ISHS Apricot Plum 2024

April 22-26, Avignon
France

Book of Abstracts

Welcome

> *It is our pleasure to welcome you at the 1st International Apricot Plum Symposium, held under the auspices of the International Society for Horticulture Science (ISH).*

We are glad to organize this first Symposium whose objectives are to establish new links between the Plum, Prune and Apricot communities and consolidate collaborations among participants, bringing together researchers from diverse fields of study, sharing a common interest in apricot and plum industries.

The symposium has been constructed to address three main goals:

- a common identification of the future challenges for the industries: they will be expressed by the invited keynotes,
- the maximization of the exchanges between participants and the integration of the young researchers in the community,
- the maximization of the impact of the research activities for the industries: the visits and meeting with fruit grower's representatives have been integrated to address this objective.

The Symposium ressembles almost a hundred of participants coming from the 5 continents. It is comprised of 8 keynote lectures, 43 oral presentations and 54 posters, organized in 6 thematic sessions plus a specific species session:

1. Orchard management
2. Postharvest and Quality of fresh and processed fruit
3. Pests and Diseases Control
4. Biology and Climate Risk Assessment
5. Genetic Resources, Genetics and Genomics
6. Breeding and evaluation of cultivars and rootstocks

The conference is expected to provide new knowledge and promote scientific dialogues. It will also give the opportunity to scientists, professionals and students to present their latest findings and discuss their current work related to both basic and applied aspects.

We hope the meeting will promote the exchange of ideas and international cooperation and collaboration among researchers to help apricot and plum producers to face tomorrow's challenges.

Jean-Marc Audergon and Bénédicte Quilot
Conveners

INRAE - GAFL, 84143 Montfavet, France

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

INRAE

ISHS

Contents

Program 3

Abstracts by sessions

Introduction 7

Session 1 Orchard management 8

Session 2 Postharvest and Quality of fresh and processed fruit 19

Session 3 Pests and diseases control 28

Plum session 37

Session 4 Biology and climate risk assessment 41

Session 5 Genetic resrouces, Gentics and Genomics 48

Session 6 Breeding and evaluation of cultivars and rootstocks 68

Keynote lectures K
Oral presentations O
Posters P

Sponsors 81

Program

Monday, April 22

16 :00-18 :30	Registration
19 :00-20 :00	**Welcome ceremony at Avignon town hall**

Tuesday, April 23

8 :00	Registration, Welcome coffee, Poster set up, Presentation uploading
9 :00	**Introductory talks** **Christian HUYGHE,** Agriculture Scientific Director, INRAE **Bénédicte QUILOT**, Director of GAFL Research Unit, INRAE
9:20	**Keynote lecture : Christian HUYGHE**, Directeur scientifique Agriculture, INRAE Challenges of tomorrow's fruit arboriculture and how they apply to plum and apricot species [Ki]
9:55	**Keynote lecture: Matthieu SERRURIER**, Economic Studies Department, CTIFL Inventory and socio-economic issues at the National and International level [Kii]
SESSION 1 Orchard management	
10:45	**Keynote lecture: Davide NERI**, Agriculture, Food and Environment, Polytechnic University of Marche How to manage the orchard in a changing climate: new opportunities [K1]
11:30	**Loreto CONTADOR** Effect of intensity of winter pruning on fruit quality and sensory analysis on 'French prune' plum (*Prunus domestica L.*) for fresh market [O1.1]
11:45	**Danilo CHRISTEN** Alternative plant protection strategies in apricot growing from agronomic, economic and environmental perspectives [O1.2]
12:00	**Lunch break – Posters**
13:30	**Jill STANLEY** The relationship between canopy light irradiance, crop load and fruit quality in mature narrow-row planar cordon apricot canopies [O1.3]
13:40	**Karen MESA** Effect of different auxin materials on growth and maturity of 'French' plum (*P. domestica L.*) [O1.4]
13:50	**Clementine JARDON** Agrivoltaic systems, an opportunity to mitigate the risk of climatic hazards in apricot orchards while producing renewable energy [O1.5]
14:00	**Abdullah AL HOSNI** Calcium Supplementation Ameliorates Salinity stress in Apricot trees irrigated with Reclaimed Wastewater: A Case Study on the Fragile Terraces Ecosystem of Al Jabal Al Akhdar, Northern Oman [O1.6]
14:10	**Lindsay BANDA** Gas exchange and water relations of Imperial Apricot (*Prunus armeniaca*) cultivar grafted on Marianna and Apricot rootstocks [O1.7]
14:20	**Ilze GRAVITE** Growing and production of cultivars on rootstock Wangenheim in the Latvian meteorological conditions [O1.8]

SESSION 2 Postharvest and Quality of fresh and processed fruit	
14:45	**Keynote lecture: Jill STANLEY**, Science Group Leader, Plant & Food Research Reducing the risk of consumers experiencing poor apricot fruit quality through orchard and postharvest management [K2]
15:30	**Coffee break – Posters**
16:15	**Séverine GABIOUD REBEAUD** Impact of postharvest ethylene treatment on apricots [O2.1]
16:30	**Irina BACCICHET** Apricot fruit quality: small changes today lead to big achievements in consumers' satisfaction of tomorrow [O2.2]
16:45	**Sylvie BUREAU** Use of a handheld NIR spectrometer for a rapid and non-destructive determination of apricot internal fruit quality in orchards [O2.3]
17:00	**Justine GIROUD ARGOUD** The physico-chemical signatures of apricot reveal a large variability of their processing ability [O2.4]
17:15	**Ingunn OVSTHUS** Possible improvements for European plum fruit for fresh consumption [O2.5]
17:30	**Alvaro DELGADO** Integrating agro-climatic characterization, chill requirements determination and phenological information to assess the adaptability of apricot and Japanese plum cultivars in a climate change context [O2.6]
19:00-20:00	**Visit Palais des Papes**

Wednesday, April 24

8 :00	Presentation uploading
SESSION 3 Pests and diseases control	
8:30	**Keynote lecture** **Cindy MORRIS**, Plant Pathology, INRAE Metamorphosing epidemiological surveillance into a tool for agroecological management of fruit tree health [K3]
9:15	**Nicolas SAUVION** Early monitoring of insect vectors is the cornerstone of ESFY management [O3.1]
9:30	**Jayasankar SUBRAMANIAN** Black Knot resistance in plums: A multi-omic approach to address genetic resistance for an unusual disease [O3.2]
9:45	**Véronique DECROOCQ** Resistance to sharka in wild apricot (*P. armeniaca* L.) natural populations [O3.3]
9:55	**Hedia BOURGUIBA** Dynamics of microbial communities in apricot species related to the identified phylogeographic groups [O3.4]
10:05	**Shadia AL RIJEIBI** Oman Botanic Garden's advancement of IPM and biological control strategies for sustainable pest and disease management in apricots: a case study from the northern biome [O3.5]
10:15	**Coffee break - Posters**

APRICOT AND PLUM SEPARATE SESSIONS	
11:00-12:00	Apricot networking _ *Cellier Benoit XII*
11:00	Plum presentations _ *Chambre du Trésorier*

	Madalina BUTAC The current situation and prospects for plum culture in Romania [Oplum.1]
11:10	**Nebojsa MILOSEVIC** Could the plum cultivar 'Nada' achieve the global importance seen in earlier cultivars from the Fruit Research Institute, Cacak [Oplum.2]
11:20	**Antonieta VERDUGO** Efficacy of 1-aminocyclopropane-1-carboxylic acid (ACC) in the thinning of Japanese plums [Oplum.3]
11:30	**Victor BEYA** Thinning efficacy of 1-aminocyclopropane-1-carboxylic acid (ACC) in Japanese plums [Oplum.4]
11:40	**Enrico LODOLINI** In continuous over-the-row harvesting for *Prunus domestica* in Central Italy [Oplum.5]
11:50	**Luke MILLIRON** Mechanical Pruning Trial after Five Years in 'French' Prune in a California Commercial Orchard [Oplum.6]
12:00	**Lunch break – Posters**
13:15	Departure for technical tour
19:00	Arrival in Avignon
20:00	**Social diner _ Espace Jeanne Laurent**

Thursday, April 25

8 :00	Presentation uploading
SESSION 4 Biology and Climate Risk Assessment	
8:30	**Keynote lecture: Inaki GARCIA DE CORTAZAR ATAURI**, AgroClim Unit Director, INRAE Climate change and perennial crops. Some questions about past and future impacts and adaptation and mitigation strategies [K4]
9:15	**Pavlina DROGOUDI** Historical changes in winter chill and relatedness with apricot bloom and yield, in Northern Greece [O4.1]
9:30	**Erica FADON** Exploring pollen development to detect endodormancy breaking and determine chilling requirements in apricot cultivars [O4.2]
9:45	**Franz NIEDERHOLZER** Seasonal pattern of sink/source limited fruit growth in 'Improved French' prune [O4.3]
10:00	**Coffee break – Posters**
SESSION 5 Genetic Resources, Genetics and Genomics	
10:45	**Keynote lecture: Andrea PATOCCHI**, Head of Fruit Breeding Group, AGROSCOPE Twenty-five years of breeding research in apple: Can the lessons learned be of inspiration to apricot and plum breeding research? [K5]
11:15	**ROUND TABLE**
11:45	**Véronique DECROOCQ** *Prunus brigantina*: the missing link between apricot and plum species? [O5.1]
12:00	**Hedia BOURGUIBA** Evolution of genetic diversity patterns of worldwide *Prunus armeniaca* L. resources [O5.2]
12:15	**Sezai ERCISLI** Wild apricots (Zerdali): High morphological, biochemical and phytochemical diversity [O5.3]
12:25	**Lunch break – Posters**
14:00	**Igor PACHECO CRUZ** Following the track of a genetic variation that drastically modifies the catechin/epicatechin ratio in

	Japanese plum fruits [O5.4]
14:15	**Shuo LIU** Research on the flavor and aroma genetic diversity of Chinese plum based on electronic nose and tongue identification [O5.5]
14:25	**Fengchao JIANG** The evolutionary analysis of the NBS gene family in the genomes of apricot, plum and peach [O5.6]
14:35	**Andrea DE LAS MERCEDES TORRES PUNINA** and **Afif HEDHLY** S-genotyping and de novo assembly of S-alleles in re-sequenced Japanese plum cultivars [O5.7] S-locus identification in 96 European apricot cultivars using a synthetic reference sequence of Parm_S-loci [O5.8]
14:55	**David GERIN-JEAN** Implementation of Marker Assisted Selection: new prospective Insights issued from GWAS approaches for addressing the major traits highlighted by apricot fruit industry [O5.9]
15:05	**Juan SALAZAR** Advanced Genetic Mapping integrating Genotype by Sequencing and QTL identification of phenology and fruit quality traits in Apricot Progenies [O5.10]
15:15	**Marie SERRIE** Investigating the multi-disease challenge in apricot through single and multi-environment genome wide association studies [O5.11]
15:25	**Coffee break - Posters**
SESSION 6 Breeding and evaluation of cultivars and rootstocks	
16:15	**Keynote lecture: David RUIZ,** Department of Plant Breeding, CEBAS-CSIC Apricot and plum breeding challenges [K6]
17:00	**Ted DE JONG** Forty years of prune breeding at UC Davis [O6.1]
17:15	**David TRICON** Ideotyping: a new approach already developed for maximizing the impact of the research activities conducted on apricot in France [O6.2]
17:30	**David KARP** Commercial cultivation in California and volatile components of 'Green Gage' plum (*Prunus domestica* L.) [O6.3]
17:45	**Michael NEUMULLER** Breeding for special traits in European plum by intra- and interspecific hybridization [O6.4]
18:00	**Ted DE JONG** ISHS presentation Awards, Next meeting choice, Conclusions
18:45	End of day

Friday, April 26

7:30	Departure for day tour
9:30	SEFRA The fruit experimental station Auvergne Rhône-Alpes
11:00	**Transfer**
11:45	Agricultural high school Lycée Agricole du Valentin Round table
13:15	**Lunch break and transfer**
14:45	INRAE UERI Gotheron _ Visit of experimental fields
15:45	**Transfer**
16:45	Visit of Chateau de Grignan
19 :00	Arrival in Avignon

P2.1
The effect of processing conditions on yield and quality of purees and juices of plums (*Prunus domestica*, cv. Jubileum)

Kjersti Aaby, Nofima, The Norwegian Food Research Inst., Osloveien 1, 1430 Aas, Norway; kjersti.aaby@nofima.no

In Norway, plums are mainly used for fresh consume and fruits not having the quality required for fresh consume are discarded. To process these plums into food products will be good for the environment and for the economy of the producers. The aim of this study was to obtain knowledge about the opportunities and challenges of processing plums through testing of different processing alternatives. Plums, fresh or frozen, were subjected to heat-treatment (50 or 85 °C) or heat-treatment followed by treatment with pectinolytic enzymes prior to pressing or sieving to obtain juices or purees. The puree yields were 53 – 95% depending on pre-treatment. The juice yields of pre-heated and enzymatic-treated plums were 42% and 80%, respectively. The purees made of plums heated to 50 °C were darker, had less colour saturation and were more yellowish than the other purees. There was little difference in colour between the purees made from fresh plums and plums blanched (85 °C) before freezing. The puree made from plums blanched after freezing, however, had lower colour saturation and a more yellow colour. There was small difference in lightness and hue of freshly prepared and stored juice, while colour saturation decreased upon storage. The juice made from plums blanched before freezing had similar anthocyanin content as the juice made from fresh plums, while juice made from plums heat-treated after freezing had about 20% lower content. After 3 months of storage at room temperature, the anthocyanin content was approximately the same in all juices and only about 1/3 of the content in freshly prepared juices. In conclusion, plums must be blanched before further processing to obtain high product yields, and to preserve anthocyanins and color. The use of processing enzymes (pectinases) was necessary to get high juice yields.

P2.2
Improving the aroma of plum spirit obtained from small fruits of cv ‘Čačanska Rodna’

Branko Popovic, Fruit Research Institute, Kralja Petra I 9, 32000 Cacak, Serbia; popovicb@ftn.kg.ac.rs
Olga Mitrovi263, Kralja Petra I9, 32000 268a269ak, Serbia; omitrovic@institut-cacak.org
Aleksandra Kori263anac, Kralja Petra I9, 32000 268a269ak, Serbia; akoricanac@institut-cacak.org
Aleksandar Leposavi263, Kralja Petra I9, 32000 268a269ak, Serbia; aleksandarleposavic@yahoo.com
Darko Jevremovi263, Kralja Petra I9, 32000 268a269ak, Serbia; darkoj@ftn.kg.ac.rs
Ninoslav Niki263evi263, Nemanjina 6, 11080 Beograd, Serbia; ninoslavyug@yahoo.com
Vele Teevi263, Studentski trg 12-16, 11000 Beograd, Serbia; vtesevic@chem.bg.ac.rs

‘Čačanska Rodna’ is very fruitful and has a tendency to overcrop. Therefore, for its successful growing, pruning is recommended as a mandatory measure. Regardless of the pruning intensity, a larger or smaller proportion of small fruits (< 25 g) are always present on the tree. Due to their small size and inappropriate color, such fruits are not suitable for drying, fresh consumption and freezing. In Serbia, such small fruits are used for the production of plum spirit. The traditional method of plum spirit production includes crushing the fruits and spontaneous fermentation of the mash with stones, followed by double distillation, which results in overexpressed and often unpleasant stone-like aroma and, in the case of long and inadequate storage of the fermented mash, an acidic taste of plum spirit too. The aim of the study was to examine whether modifications of traditional plum spirit production method, which include a shorter storage time of the fermented mash, removal the stones

before alcoholic fermentation, pulping of fruits and use of selected yeasts, can improve the smell and taste of plum spirit obtained from small fruits of cv 'Čačanska Rodna'. The plum spirits obtained by six different processing methods, including the traditional one, differed significantly in terms of the contents of 21 out of the 24 volatile compounds, as well as of sensory ratings. The plum spirit produced from the mash of crushed stoneless plums, spontaneously fermented and distilled immediately after finished alcoholic fermentation was evaluated with the highest sensory score, even higher than the plum spirits obtained by the most commonly used method in modern distilleries today (spirits from the pulped stoneless plums, fermented with selected yeasts and distilled immediately after finished fermentation). By choosing adequate processing method, excellent quality plum spirit can be obtained even from the small fruits of cv 'Čačanska Rodna'.

P2.3
Effects of light on carotenoid biosynthesis and color formation of apricot (*Prunus armeniaca* L.) fruit

Junhuan Zhang, Institute of Forestry & Pomology, Beijing Academy of Agri. & Forestry Sci., Ruiwangfen Jia 12#, Fragrant Hills, Haidian, Beijing, China; zhang_junhuan@163.com

For apricot (*Prunus armeniaca* L.), β-carotene mainly contributed to the flesh color and fruit nutrition. In order to explore the effects of light on carotenoid biosynthesis and color formation in apricot fruits, two color-contrasted apricot cultivars 'Jingluohong' (yellow-fleshed cultivar) and 'Zaoyu' (white-fleshed cultivar) were selected as materials, with three development stages including green fruit with hard kernel (GR); color-turning fruit (CT) and full-ripening fruit (FR). At GR stage, some fruits had been shading with opaque paper bag and removed until one week before full-ripening. The carotenoids in the apricot flesh under different treatments were analyzed by UHPLC-APCI-MS/MS, and a series of crucial enzyme genes involved in β-carotene biosynthesis pathway including genes psy1, lcy-B, lcy-E, nced5, nced1 and ccd4 were detected by using qRT-PCR analysis. The results showed that, at FR stage of fruit ripening, the content of carotenoid, carotene, β-carotene, lycopene and (E/Z)-phytoene in 'Jingluohong' (yellow-fleshed cultivar) flesh decreased significantly after shading. However, once removed the bag used for shading, the contents of total carotenoids and each carotenoid component increased rapidly, even more higher than that in unshaded fruits. In corresponding, the gene expressions of psy1 presented the same variation trend. In contrast with yellow-fleshed cultivar, the contents of total carotenoids and each carotenoid component especially lycopene content in 'Zaoyu' flesh increased significantly after shading, also higher than that in unshaded fruits and bag-removed fruits. The gene expression level of nced5, nced1 and ccd4 were significantly higher than those in other treatment fruits. The expression of lcy-E in unshaded white-flesh cultivar 'Zaoyu' was significantly higher than that in other treatments. These results indicated that the light stimulated the carotenoid synthesis by regulating gene expression in yellow-fleshed cultivar, whereas shading treatment could increase the carotenoid accumulation in white-fleshed apricot cultivar. Which lay the fondation for further study on the improvement of fruit color and nutrition by regulating light conditions in apricot.

P2.4
Fruit quality assessments of organic plums grown in Norway

Mekjell Meland, Nibio Ullensvang, Norwegian Institute of Bioeconomy Research, N-5781 Lofthus, Norway; mekjell.meland@nibio.no
Milica Fotiric Aksic, Faculty of Agriculture, University of Belgrade, 11080 Belgrade, Serbia; fotiric@agrif.bg.ac.rs