova, Petya Ivanova
Institute of soil science, agrotechnologies and plant protection „Nikola Poushkarov", Bulgaria
eveha@abv.bg

Strawberries, in addition to being a valuable source of nutrition, are also a much-preferred fruit due to their taste, attractive appearance, pleasant aroma, beautiful colour. The white strawberries are more attractive with their exotic taste and interesting colour. The aim of this paper is to present the effects of the applied regimes of fertilization and irrigation on the growth parameters of white strawberry cultivar. A two-factor experiment was conducted during 2023-2024 in unheated greenhouse in the Chelopechene experimental field, Sofia, Bulgaria with drip irrigated and fertigated strawberry cultivar *Fragaria* x *ananassa* 'Snow White'. The irrigation and the fertilization factors were applied in two rates: I1 - 75% (ETc) I2 - 50% (ETc), F1: optimal fertilization N8.09P12.76K15.62; F2 – suboptimal fertilization - 75% (F1). Five treatments were tested: control: I0F0:100% (ETc) without fertigation; I1F1; I1F2; I2F1; I2F2. I1F1 plants showed the highest values of studied growth parameters. It was established that plants from I1F1 treatment were 31% higher compared to plants from I2F2 treatment. The plant grow index was as follow: I1F1 (31.13 cm), I1F2 (26.31 cm), I0F0 (25.49 cm), I2F1 (23.65 cm) and I2F2 (19.89 cm).

Key words: *Fragaria*; plant grow index; irrigation rates; fertilization

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Vegetative growth and productivity of apple trees in a renovated orchard

Toivo Univer and Liisi Kont
Estonian University of Life Sciences Institute of Agricultural and Environmental Sciences, Polli Horticultural Research Centre, Estonia
toivo.univer@emu.ee

Long-term cultivation of fruit trees leads to soil fatigue, a condition caused by the combined effects of adverse physical, chemical, and biological soil factors. In the experiment, the removal of an old orchard during its amortization phase was studied using stump grinding with a forestry tiller. In the old apple orchard, intercrops such as cereals, white sweet clover (*Melilotus albus*), and many-leaved lupine (*Lupinus polyphyllus*) were grown. The intercrops were cultivated for four years. The selected apple cultivars for the experiment were 'Antei', 'Auksis', 'Lobo', 'Tiina', and 'Vahur', all grafted onto the dwarfing rootstock B.9. In the amortized orchard, the removal of stumps by forestry tilling combined with the use of green manure over four years promoted increased height and trunk diameter growth in young trees. The formation of flower buds and fruit development was significantly influenced by the interaction between the cultivar and the rootstock. Fruit set and yield formation in the orchard depend on the specific characteristics of the cultivar. Tree height and trunk thickness are influenced by the pre-planting land preparation technology for at least 10 years. In a fully productive orchard, the average total yield per tree is higher in the variant with milled stumps, although this had no effect on the average fruit weight.

Key words: renovation; replanted apple orchard; apple replant disease

Biodiversity and innovations in horticultural crop breeding

Keynote presentation

Status, difficulties and visions for improving resilience in apple cultivation by breeding resistant varieties

Henryk Flachowsky
Julius Kühn Institute (JKI) – Federal Research Centre for Cultivated Plants, Institute for Breeding Research on Fruit Crops, Dresden-Pillnitz, Germany
henryk.flachowsky@julius-kuehn.de

Eating fresh fruit is the basis for a healthy diet. Around 68.8 kg of fruit are consumed on average in Germany each year. Apples alone account for 22.4 kg. Around half of these apples (~1 million tons) are produced in Germany. To meet consumer quality demands, up to 20 fungicide treatments are used to control fungal diseases. Growing resistant varieties could help to reduce the use of fungicides, but so far, there are only a few resistant varieties with good fruit quality available. Breeding resistant varieties is a time-consuming process for which suitable genetic resources are often lacking. For this reason, great efforts have been made in recent years in Germany and other European countries to collect fruit genetic resources, to optimize their conservation and to jointly organize their evaluation and use in pre-breeding. Decentralized networks such as the German Fruit Genbank have been established, in which various partners contribute to the conservation of traditional apple varieties with their collections. The varieties available in these collections were tested for trueness-to-type and genotyped with genome-wide SNP marker arrays to enable GWAS studies. Bi-parental populations with selected donors were established, which were used for mapping genes and QTL associated with resistance to apple scab, fire blight and *Diplocarpon coronariae*. Different collecting expeditions to apple centres of origin (e.g. Caucasus) were organized to systematically expand the gene pool for breeding. As a result, new resistances for fungal and bacterial diseases could be identified and genetically mapped. In individual cases, it was even possible to isolate and functionally characterize the underlying genes. This work has considerably expanded the possibilities in resistance breeding, including marker-assisted selection. The presentation will give an overview of the work of the last two decades and show, using selected examples, the problems and difficulties associated with resistance breeding in apple.

Key words: resistance breeding; genetic resources; marker-assisted selection (MAS); pre-breeding

Biodiversity and innovations in horticultural crop breeding

Oral presentations

A living heritage: old and traditional horticultural varieties supporting biodiversity from gene bank to field

Denise F. Dostatny, Anna Bakalarska, Mariusz Chojnowski
The National Institute of Horticultural Research, Poland
denise.dostatny@inhort.pl

Agriculture remains one of the major threats to biodiversity, primarily due to partial habitat destruction, unsustainable land use, and the erosion of genetic diversity. At the same time, plant genetic resources are essential for crop improvement and long-term food security. A significant share of global agrobiodiversity is safeguarded through ex situ conservation—stored as seed collections in gene banks and other seed banks around the world. These collections include cultivated varieties and crop wild relatives, which play a crucial role in broadening the genetic base for breeding resilient crops. In Poland, the active collection of vegetable genetic resources—including traditional and old cultivars as well as wild relatives—is maintained by the Regional Centre for Horticultural Biodiversity (RCBO) at the National Institute of Horticultural Research in Skierniewice. The collection's origin dates back to 1960, when the first efforts to gather horticultural genetic material were initiated. These activities continue today through field expeditions across Poland and neighbouring countries. The living collection supports both scientific research and biodiversity-based development in rural areas. One of the ongoing initiatives of the RCBO focuses on the multiplication, evaluation, and registration of regional and amateur vegetable varieties. It aims to increase their representation in the National List of Vegetable Plant Varieties and supports the implementation of agri-environment-climate schemes under the EU's Common Agricultural Policy (CAP). It also assists farmers in reintroducing locally adapted, historically cultivated varieties. To date, ten old vegetable varieties have been submitted for registration and are currently awaiting approval. This progress highlights the agricultural and cultural value of traditional horticultural crops. There is growing recognition of the need to preserve these genetic resources—not only for their breeding potential but also as a moral responsibility to protect biodiversity and regional heritage for future generations.

Key words: plant genetic resources; old varieties; horticultural biodiversity; preservation

Biodiversity and innovations in horticultural crop breeding

Oral presentations

Molecular identification and phylogenetic analysis of promising Lithuanian grapevine genotypes

Birutė Frercks and Ingrida Mažeikienė
Lithuanian research centre for agriculture and forestry, Lithuania
birute.frercks@lammc.lt

Lithuanian breeder Antanas Gailiūnas (1918 – 2004) created a series of interspecific hybrids of grapevine for the northern climate zone. As the climate has become milder over the past few decades, several promising grapevine genotypes of this authors have become the main vineyard crops in Lithuania. Due to long-term vegetative propagation among amateur gardeners (about 50 years), plant heterogeneity has been observed in collections and vineyards, and it is not yet clear whether these are only phenotypic differences resulting from agroclimatic conditions or genotypic. There is also no data on the origin of Lithuanian grape seedlings, and according to EU wine regulations, only V. vinifera varieties or regionally registered hybrids can be used for wine production. Therefore, the aim of this study was to assess the genetic diversity of grape varieties common in Lithuania and, as far as possible, the origin. A total of 78 grape leaf samples were collected in 6 Lithuanian vineyards. Eight microsatellite markers (SSR) were used for molecular identification of grapevines, following the recommendations of the International Organization of Vine and Wine (OIV). A total of 133 polymorphic alleles were identified. The number of alleles identified with each primer pair ranged from 7 to 18. The most informative loci were VVMD28, VVMD32 and VVS2. The set of SSR markers for each genotype was informative and sufficient to show the genetic distance between grape genotypes. In several cases, differently named samples had the same genetic code. The data revealed the genetic diversity among the grapevines grown in Lithuania and highlighted cases of misidentification. The analysis of the selected SSR markers proved to be an effective tool for genotype separation and provided essential data for the separation, authentication and registration of local grape varieties according to EU regulations.

Key words: *Vitis*; microsatellite markers; genetic diversity

Biodiversity and innovations in horticultural crop breeding

Oral presentations

The actualities of apple breeding in Latvia

Laila Ikase
Institute of Horticulture (LatHort), Latvia
laila.ikase@lathort.lv

For successful development of fruit production in Latvia it is necessary to obtain new cultivars suitable for commercial growing and able to compete with imported fruits. The aim of the apple breeding program at Institute of Horticulture is to combine the following: (1) high fruit quality, long storage, improved flesh firmness and biochemical content, especially Brix, polyphenols; (2) climate adapted tree with high and regular yields, easy for training, desirably with self-thinning fruits; (3) complex resistance or tolerance to main apple diseases – scab, mildew and others. The resistance has to be durable, so different resistance sources are combined in crosses, including genes *Rvi6* and *Rvi5*. Sources of fire blight resistance are also used, as this disease now arrives in Latvia. Recently more attention is paid to late flowering with some resistance to spring frosts, as this trait is becoming increasingly important in Latvia with climate change. For improved quality, best cultivars grown worldwide are included, like 'Bohemia', 'Honeycrisp'. Late maturing is preferred, but with harvest not too late for Latvia. In 2024 six variety candidates were applied for registration: 'Inara' ('Alesya' × 'Honeycrisp'), 'Raivo' ('Bogatyr' × 'Fantazja'), 'Sarmīte' (Co-op 7 × AMD-12-15-15) for commercial growing and 'Katrīnīte' *Rvi6* (BM 41497 × 'Latkrimson') for home gardens; ornamental apples 'Antonija' and 'Dūdars' (both 'Top Millionaire' × D-1-94-2). Promising variety candidates for registration are H-15-05-20 'Ilze' ('Eksotika' × 'Bohemia'), H-3-07-164 'Vizma' ('Ligita' × 'Honeycrisp'), cider apple P 53-1 'Pūres Sidra' ('Redcroft' o.p.), ornamental crab S1-8 'Austris' ('Geneva crab' o.p.).

Key words: *Malus* × *domestica*; disease tolerance; climate adaptation; fruit quality

Biodiversity and innovations in horticultural crop breeding

Oral presentations

New applied breeding program of haskap berry (*Lonicera caerulea* L.) at the National Institute of Horticultural Research in Skierniewice

Stanisław Pluta, Łukasz Seliga, Anita Kuras, Agnieszka Marasek, Małgorzata Podwyszyńska, Monika Michalecka, Monika Kałużna
National Institute of Horticultural Research (InHort), Poland
stanislaw.pluta@inhort.pl

The growing interest in new Haskap berry cultivars with improved features contributed to the launch of a new applied breeding program at the National Institute of Horticultural Research, Skierniewice in 2023. The main goal is to obtain new high yielding cultivars, with different ripening time, increased fruit quality and tolerance to biotic and abiotic stresses. The conventional breeding method is supported by molecular, cytogenetic and phytopathological analyses to increase effectiveness of breeding genotypes adapted to the changing climatic conditions of Poland. Molecular verification of the polymorphism of 20 genotypes contributed to the selection of parental forms for crosses, ensuring genetic diversity of the F1 seedling population. The cytometric evaluation of the ploidy level and analysis of the chromosome number confirmed the genetic stability of the tested varieties. The viability and germination of pollen grains of selected parental forms on media were examined. The growth of pollen tubes in pistils was observed microscopically and it was confirmed that pollen tubes reached the ovary after 72 h from pollination only for single crosses. The highest crossing ability was found for genotypes originating from the same geographical area. The resistance of 35 cultivars to pests and diseases, mainly powdery mildew and gray mold, was assessed. In addition, plant tolerance to drought stress and sunburn was determined. In 2023-2024, a total of 51 crossing combinations were made and 3,200 F1 seedlings were produced. Evaluation of seedlings will allow for the selection of valuable individuals, characterized by improved yield, fruit quality, high level of bioactive compounds, firmness and taste.
The research was carried out as part of the targeted subsidy of the Ministry of Agriculture and Rural Development – Task 3.16: "Production of initial materials of Haskap berry (*Lonicera caerulea* L.) with different ripening time, high fruit quality and tolerance to fungal diseases, drought and sunburn".

Key words: breeding methods; polymorphism; cytometry; ploidy; pollen germination; biotic and abiotic stresses

Biodiversity and innovations in horticultural crop breeding

Oral presentations

Characterisation of peaches and apricots gathered in the RIH collections in Skierniewice using UPOV test gudielines

Mirosław Sitarek and Agnieszka Stań-Szyszczyńska
National Institute of Horticultural Research (InHort), Poland
miroslaw.sitarek@inhort.pl

Species such as peach (*Prunus persica* L.) and apricot (*Prunus armeniaca* L.) are not cultivated in Poland on an excessive scale. The number of varieties that can be cultivated in Poland's cold climatic conditions is very limited. The database of fruits and tree traits elaborated on measurements and observations made in the collections are fundamental source of knowledge on peach and apricot varietie's value for Polish fruit growers. They are also a source of information that can be used in the breeding of new varieties. The peach and apricot field collections in the National Institute of Horticultural Research in Skierniewice, Poland, were established in 1995. At present in total over 140 accessions (cultivars, selections, hybrids and seedlings) of peaches and nectarines, and 100 accessions of apricots are preserved and evaluated in the collections. Field collections are located at the Experimental Orchard in Dąbrowice near Skierniewice (Central Poland, at 145 m altitude, 51°54″ N/20°06″ E). Each genotype is represented by three trees growing at a spacing of 5 × 3 m. Peach trees are grafted on Mandżurska peach seedlings and apricot trees on Myrobalan seedlings. Trees growing in collections are not irrigated, poorly pruned, and fruitlet thinning is not practiced in the orchard. Herbicides and fertilizers are applying according to the standard recommendations for commercial peach and apricot orchards. The data collected included tree health status, beginning and intensity of flowering using a scale ranged from 1 to 9, fruit ripening date, productivity using a scale ranged from 1 to 9, fruit weight and content of soluble solids in fruit. The characteristics of the collected accessions will be presented in terms of the above-mentioned features.
Acknowledgement: This work was carried out as part of the task commissioned and financed by the Polish Ministry of Agriculture and Rural Development; Task 1.2 "Ex situ conservation of genetic resources of horticultural plants".

Key words: tree health; phenology; productivity; fruit attributes

Biodiversity and innovations in horticultural crop breeding

Oral presentations

Development of gametophytes of temperate climate *Blechnaceae* species with an example of *Austroblechnum penna-marina* in *in vitro* cultures

Kanchan Soneji and Katarzyna Wróblewska
Wroclaw University of Environmental and Life Sciences, Poland
kanchan.soneji@upwr.edu.pl

The *Blechnaceae* family began diversifying in the late *Cretaceous* from Eurasia and expanded globally. Gradually their prevalence dominated in southern temperate zones due to their cold tolerance. In this context *in vitro* spore culture can be a suitable alternative for biodiversity restoration in the northern hemisphere. In view of the same, this study examines the spore development and germination process of *Austroblechnum penna-marina in vitro*. Spores were obtained from Wroclaw Botanical Garden. They were sown in Murashige and Skoog medium and cultured at at 23 o C, 50% relative air humidity, with a 12-hour photoperiod. PPFD was 48-52 µmol/m²s (for light) and 5-10 µmol/m²s (for dark). Spores were observed under microscope every week for 3 months. Spores were monolete, ellipsoidal to spheroidal, and chlorophyllous. Germination occurred on day 19 with exposure to light, as spores kept in darkness (PPFD-5-10 µmol/m²s) did not germinate, indicating they are positively photoblastic. Prothallial cells emerged and underwent periclinal divisions between days 20-42, forming uniseriate filaments 6-8 cells long. Plate phase developed between days 42-53, marking variation in prothallial development pattern. During this vegetative gametophyte stage, few light brown rhizoids formed, and marginal unicellular hairs began to develop. This stage was followed by development of adult gametophyte.

Key words: *in vitro* spore culture; prothallial cells; plate phase; gametophytes

Biodiversity and innovations in horticultural crop breeding

Flash presentations

Conservation of old lettuce cultivars and landraces in the Regional Centre for Horticultural Biodiversity at the National Institute of Horticultural Research in Skierniewice

Anna Bakalarska, Denise Fu Dostatny, Mariusz Chojnowski
National Institute of Horticultural Research (InHort), Poland
anna.bakalarska@inhort.pl

The Regional Centre for Horticultural Biodiversity was established as part of a project of the Research Institute for Horticultural Research supported by EU funds. The aim of the project was to build a storage facility for an active collection of genetic resources of horticultural crops. Genetic resources of vegetable plants have been collected by the Vegetable Research Institute in Skierniewice in the form of seeds since 1981 and deposited in the Plant Breeding and Acclimatization Institute, where they were stored at a temperature of 0-4°C in vacuum-sealed jars. Since 1981, 438 accessions have been collected. About 10% (42) of accessions are wild plants, 34% (150 accessions) are landraces, 52% (229 accessions) are modern varieties, and about 4% (17) are breeding material. Currently, all lettuce genotypes are being inventoried and an active collection is being created in Skierniewice. Old Polish cultivars, as well as some landraces, are subject to the registration procedure as conservation varieties. Genetic material after inventory and regeneration is available for research, breeding and educational purposes in accordance with the conditions of SMTA of ITPGRFA. For direct use, the genetic material of old Polish cultivars and landraces is available in accordance with the rules of simple MTA only to Polish users. The GRIN-Global INHORT management system is used for the management and distribution of horticultural genetic resources.

Key words: lettuce; seed; storage; genetic resources

Biodiversity and innovations in horticultural crop breeding

Flash presentations

Initial assessment of pear hybrids in the collection

Uladzimir Bury, Dzintra Dēķena, Edgars Rubauskis, Inese Drudze
Institute of Horticulture (LatHort), Latvia
uladzimir.bury@lathort.lv

Pear winterhardiness is an unsolved actuality despite possible climate changes that bring the actual border of commercial cultivation of this fruit crop to the North. The parent traits used in the breeding program resulted in a hybrid P-96-2 of crossing 'Superklap Nr.3' × 'Suvenirs'; the hybrids P-85-21, P-85-39 and P-85-9 of crossings of 'Pepi' × 'Belorusskaya Pozdnaya'; P-84-22 and P-84-20 of 'Pepi' × 'Guna' (AM-5-7-20); P-79-5 of 'Suvenirs' × 'Dessertnaya' (Crimea); P-78-2 of "Janitena 8" × 'Conference'; P-72-2, P-72-15 ('Helga') and P-72-12 of 'Belorusskaja Pozdnaya' × 'Patten'; P-70-14 and P-70-13 of 'Belorusskaya Pozdnaya' × 'Guna'; P-68-9 of 'Tem-bo-li' × 'Guna'; P-67-23 and P-67-13 of 'Tem-bo-li' × 'Suvenirs'; P-47-1 of 'Vasarine Sviestine' × 'Patten'; and P-39-1 ('Elina') of 'Dessertnaya' (Crimea) × 'Vasarine Sviestine'. Within the frame of the project "Horticultural crop breeding program for the development of breeding material to support the conventional, integrated and organic agricultural crop production technologies" the initial assessment of hybrids indicated that the largest fruits (216 – 221 g) were obtained during the period of evaluation, hybrid P-79-5 that harvested 113 – 124 days after full bloom, accumulating sum of active temperature 904 °C and reaching content of soluble solids in the fruits 11.6 – 12.0 Brix%. By size (168 – 282 g), followed by hybrid P-72-12 that harvested 114 – 145 days after full bloom, accumulating a sum of active temperature 908 - 1029 °C and reaching content of soluble solids in the fruits 10.7 – 13.4 Brix%. The highest content of soluble solids was found in the hybrids P-72-2 and P-67-23 (11.4 – 16.6 and 12.9 – 14.2 Brix%, respectively). Comparable late harvesting time (114 – 145 days after full bloom) had hybrids P-47-1, P-67-23, P-72-12, P-72-2, P-84-20, and P-85-39 accumulating at least 904 – 1059 °C sum of active temperature.

Key words: *Pyrus*; fruit size; soluble solids; days after full bloom; accumulated temperature

Biodiversity and innovations in horticultural crop breeding

Flash presentations

The latest results of the Japanese quince (*Chaenomeles japonica*) Latvian breeding program - cultivar 'Ada'

Edite Kaufmane, Dalija Seglina, Inta Krasnova, Pawel Gornas
Institute of Horticulture (LatHort), Latvia
edite.kaufmane@lathort.lv

In Latvia, Japanese quince (*Chaenomeles japonica*) is a commercially important fruit crop. To replace inconsistent seedling plantations, the Institute of Horticulture (LatHort) is developing new cultivars suited to Latvian and Northern European climates. These cultivars aim to be weather-resilient, high-yielding, winter-hardy, easy to maintain, disease-resistant, and ideally self-fertile. After extensive testing, the cultivar 'Ada', developed from Alberts Tīcs' breeding material, was selected and submitted for registration in Latvia in 2024. Its release honours Tīcs, a pioneer in Japanese quince breeding. 'Ada' grows as a large, spreading, medium-upright, thornless bush with good winter hardiness and disease resistance. It flowers abundantly and yields 4–6 kg per bush annually. Its fruits ripen from late August to early September and are large (50–95 g), oval, dark yellow with a rosy blush, and uniform in size. The fruits have a high vitamin C content (88.2 mg/100 g) and total acids (5.2%). They also contain 12.1 mg/100 g tocopherols (18% retained in candied form), 1.3 mg/100 g carotenoids (15% retained), and 1468.2 mg/100 g polyphenols (11% retained), all calculated on a dry weight basis. The fruit's relatively soft texture (82.6 N) makes it ideal for processing. In sensory evaluations, 'Ada' candied fruits scored highest for taste and appearance. 'Ada' also shows low trait segregation in subsequent generations. Its self-pollinated seedlings are more uniform and resemble the mother plant more closely than other cultivars. These seedlings exhibit higher total phenol content (872 and 720 mg/100 g, DW) and superior antioxidant activity (over 200 µmol TE/100 g, DW). In breeding trials, 'Ada' consistently delivers top yield and fruit quality.

Key words: seedlings; fruit quality; biochemical composition; candied fruits

Biodiversity and innovations in horticultural crop breeding

Flash presentations

Expression profiling of genes involved in fruit wax biosynthesis in different genotypes of blueberry

Sylwia Keller-Przybyłkowicz, Stanisław Pluta, Łukasz Seliga, Agnieszka Walencik, Krystyna Strączyńska, Renata Czarnecka
National Institute of Horticultural Research (InHort), Poland
sylwia.keller@inhort.pl

The highbush blueberry (*Vaccinium corymbosum* L.) is common soft fruit species cultivated in world temperate regions. Postharvest shelf life of fruit berries is an important factor in the breeding selection of this species. The fruit wax coat intensity, significantly vary in accordance to the cultivated genotype, is of particular importance in this aspect. Based on transcriptome analysis of fruit samples of 'Duke' and 'Bluecrop' we have selected four genes, involved in wax and long fatty acids biosynthesis pathways. The differentially expressed and functionally annotated genes (DEG's) were finally analyzed in accordance to their expression profiling. The comparison of cDNA libraries, obtained from the transcriptomes of fruit peal of 'Duke' and 'Bluecrop' (producing fruits with low and intensive wax coat, respectively), over 74,500 genes were identified (38,574 -overexpressed and 35,927 -inhibited). For the gene expression profiling we have selected: CER3-like (fatty acid acyl-CoA reductase), WSD1 (wax degradation protein), VcAldOx (aldehyde oxidase) and VcAlcoDeh, (alcohol dehydrogenase), participating in the processes of fatty acid decarboxylation. The expression gene pathways were finally analyzed in the genomes of blueberry genotypes, cultivated in InHort: 'Auroa', 'Bluegold', 'Toro', 'Bonifacy', 'Rubel', 'Liberty', 'Jorma', Duke 1, Duke 2, Duke 3, 1A/1, 2A/1, 12A/4, 17A/2, 19A/2, 20A/2, 21A/2. We have observed significantly lower level of activity of selected genes in the fruit samples of cultivars producing intensive wax coat. Uncovered genes may be contributed as candidates for molecular markers pivotal in breeding acceleration of high-quality fruits of blueberry cultivars. The research was carried out under the special-purpose subsidy of the Polish Ministry of Agriculture and Rural Development, Task 3.5: "Production of highbush blueberry (*Vaccinium corymbosum* L.) initial materials with high-quality fruit and molecular analysis of specific genomic fragments".

Key words: blueberry; expression; transcriptome; differentially expressed genes; wax

Biodiversity and innovations in horticultural crop breeding

Flash presentations

The apple ideotype: consumer preferences in Latvia

Arta Kronberga, Dāniels Udalovs, Laila Ikase
Institute of Horticulture (LatHort), Latvia
arta.kronberga@lathort.lv

Crop breeding is essential to ensure food security, improve nutritional value, and address the challenges posed by growing conditions and climate change. Ideotype breeding is a plant breeding approach that develops an ideal plant model with traits considered suitable for a particular environment or system. An apple variety ideotype used in the breeding programme at the Institute of Horticulture incorporates more than 40 distinct traits. Due to changes in climate and the development of advanced methodologies and technologies—such as genomic selection, marker assisted selection, rapid breeding methods, and phenotyping platforms—the ideotype model requires periodic review. Consequently, work began in 2025 to update the apple ideotype.
Consumer preferences and market trends are essential considerations in apple breeding programs. Integrating these factors into the breeding process helps ensure that new apple varieties meet consumer expectations and achieve commercial viability. To assess the preferences of Latvian consumers and commercial growers, surveys were conducted, and this presentation provides an overview of the current preferences among Latvian growers and consumers regarding ideal apple tree varieties.
This research was supported by the project “Horticultural crop breeding program for the development of breeding material to support conventional, integrated and organic agricultural crop production technologies”.

Key words: *Malus* × *domestica*; breeding program; consumer preferences; survey

Biodiversity and innovations in horticultural crop breeding

Flash presentations

Breeding of European plum (*Prunus domestica* L.) in Poland

Anita Kuras, Marek Szymajda, Renata Czarnecka, Krystyna Strączyńska
National Institute of Horticultural Research (InHort), Poland
anita.kuras@inhort.pl

The aim of the European plum breeding program carried out at the National Institute of Horticultural Research in Skierniewice, Poland is to obtain new cultivars useful for combine harvesting of fruit and tolerant to plum pox virus (PPV). Result of this breeding program have been the varieties: 'Węgierka Dąbrowicka', 'Emper', 'Kalipso', 'Polinka' and 'Jovita' included in the National Register of Cultivated Plant Varieties of COBORU in Słupia Wielka. In the years 2020-2025, 50 cross combinations were performed, using parental forms from different geographical regions - Poland, Sweden, Germany and the USA. Currently 3324 plum seedlings are under evaluation in the selection plots. Nineteen valuable selections were planted in two field trials for further evaluation. In order to eliminate closely related parental genotypes from the crossing breeding program and to verify the genetic identity of the best individuals selected from the evaluated seedling populations, the SSR (Simple Sequence Repeats) method is used. The use of SSR markers is recommended due to their uniform occurrence in the genome, high degree of polymorphism and codominant nature of inheritance. The research was carried out in the frame of subsidy of the Ministry of Agriculture and Rural Development special-purpose – Task 3.9: „Developing of an initial European plum (*Prunus domestica* L.) plant material suitable for combine harvesting of fruit and tolerant to sharka".

Key words: hybridization; plum genotypes; selection; SSR-PCR; genetic relationships; genetic identification

Biodiversity and innovations in horticultural crop breeding

Flash presentations

Dual-purpose sweet cherry (*Prunus avium*) in Latvia

Dagnija Lazdiņa, Santa Celma, Mudrīte Daugaviete
Latvian State Forest Research Institute "Silava", Latvia
dagnija.lazdina@silava.lv

Sweet cherry (*Prunus avium*) heartwood is lustrous, pink-brown, and photo-oxidises to a rich reddish brown. Because genotypes that simultaneously express superior timber and fruit traits can be clonally propagated, LSFRI Silava evaluated this dual-use potential by comparing ten cultivars locally grown for fruit production with nine clones bred primarily for wood production. The fruit of cultivars for fruit production averaged 5.8 g and > 21 mm in diameter with 89.5–94 % pulp, whereas timber clones yielded 2–4 g berries containing 82.5–88.5 % pulp. Nevertheless, several forestry lines—most notably the Danish seed-orchard progeny 'Truust 1'—displayed competitive pulp fractions. Multivariate analysis identified four Latvian clones that combine straight stems (diameter at breast height 19–24 cm at 15 years) with fruit quality acceptable for processing. These findings confirm that locally selected sweet-cherry clones can deliver both high-grade wood and a supplementary berry crop without compromising frost tolerance. Efficient mass-propagation protocols, including soft-wood cuttings and in-vitro culture, have already been optimised, and the first commercial dual-purpose plantations established near Dobele and Smiltene provide Baltic growers with a resilient, climate-adaptive option for diversified agroforestry.

Key words: *Prunus avium*; fruits; yield; timber

Biodiversity and innovations in horticultural crop breeding

Flash presentations

The productive value of new apple (*Malus domestica* Borkh.) genotypes bred at the National Institute of Horticultural Research, Skierniewice, Poland

Mariusz Lewandowski, Sylwia Keller-Przybyłkowicz, Agnieszka Walencik, Krzysztof Strojny
National Institute of Horticultural Research (InHort), Poland
mariusz.lewandowski@inhort.pl

Productive value of five new apple breeding clones: No. 22 (J-2003-11-02 – 'Gold Milenium' × 'Szampion'), No. 26 (J-2003-11-05 – 'Gold Milenium' × 'Szampion'), No. 28 (J-2003-11-04 – 'Gold Milenium' × 'Szampion'), No. 69 (J-2003-05 – 'Melfree' × 'Sawa'), No. 70 (J-2003-11 – 'Gold Milenium' × 'Szampion') was evaluated at the National Institute of Horticultural Research (InHort), Skierniewice, Central Poland. The clones were compared to the standard cultivars 'Szampion' and 'Gold Milenium'. The plant material was produced by the hand-winter grafting of genotypes on M.9 rootstock. Trees, about 1.5 m height single shoots, were planted in 2015 in a medium fertile soil in the orchard. Trees in the experimental trial were planted at the density of 3.5 m x 1.25 m in the randomized block design (3 replications, 3 trees per plot). Studies and observations were conducted during eight consecutive seasons (2017-2024). The trees vigour, flower intensity, ripening time, fruit yield and fruit quality (including: weight, skin colour, shape, attractiveness and taste) were assessed. The studied apple clones were significantly different in terms of the evaluated traits. The most promising genotype, was the late ripening clone No. 28 (J-2003-11-04), obtained from the cross combination of 'Gold Milenium' and 'Szampion'. Its fruit yield was approximately 30% higher in comparison to 'Szampion' standard cultivar and surpassed it in fruit taste and attractiveness. Moreover, it is resistant to apple scab (Venturia inaequalis) and low susceptible to other economically important pathogens and pests.
Acknowledgement: The research was carried out in the frame of subsidy of the Ministry of Agriculture and Rural Development special-purpose – Task 3.13: „Developing of an initial apple plant material (*Malus domestica* Borkh.) with the solid skin colour, annually fruiting and resistant to apple scab".

Key words: apple breeding program; apple clones; fruit yield and quality

Biodiversity and innovations in horticultural crop breeding

Flash presentations

New Polish strawberry clones in the field trials at the National Institute of Horticultural Research in Skierniewice, Poland

Agnieszka Masny, Jolanta Kubik, Krzysztof Pęzik, Piotr Skręta
National Institute of Horticultural Research (InHort), Poland
agnieszka.masny@inhort.pl

Strawberry breeding at the National Institute of Horticultural Research has been carried out for many years. Every year, tens of crosses were made, thousands of seedlings were produced and assessed, the best of them were selected for further studies. The most valuable clones, selected in 2023-2024, are:
T-201457-16 (Grandarosa × Elsanta): medium late; fruits large, cordiform, light red, firm, rich in extract, polyphenols and anthocyanins. Plants resistant to white leaf spot and powdery mildew, susceptible to red leaf scorch.
T-201458-20 (Pink Rosa × Elsanta): medium early; fruits large, cordiform, light red, very firm, medium rich in polyphenols, anthocyanins and ascorbic acid. Plants resistant to white leaf spot, powdery mildew and red leaf scorch.
T-201536-06 (Clery × Grandarosa): medium early; fruits large, conical, light red, firm, medium rich in extract, polyphenols, anthocyanins and ascorbic acid. Plants resistant to white leaf spot and powdery mildew, susceptible to red leaf scorch.
T-201567-04 (Patty × Panvik): early; fruits large, conical, intensive red, very firm, very rich in extract and polyphenols. Plants resistant to white leaf spot and powdery mildew, low susceptible to red leaf scorch.
T-201525-05 (Cifrance × Panvik): early; fruits large, conical, intensive red, very firm, very rich in extract, medium rich in polyphenols, anthocyanins and ascorbic acid. Plants resistant to white leaf spot, powdery mildew and red leaf scorch.
T-201556-16 (Marmolada × Pink Rosa): medium late; fruits large, cordiform, intensive red, firm, rich in extract, polyphenols and ascorbic acid. Plants resistant to white leaf spot and powdery mildew, medium susceptible to red leaf scorch.
The research carried out in the frame of subsidy of the Ministry of Agriculture and Rural Development special-purpose – Task 3.4: “Developing strawberry (*Fragaria* × *ananassa* Duch.) breeding material, characterized by plant tolerance to verticillium, resistance to low temperatures and drought, and high content of health-promoting ingredients in fruits”.

Key words: *Fragaria* × *ananassa* Duch.; strawberry applied breeding; new cultivars; genotypes

Biodiversity and innovations in horticultural crop breeding

Flash presentations

The productive value of new gooseberry (*Ribes grossularia* L.) genotypes bred at the National Institute of Horticultural Research, Skierniewice, Poland

Łukasz Seliga, Stanisław Pluta, Monika Mieszczakowska Frąc
National Institute of Horticultural Research (InHort), Poland
lukasz.seliga@inhort.pl

In the years 2022–2024, at the Experimental Orchard of the National Institute of Horticultural Research (InHort) in Dąbrowice, near Skierniewice (central Poland), study was carried out to assess the production value of 23 gooseberry (*R. grossularia* L.) genotypes, including 16 foreign varieties ('White Triumph', 'Invicta', 'Captivator', 'Hinnonmaki Green', 'Hinnonmaki Rot', 'Mucurines', 'Krasnoslaviański', 'Puszkińskij', 'Rodnik', 'Sadco', 'Kamieniar' 'Niesłuchowski' 'Reflamba', 'Rolonda'), 2 Polish varieties bred by the InHort – 'Hinsel' and 'Resika', and 7 breeding clones (AGR-2/2, AGR-2/33, AGR-86, AGR-101, AGR-102, AGR-108 and AGR-117). Plant growth vigour (height and width of bushes), yield, fruit mass and color, as well as fruit chemical composition (extract, dry matter, acidity, and pectins) were assessed. The results showed a large diversity of the gooseberry genotypes tested. The shortest bushes were produced by the cultivars 'Puszkiszkij' and 'Niesłuchowski', and the tallest by the clone AGR-117. The narrowest bushes had 'Invicta', and the widest the clone (AGR-117). The lowest average yields were obtained for the cultivars 'White Triumph' and 'Invicta', the highest for the clones AGR-102, AGR-2/33 and AGR-102. The average fruit mass of the studied genotypes was also diverse, the smallest fruits were produced by 'Captivator', 'Sadco', and AGR-101, and the largest by the clone AGR-102. The fruits were of different colours: yellow, green-yellow or red; half of the genotypes produced red fruits, most of the clones – yellow. The average extract content in the fruits ranged from 9.49°Birx to 15.71°Brix, dry matter from 13.72% to 20.24%, acidity from 1.69% to 2.74%, and total pectin content from 3952 to 5846 mg/kg. The obtained results showed that the breeding clones exceeded foreign varieties in terms of yield, fruit weight and some fruit quality parameters. The clones will be subjected to further evaluation in order to select the most valuable genotypes and potential new Polish gooseberry cultivars. The research was carried out as part of a targeted subsidy from the Ministry of Agriculture and Rural Development – Task 3.6: "Production of gooseberry (*Ribes grossularia* L.) initial materials with the qualities of dessert fruit, suitable for trellising cultivation and resistant to American gooseberry mildew".

Key words: breeding clones; growth vigour; yield; chemical composition

Biodiversity and innovations in horticultural crop breeding

Flash presentations

The impact of climate change on raspberry breeding objectives in Latvia

Sarmīte Strautiņa, Ieva Kalniņa, Valda Laugale, Kitija Bičuša
Institute of Horticulture (LatHort), Latvia
sarmite.strautina@lathort.lv

Although raspberries have been grown in Latvia since the 19th century, the lack of suitable cultivars has limited their expansion. While in the 20th century one of the most important characteristics was hardiness, ecological plasticity and the ability to adapt to rapid temperature fluctuations during winter are now becoming increasingly important. In order to improve the ecological plasticity of cultivars, local selections and winter-hardy cultivars selected in Russia are included in breeding. In the last five years, three new summer raspberry cultivars have been submitted for registration in Latvia. The main problem with autumn raspberries in field conditions is the start of ripening. Currently, for most of the autumn raspberry cultivars grown, this occurs in mid-August or even in late August-early September. In years with early autumn frosts, a large part of the harvest of later cultivars is not harvested. The aim of selection is to obtain varieties with the earliest possible flowering time and the start of berry ripening in the last ten days of July. In order to reduce the risks of climate change, raspberry cultivation in light plastic tunnels is expanding. With the expansion of this type of cultivation, greater attention should be paid to the resistance of cultivars to mildew, which does not cause problems in field conditions.

Key words: *Rubus idaeus*; ecological plasticity; primocane and floricane raspberries

Biodiversity and innovations in horticultural crop breeding

Flash presentations

Growth and yield of new late ripening sweet cherry (*Prunus avium* L.) clones grafted on two rootstocks

Marek Szymajda
National Institute of Horticultural Research (InHort), Poland
marek.szymajda@inhort.pl

One of the main objectives of sweet cherry breeding at the National Institute of Horticultural Research (Inhort) in Skierniewice is the development of cultivars well-adapted to the soil and climatic conditions of Poland and producing high-quality fruits with a late ripening period. As a result of ongoing breeding efforts, seven clones were selected: Cz-KD1-3-23, Cz-KD1-3-25 ('Drogan Yellow' × 'Sweetheart'), Cz-KD1-3-51, Cz-KD1-3-53, Cz-KD1-3-54, Cz-KD1-3-59, and Cz-KD1-3-62 ('Drogan Yellow' × 'Regina'). These clones were included in cultivar comparison trials aimed at assessing the growth and fruiting characteristics of the newly developed cherry clones. The experiment was established in autumn 2017 at the Experimental Orchard in Dąbrowice (central Poland), belonging to the Inhort. Trees of the studied clones and standard cultivars were planted on two rootstocks: the vegetative rootstock 'Gisela 5' and the generative rootstock – *P. avium* seedlings 'Alkavo'. The standard cultivars used for comparison were 'Regina' and 'Kordia'. On average across both rootstocks, the clones Cz-KD1-3-23, Cz-KD1-3-25, Cz-KD1-3-53, Cz-KD1-3-54, and Cz-KD1-3-59 exhibited weaker growth than the trees of the standard cultivar 'Kordia', and similar growth to the standard cultivar 'Regina'. The fruits of all studied clones ripened at a similar time to 'Regina', and several days later than those of 'Kordia'. Overall, across both rootstocks, the highest yield was produced by clone Cz-KD1-3-53, although its fruit size was smaller than that of the standard cultivars 'Regina' and 'Kordia'. Due to its high yield potential and late ripening period, clone Cz-KD1-3-53 may be a valuable candidate for further breeding aimed at developing late-ripening sweet cherry cultivars.
The research was carried out in the frame of subsidy of the Ministry of Agriculture and Rural Development special-purpose – Task 3.10: „Development of an initial sweet cherry (*Prunus avium* L.) plant material producing high-quality and crack-tolerant dessert fruits using embryo rescue technique".

Key words: sweet cherry breeding; new cultivar; fruit quality; yield

Biodiversity and innovations in horticultural crop breeding

Flash presentations

Smart breeding concept for apple breeding

Daniels Udalovs, Gunārs Lācis, Laila Ikase, Arta Kronberga
Institute of Horticulture (LatHort), Latvia
daniels.udalovs@lathort.lv

Apple trees are one of the most widely cultivated fruit crops in temperate regions and have significant economic, nutritional, and cultural value. Apple cultivars with higher yield, robustness, and quality are needed as consumer expectations rise and climate changes. From cross to cultivar release, traditional apple breeding takes 15 to 25 years. This extended timeline is primarily due to the long juvenile period of apple trees and the complexity of accurately assessing many traits over multiple growing seasons. To meet the growing demand for new cultivars more efficiently, it is crucial to shorten the breeding cycle and improve the quality and reliability of selection. This requires the integration of modern tools and technologies to reduce dependency on time-consuming phenotyping methods and subjective evaluations, and instead use precise, high-throughput, and data-driven approaches. Smart breeding offers a promising pathway to overcome these limitations. Smart breeding is the approach of combining traditional breeding strategies with new technologies to efficiently and effectively develop climate resilient, high-quality and disease-resistant apple cultivars with higher yield potential. It contributes to a shorter breeding cycle and more efficient screening of desirable genotypes. The key components for the smart breeding are Incorporating consumer preferences and market trends into the breeding process to develop apple varieties that meet market demands Genomic selection for improving fruit quality, disease resistance, productivity and climate adaptation; Marker-Assisted Selection (MAS); Methods to accelerate the breeding process; Data-driven breeding ; Collaborative breeding programs ; High throughput phenotyping . The study focuses on a summary of the most recent smart breeding technologies implemented in apple tree breeding, as well as survey data on the preferences of Latvian consumers and producers for apple fruits and apple trees.

Key words: apple cultivars; genomic selection; high-throughput phenotyping; climate resilience

Biodiversity and innovations in horticultural crop breeding

Flash presentations

Blackcurrant genetic resources for sustainable production

Valda Laugale, Inta Krasnova, Sarmīte Strautiņa, Līga Lepse, Inga Moročko-Bičevska
Institute of Horticulture (LatHort), Latvia
valda.laugale@lathort.lv

Blackcurrants have become the most widely grown berries in Latvia, where organic plantations occupy a particularly large area. However, their cultivation relates to many healthiness problems which influence productivity. Genetic resources can be an important source for the development of resistance to various unfavourable conditions. The Institute of Horticulture (LatHort) is responsible for the maintenance of blackcurrant genetic resources in Latvia. Collections are located in two places – Dobele and Pūre (Tukums region). To find the sources for breeding of resistant cultivars the evaluation of local blackcurrant genetic resources was performed with an emphasis on resistance to pests, diseases and adverse environmental conditions. Plant phenological, yield and fruit quality traits were evaluated as well. In total, 26 genotypes were evaluated, including local cultivars, breeding selections and local genotypes obtained during expeditions. Evaluated genotypes showed great variability within the resistance to various pests and diseases. VI-2, 'Karina', GEN 645 and 'Ritmo' showed the highest resistance to pests and diseases. Based on the evaluation results the most valuable 10 blackcurrant accessions: 'Mara Eglite', 'Karina', Nr. 675/10, 'Domino', 'Ritmo', 'Viktor', 16-9, Nr. 3-2004, Nr. 6-1995, Nr. 96-8707-3, were selected for development of virus free Germplasm Core Collection. The studies were performed in the frame of the ERDF project No. 1.1.1.1/18/A/026 "Studies on Ribes plants, Cecidophyopsis mites and Blackcurrant Reversion virus for sustainable resistance breeding and cultivation of Ribes" and National Research Programme Project No. VPP-ZM-VRIIILA-2024/1-0002 "Research-based solutions for sustainable agri-food system addressed to the European Green Deal objectives (GreenAgroRes)".

Key words: *Ribes nigrum*; genotype; phenology; resistance; yield; fruit quality

Green Chemistry and Sustainable Food processing

Keynote presentation

Mitigation strategies against Maillard reaction in food

Sylwia Mildner-Szkudlarz and Maria B. Różańska
Poznań University of Life Sciences, Poland
sylwia.mildner-szkudlarz@up.poznan.pl

Heat treatment of foods is a critical operation in industry and leads to the development of a wide range of flavours and tastes through the Maillard reaction. In addition to sensory modifications, the Maillard reaction can also result in the production of potentially hazardous compounds called advanced glycation end products (AGEs). AGEs are typically present in baked goods and can enter the body through dietary routes. Chronic illnesses, such as diabetic complications, atherosclerosis, and Alzheimer's disease, are associated with the accumulation of dietary AGEs in the body. Therefore, the various strategies for controlling Maillard reaction hazards in baked goods have been widely studied. AGEs generation and contents in bakery products can be influenced by product formulation and processing parameters. Due to the diverse composition and processing conditions of baked goods, significant variations exist in the levels of AGEs across different food categories. Recently, studies have discovered that phenolic compounds exhibit a certain degree of inhibitory effect on the formation of AGEs. Their antiglycation effect may involve a range of different mechanisms, including reactive carbonyl trapping, antioxidant activity, sugar autoxidation inhibition, and amino-group binding inhibition and competition. However, the literature presents confusing results, with some antioxidants either inhibiting or enhancing Maillard reaction-derived chemical hazards. Moreover, it is still not clear which action mechanism plays the most important role. At present, there is no clear regulation regarding the content of AGEs in food in various countries and organizations. However, considering human health, it is recommended to optimize food production processes to minimize AGEs concentrations.

Key words: Maillard-type products; bread; dicarbonyl compounds; advanced glycation end-products; polyphenols

Green Chemistry and Sustainable Food processing

Oral presentations

Field-based green chemistry using herbal extracts for sustainable winter wheat yields

Rendy Anggriawan, Kęstutis Romaneckas, Aušra Sinkevičienė, Rasa Kimbirauskienė, Rita Čepulienė, Austeja Švereikaitė, Zita Kriaučiūnienė, Rita Pupalienė, Jovita Balandaitė
Vytautas Magnus University, Lithuania
rendy.anggriawan@vdu.lt

Green chemistry enables sustainable crop management through bio-based alternatives to synthetic agrochemicals. In winter wheat systems, plant-derived extracts rich in secondary metabolites serve as multifunctional biostimulants and biopesticides, enhancing yield and stress tolerance while reducing environmental footprints. On-farm extraction of these bioactive compounds aligns with circular agriculture, offering scalable and economically viable solutions. This research systematically evaluated locally sourced biomass for sustainable agriculture applications through three experimental phases at Vytautas Magnus University, Agriculture Academy, Lithuania. First, field-scale assessment of maize-legume-native weed intercropping systems. Second, Laboratory investigation of aqueous biomass extract effects (1:10, 1:50, 1:250 w/v) on maize (*Zea mays* L.), winter wheat (*Triticum aestivum* L.), and spring barley (*Hordeum vulgare* L.) seed performance. Third, field validation of a novel plant-derived biostimulant's impact on winter wheat agronomic parameters. *In vitro* testing demonstrated consistent stimulatory effects on winter wheat (*Triticum aestivum* L.) seed germination and seedling development following treatment with Sosnovsky's hogweed (*Heracleum sosnowskyi*) extract at a 1:250 dilution. This response proved more pronounced and reproducible compared to extracts derived from leguminous species and other field-collected weeds. The potential of Sosnovsky's hogweed (*Heracleum sosnowskyi*) extract as a bio-based input was evaluated under field conditions. Application of a low-concentration extract (1:250) resulted in significant increases in winter wheat biomass, with fresh and dry matter rising by 5.2% and 10.2%, respectively. Leaf chlorophyll and nitrogen content also improved by 6.3% and 4.5% compared to the water-treated control. Moreover, the extract enhanced key yield components, including a 13–25% increase in the number of productive stems, a 19–28% rise in ear mass, and an 18–29% improvement in grain yield. While grain quality parameters remained unaffected, a slight improvement in resistance to ear diseases was observed. These findings suggest that integrating green chemistry approaches within crop rotation systems such as repurposing invasive species like Sosnovsky's hogweed may offer both agronomic and ecological benefits by enhancing crop performance and supporting invasive species management.

Key words: biostimulants; herbal extracts; *Heracleum sosnowskyi*; *Triticum aestivum*; productivity

Green Chemistry and Sustainable Food processing

Oral presentations

Antioxidant activity, phenolic and chlorophyll content of perennial *Allium* species grown in Lithuania

Vaida Čepulienė, Danguolė Juškevičienė, Jonas Viškelis, Rasa Karklelienė
Lithuanian Agriculture and Forestry Centre, Lithuania
vaida.cepuliene@lammc.lt

Perennial species of the *Allium* genus are known for their diverse chemical profiles and biological activities, which are influenced by both biotic and abiotic factors – harvest timing being especially critical. This study evaluated the two-year (2023–2024) bioactive compounds of five perennial *Allium* species from the collection of the Institute of Horticulture, Lithuanian Research Centre for Agriculture and Forestry. Antioxidant activity, total phenolic content and total chlorophyll content were analyzed at the Laboratories of Biochemistry and Technology. Antioxidant activity was assessed using three complementary assays: Ferric Reducing Antioxidant Power (FRAP), 2,2-diphenyl-1-picrylhydrazyl (DPPH), and ABTS radical scavenging activity, with results expressed in µmol Trolox equivalents (TE) per gram DW. Total phenolic content (TPC) was determined using the Folin–Ciocalteu method and expressed as mg gallic acid equivalents (GAE) per gram of dry weight (DW). Chlorophyll content was measured spectrophotometrically using 80% acetone extraction, with absorbance readings at 649 nm and 665 nm to calculate total chlorophyll concentration. In both years, *Allium ursinum* L. and *Allium nutans* L. consistently exhibited the highest TPC. During the experiment years, *A. ursinum* L. reached 1190.2 mg GAE/100g, while *A. nutans* L. accession achieved up to 864.6 mg GAE/100g. The results of FRAP and ABTS assays indicated higher antioxidant activity in 2023 relative to 2024 in all investigated species. Regarding chlorophyll accumulation, the highest total chlorophyll content was recorded in *A. schoenoprasum* L. and *A. ursinum* L., which consistently maintained superior pigment concentrations in both 2023 and 2024. These results highlight *A. ursinum* L., *A. nutans* L. *and A. schoenoprasum* L. as promising species with strong and stable phytochemical potential, they support their use in functional food development and targeted breeding programs under temperate climate conditions.

Key words: Allium; perennial vegetables; antioxidant activity; total phenolic content; chlorophyll content; harvest timing; bioactive compounds; functional foods

Green Chemistry and Sustainable Food processing

Oral presentations

Effect of pH on Japanese quince seed protein extraction and technological properties

Danija Lazdiņa [1,2], Dalija Segliņa [1], Inta Krasnova [1], Inga Ciproviča [2]
[1] Institute of Horticulture (LatHort); [2] Latvia University of Life Sciences and Technologies, Latvia
danija.lazdina@lathort.lv

Seeds are a major by-product of fruit processing, but their industrial processing is limited to oil production. Protein extraction is a logical step in seed processing, but extraction pH affects protein and other compound extractability, yield and properties. The aim of the study was to investigate the effect of extraction pH on protein and phenolic compound extraction. Japanese quince seed meal was defatted using supercritical CO2 and protein was extracted at pH 8, 9 and 10 to determine the effect of extraction pH on protein properties and composition, focusing on phenolic compounds. Dry protein yield ranged 12.1 (pH 8) to 14.1 % (pH 9). Extraction at pH 9 and 10 improved yield, compared to pH 8 ($p = 0.0018$; 0.0122, respectively), but did not improve it incrementally. Total phenolic compound content was higher when extracted at pH 10, but similar between pH 8 and 9 ($p = 0.0799$), whereas tannin content was unaffected by extraction pH ($p > 0.05$). Surface hydrophobicity was increased at extraction pH 10, but intrinsic fluorescence decreased for pH 9 and 10. Solubility (pH 4 - 8) was affected by extraction pH ($p = 0.00818$), and was significantly higher at pH 7 and 8, protein content in the solute was higher for pH 8-extracted protein. Least gelation concentration was slightly higher (8 %) for pH 10 extracted protein, compared to pH 8 and 9 (6 %). Extraction at higher pH resulted in higher FRAP ($p < 0.0001$) and DPPH radical inhibition activity ($p = 0.0126$) scores, but did not affect ABTS radical inhibition ($p = 0.197$). Antioxidative activity increased with higher extraction pH. While extraction pH did not have a significant effect on free tannin content in the protein, it affects yield, total phenolic compound content, protein chemical properties, gelation and antioxidant properties (FRAP and DPPH, but not ABTS).

Key words: valorization; Isolate; tannin; plant-based

Green Chemistry and Sustainable Food processing

Oral presentations

Edible plates from wheat bran and blackcurrant pomace: a multidisciplinary approach to by-product valorisation

Vitalijs Radenkovs, Karina Juhnevica-Radenkova, Paweł Górnaś, Dmitrijs Jakovlevs, Martins Andzs, Inta Krasnova, Daniels Udalovs, Ingmars Cinkmanis, Alona Irmeja, Jorens Kviesis, Anda Valdovska, Dalija Seglina
Institute of Horticulture (LatHort), Latvia
vitalijs.radenkovs@lathort.lv

This study developed biodegradable, edible plates (EPs) using wheat bran (WB 67–90%) and blackcurrant pomace (BP 3–10%) as sustainable plastic alternatives. Eleven formulations were tested with additives: stabilizers (chitosan, levan, xanthan), plasticizers (glycerol, lactic acid), crosslinking agents (citric acid, lecithin), and film-forming agents (gluten, gelatin). EPs with WB (67–80%) and BP (4–5%), plus gluten or xanthan and lactic acid, showed high fracture strength (148.7–235.2 N) and low water/oil absorption. SEM revealed dense, compact structures, while >8% BP and 10% apple puree increased porosity and defects. All EPs had safe levels of 5-hydroxymethylfurfural. Functional compounds were present, including tocopherols, tocotrienols, alkylresorcinols, anthocyanins, and fiber. Sensory analysis highlighted EPs 21.2 and 25.1 as the most favorable in structure, taste, and visual appeal. These findings show that combining food by-products with targeted bio-additives can yield sustainable, nutritious, and consumer-acceptable EPs, supporting win-win-win environmental, nutritional, and industrial sustainability goals. The studies were performed in the frame of the National Research Programme Project No. VPP-ZM-VRIIILA-2024/1-0002 “Research-based solutions for sustainable agri-food system addressed to the European Green Deal objectives (GreenAgroRes)”.

Key words: plant-based plates; zero-waste technology; industrial by-products; bioactive compounds; physicochemical properties

Green Chemistry and Sustainable Food processing

Oral presentations

Organic apples – how to improve their storability

Krzysztof P. Rutkowski, Zbigniew B. Jóźwiak, Anna Skorupińska, Jan A. Zdulski, Patrycja Boruch, Anna Ciecierska, Karol Fabiszewski
National Institute of Horticultural Research (InHort), Poland
krzysztof.rutkowski@inhort.pl

In the years 2021-2025, the storage ability of organic apples was assessed. Fruits of following cultivars were evaluated: 'Ariwa', 'Chopin', 'Empire', 'Gala Must', 'Gala Royal', 'Golden Delicious', 'Goldstar', 'Idared', 'Jonagored', 'Muna', 'Red Jonaprince', 'Shampion' and 'Topaz'. The research was focused on the effect of post-harvest fruit treatments, inter alia, with hypochlorous acid (Bio ActiW 2000 or AgroECA), hot water (40°C, 48°C and slightly above 50°C) or carbon dioxide (30%) and the use of MAP packaging (Xtend bags) on reducing unfavourable quality changes in the fruit during storage. Apples were stored at a temperature of 2°C. Fruit weight, percentage of blush, maturity (internal ethylene concentration and starch index), skin colour, flesh firmness, titratable acidity, and total soluble solids content in apples were measured. The occurrence of storage disorders and diseases was noticed after storage and shelf life. Generally, it should be stated that for apples of all tested cultivars, the bitter rot and bull's eye rot were the most important storage diseases. The most effective method of limiting the development of those diseases was post-harvest treatment of the fruit with hot water. The optimal treatment parameters were 48°C for 2 minutes. Lowering the temperature of hot water during treatment to 40°C may not guarantee the reduction of the occurrence of the diseases. On the other hand, using the water at a temperature of 50°C (and higher) may cause skin damage. A problem that may appear, especially after treatment with hot water, is the development of blue mould (caused by *Penicillium expansum*).
The research was carried out in the framework of a subsidy of the Polish Ministry of Agriculture and Rural Development, special-purpose Task 7.1: "Improving methods of organic fruit plant growing".

Key words: *Malus domestica*; organic; storage; quality; disorders; diseases; postharvest treatment

Green Chemistry and Sustainable Food Processing

Flash presentations

Rapid RP-HPLC baseline separation of eight tocochromanols achieved by fully porous particles column with pentafluorophenyl propyl (PFP) ligands

Krists Dukurs and Paweł Górnaś
Institute of Horticulture (LatHort), Latvia
krists.dukurs@lathort.lv

Over the past decade, a remarkable increase in interest has been observed in the generational shift of chromatographic columns from fully porous particles (FPPs) to superficially porous particles (SPPs), driven by the distinct advantages of SPPs over FPPs in the separation of small phytochemicals, such as tocochromanols. Tocochromanols - including tocopherols, tocotrienols, the lesser-known tocomonoenols, and other related tocols - collectively referred to as vitamin E, are secondary lipophilic metabolites present in higher plants. Analytical methodologies for molecule separation are continually refined to facilitate a more comprehensive and accurate interpretation of experimental results. This study demonstrates the first FPPs pentafluorophenyl propyl (PFP) column achieving fully baseline-resolved separation of eight tocochromanols in relatively short time (13.5 min) and low pressure (12.7 MPa) by reverse phase liquid chromatography (RPLC). Tocochromanols were separated on an Epic PFP-LB column (3 µm, 150 × 4.6 mm), secured with a PFP guard column (4 × 3 mm), heated in the column oven at 40 °C, by elution with 91% aqueous methanol (v/v) at a flow rate of 1.0 mL/min. The established method enables detection of α-tocomonoenol in palm oil and other potential tocols and was successfully tested on over 20 types of different plant material. The findings of the present study indicate that FPPs technology may perform comparably to or even exceed in some aspects e.g. nearly twice lower back pressure, the performance of SPPs technology.
Funding: This research was funded by the Latvian Council of Science project no. lzp-2024/1-0600.

Key words: prenyllipids; fluorescence detection; seeds; oils; lipophilic molecules

Green Chemistry and Sustainable Food Processing

Flash presentations

Apricots and melons in Latvia - a preliminary study on quality indicators

Inta Krasnova, Līga Lepse, Ilze Grāvīte, Dalija Segliņa
Institute of Horticulture (LatHort), Latvia
inta.krasnova@lathort.lv

With climate change, the cultivation of various southern fruits is becoming increasingly popular in Latvia. The aim of the Horticultural plant breeding program (Project No.10.9.1-11/24/1543-e) at the Institute of Horticulture is to develop melon and apricot cultivars that can serve as niche products characterised by good taste, texture, valuable chemical composition, and suitability for successful cultivation under Latvian conditions. In the 2024 season, samples from melon (Cucumis melo) cultivars 'Solo', 'Junior', 'Geoliz F1', and hybrid No.14, as well as apricot (Prunus armeniaca) cultivars 'Boriss', 'Velta', 'Gundega', and 'Dimaija', were tested. For comparison, samples of commercially available melons and apricots were analysed. Chemical analyses were performed on the samples, including total phenolic content, flavonoids, carotenoids, vitamin C, total acidity, and soluble solids content. Antioxidant activity was evaluated using the FRAP and DPPH methods, and for green melons, chlorophyll content was determined. Among the studied apricot cultivars, 'Dimaija' and 'Gundega' stood out with high total phenolic content (303.8 and 230.2 mg/100 g, respectively), which is three to five times higher compared to the control sample. Latvian apricots, except for the 'Boriss' cultivar, were more acidic, contained higher levels of vitamin C (13–16 mg/100 g compared to 9.3 mg/100 g in the control), but had lower carotenoid content (1.6–2.6 mg/100 g compared to 3.2 mg/100 g in the control). Among the orange-fleshed melon cultivars, 'Solo' showed a higher carotenoid content than 'Junior' (2.6 mg/100 g and 1.2 mg/100 g, respectively). All studied melon samples exhibited a 1.3 to 5.3 times higher vitamin C content than the commercial control sample. The highest total chlorophyll content in green-fleshed melons was recorded in hybrid No.14 (69.2 µg/g), whereas the 'Geoliz F1' sample showed nearly twice as low a value (39.8 µg/g), and the control sample only 14.6 µg/g. The preliminary results of the study indicate that the locally bred melon and apricot cultivars have high chemical quality parameters, which is important for expanding the local niche market.

Key words: carotenoids; vitamin C; total phenolics; breeding; non-traditional crops

Green Chemistry and Sustainable Food Processing

Flash presentations

Chokeberry and blackcurrant pomace – valuable bio-waste as a source of bioactive ingredients

Monika Mieszczakowska-Frąc, Jan Piecko, Wioletta Popińska, Justyna Szwejda-Grzybowska, Niall Dickinson, Sebastian Siarkowski, Dorota Konopacka
National Institute of Horticultural Research (InHort), Poland
monika.frac@inhort.pl

Both chokeberry and blackcurrant fruits are berries rich in bioactive compounds, especially anthocyanins. During processing, some anthocyanins are lost due to the use of thermal or mechanical processes. In the process of producing fruit juices, a significant part of the bioactive components remains in the pomace, which is a post-production waste in the production of juices. The presence of pectin compounds in blackcurrants, or a large proportion of compact, leathery skin in chokeberries, makes it difficult to squeeze juice from these fruits. Therefore, these fruits must be pre-treated before pressing – heated, enzyme treatment, which forces a compromise between the obtained juice pressing efficiency and the losses of valuable ingredients that do not pass into the final product. Chemical analysis of the raw material and pomace confirmed that the chokeberry and blackcurrant are rich in phenolic compounds, with anthocyanins in chokeberry fruits constituting 36% of all phenolic compounds, and in blackcurrant as much as 79%. The calculation of the anthocyanin balance during the pressing of cloudy juices between the raw material, juice and pomace indicates a high retention of these components in pomace at the level of 44.2% in the case of pressing chokeberry juice and 21.0% in the case of blackcurrant. In our research, we investigated the effect of drying at 60 °C and 80 °C and micronization on polyphenolics, minerals and fibre content in dried chokeberry and blackcurrant pomace. The characteristics of the chemical composition of the micronized preparation of chokeberry and blackcurrant pomace confirmed that these products are an excellent source of fiber, as well as minerals, which also gives them high nutritional properties. Additionally, the micronized preparation of blackcurrant pomace is rich in L-ascorbic acid (vitamin C). Products made from dried chokeberry and blackcurrant pomace may be interesting for use in food, pharmaceutical and cosmetic products.

Key words: chokeberry *Aronia melanocarpa;* blackcurrant; *Ribes nigrum*; pomace by-products; bioactive chemical composition; fibre; micronization

Green Chemistry and Sustainable Food Processing

Flash presentations

The proximate composition, mineral and pectin content and fatty acid profile of the pomace fraction of 16 rowanberry cultivars

Viive Sarv, Shehzad Hussain, Reelika Rätsep, Ave Kikas
Estonian University of Life Sciences, Estonia
viive.sarv@emu.ee

The berry pomace could be a potential source for food applications due to its high content of polyphenols, but also dietary fiber, PUFAs and pectin. This is the first study that aims to compare the total dietary fiber (TDF), protein, fat, mineral, pectin and fatty acid content of the following 16 different pomace samples of Sorbus aucuparia L. cultivars (cvs): 'Likernaja', 'Burka', 'Alaja Krupnaja', Granatnaja', 'Rubinovaja', 'Bussinka', 'Vefed', 'Angri', 'Krasnaja', 'Solnechnaja', 'Sahharnaja', 'Oranzevaja', 'Kubovaja', 'Moravica', 'Rosina' and 'Rossica', in order to find new natural materials for valorization. The contents of pectin and dietary fibers were analyzed using the respective Megazyme enzymatic kits. The TDF content was the highest in the pomace samples of hybrid cvs 'Granatnaja' (63.04% dry mass DM), 'Burka' (64.52% DM), 'Rubinovaja' (65.66% DM) and 'Likernaja' (67.17% DM). The pomace of hybrid cv 'Rubinovaja' was distinguished from other samples by its high protein content, cv 'Alaja Krupnaja' by its high pectin content and cv 'Oranzevaja' by its high fat content, which were 7.58% DM, 8.39% DM and 7.47% DM, respectively. The pomace of cv 'Sahharnaja' possessed the highest average macro-element content (1.56 g/kg DM). The average fatty acids profile was characterized by a high content of linoleic acid (51.94%), oleic acid (20.55%) and palmitic acid (12.96%). The lowest n6/n3 ratio was found in the hybrid cv 'Alaja Krupnaja' (6.70%). The data obtained demonstrate that the pomaces of certain cultivars of rowanberry contain significant amounts of valuable components, which can be used in functional food and cosmetic applications.

Key words: rowanberry cultivars; dietary fiber; pectin; minerals; fatty acids

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