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International Sea buckthorn Association (ISA)

Organized by

HIPPOPHAE HELLAS

In Collaboration with

University of Thessaly Dept. Agriculture, Crop Production and Rural Environment

9th INTERNATIONAL SEA BUCKTHORN ASSOCIATION CONFERENCE ISA-2023

SEA BUCKTHORN IN CHANGING CLIMATE CONDITIONS. NEW CHALLENGES, TECHNOLOGIES AND PROSPECTIVES

22-25 MAY 2023

Thessaloniki, Greece

Grand Hotel, (305 Monastiriou str, 546 28)

www.isacongress2023.gr

under the auspices

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Seabuckthorn berries

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Our cultivations located at several regions of Greece and especially in the region of Thessaly, Macedonia and the Peloponnese.

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CONFERENCE ORGANIZATION

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International Seabuckthorn Association(ISA)

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Hippophae Hellas

In Collaboration with

University of Thessaly Dept. Agriculture Crop Production and Rural Enviroment

Under the Auspices

Ministry of Rural Development and Food

Region of Central Macedonia

City of Thessaloniki

SEVE- Greek Exporters Association

INTRODUCTION LETTER

Dear Colleagues and friends,

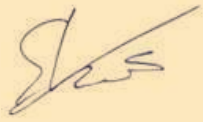
With great pleasure, we would like to announce the **9th International Seabuckthorn Association Conference ISA-2023**, organized by Hippophae Hellas in collaboration with The Agronomic Departments of the University of Thessaly, hosting by International Seabuckthorn Association (ISA). The Conference will be held from 22 to 25 May 2023 at Grand Hotel Palace in Thessaloniki, Greece.

The **Seabuckthorn Conference** is an event for experts, researchers, and stakeholders in the Seabuckthorn industry to come together and discuss the latest developments, innovations, and challenges in this field. According to historical data, Greece is the territory where the origin story of Hippophae came from. Combination of climate conditions and modern approaches in cultivation technologies leads to successful results in Seabuckthorn industry in Greece. Within last several years Seabuckthorn plantations in Greece rise up from mostly nothing to more than 200 hectares, providing both high productivity and unique palatability. The conference will cover a range of topics, including Seabuckthorn cultivation, processing, and product development, as well as its applications in food, medicine, cosmetics, and other industries.

Your participation will provide a valuable contribution to the discussions and will provide a great opportunity for you to network with other professionals in the industry.

The conference promises to be an exciting and informative event, and we would be honored to have you as a participant.

Kind Regards,



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Master of Science in Technical Physics

XATZIKONSTANTINOU BOUZALAKOU CHRISTINA
Construction Manager of Hippos Energy

ZHANG YUMEI
Professor, Peking University

GENERAL INFORMATION

Conference Dates
Monday 22 May 2023
Tuesday 23 May 2023
Wednesday 24 May 2023
Thursday 25 May 2023

Conference Venue
Grand Hotel Palace
Garden Hall (Ground floor)
Address: Monastiriou 305 str, 546 28, Thessaloniki, Greece | T: +30 231 549000

Organization
The Conference is organized by Hippophae Hellas SA, in collaboration with University Of Thessaly Dept. Agriculture, Crop Production and Rural Environment

Hosting
The Conference is hosted by The International Seabuckthorn Association (ISA)

Conference Language
The official language of the Conference is English. No simultaneous translation will be provided

Session currency
Local Currency is Euro (€)

Conference Website & Registration
www.isacongress2023.gr

Badge Identification
Registration badges will be used during the Conference. Participants will receive their badges upon check-in on arrivals day. Participants are requested to wear their badges at all times. Admission to Conference areas will not be allowed without badge identification

Registration Fees

Category	
Commercial	350,00 €
Scientific	300,00 €
Students	150,00 €
Accompanying person	150,00 €

- *For Scientific/Students participants, VAT (24%) included in the registration fee.*
- *For commercial European participants with VAT Vies, VAT (24%) included in the registration fee.*
- *For commercial participants not belonging to E.U.,VAT (24%) will be added at the final invoice.*
- *For commercial European participants with no VAT Vies, VAT (24%) will be added at the final invoice.*
  **Based on applicable VAT prices*
- *No cancellation is possible. Registration fees are non-refundable.*

***Registration Fee Includes**: Conference Registration / Admittance to all theoretical scientific sessions / Conference documentation / Certificate of Attendance/coffee break/lunch/dinner/technical visit to Chalkidiki*
***For Accompanying persons registration fee includes**: coffee break/lunch/dinner /technical visit to Chalkidiki*
***Not includes**: Admittance to all theoretical scientific sessions / Conference documentation / Certificate of Attendance.*

Exhibition
During the Conference an exhibition will be organized by the sponsor companies

Conference Organization Office

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- Planning of facilities - infrastructure and planting
- Construction of infrastructure and facilities
- Implementation of required operations with company personnel
- Cultivation certifications
- Mechanical collection

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PROGRAM 22-23 MAY 2023

Monday 22 May 2023

17:00-20:00 Registrations

20:00 Dinner

Tuesday 23 May 2023

09:00-10:30 Opening Ceremony-Greetings

Chairman:
Lu Shunguang (Secretary General of ISA, members of ISA Board and SCISA)
Nikolaos Doukas (General Manager of Hippophae Hellas)

Welcome speeches by:
Nikolaos Doukas - General Manager of Hippophae Hellas
Zhao Dongxiao - President of ISA (3' Recorded Video)
Apostolos Tzitzikostas - Regional Governor of Central Macedonia
Konstantinos Zervas Mayor of city of Thessaloniki
George Nanos - Professor of University of Thessaly
Nikolaos Doukas About Hippophae Hellas

10:30-11:00 Coffee Break

11:00-13:10 Round table I - Keynote Speeches

Chairman: Professor **Yang Baoru**

11:00-11:30 P1. Multi-omics Revealing Lipid Biosynthesis Mechanism of Seabuckthorn Organs
Chengjiang Ruan

11:30-12:00 P2. Investigations on Fungi in Context with Sea Buckthorn Dieback in Northern Germany
Carolin Popp

12:00-12:30 P3. Development of Several New Sea Buckthorn Beverage.
Yumei Jiang

12:30-12:50 Nagros-Golden food
Konstantinos Kokkinos

12:50-13:10 Hippo Energy
Christina Xatzikonstantinou Bouzalakou

PROGRAM 23 MAY 2023

13:10-14:30 Lunch Break

14:30-18:00 Technical Session I:

Seabuckthorn breeding and cultivation

Chairmen: Professor **Virendra Singh**, Professor **Dalija Seglina**

14:30-14:50 P4. Introduction of China's Main Seabuckthorn Cultivars for Plantations
Lu Shunguang

14:50-15:10 P5. Flight Dynamic and Damage of Seabuckthorn fruit fly Rhagoletis batava Hering, 1958 in Organic Seabuckthorn Orchards in LATVIA
Edite Jākobsone

15:10-15:30 P6. Distribution of Seabuckthorn (Hippophae spp. Linn) in Nepal
Youba Raj Pokharel

15:30-15:50 P7. Development of an integrated approach for mass trapping of Rhagoletis batava in organic seabuckthorn orchards
Małgorzata Tartanus

15:50-16:20 Coffee Break

16:20-16:40 P8. Cross disciplinary research on sea buckthorn plantation in southern and northern Finland
Yang Baoru

16:40-17:00 P9. Seabuckthorn fruit quality from Greek orchards
George Nanos

17:00-17:20 P10. Hippophae (salicifolia, neurocarpa, rhamnoides caucasica, rhamnoides sinensis) and Elaeagnus (angustifolia, umbellata, pungens) seed germination
Hamid Ahani

17:20-17:40 P11. Performance of Russian seabuckthorn varieties during 4 years in Lahaul valley, cold desert of Himachal Himalayas
Virendra Singh

17:40-18:00 P12. Study on Propagation in Vitro of German Cultivars of Sea Buckthorn and Naturalization
Zvaigzne Galina, Thomas Moersel

19:00-20:00 Dinner

20:00-22:00 2023 ISA Board Meeting (Theta Hall)

PROGRAM 24 MAY 2023

Wednesday 24 May 2023

09:30-10:50 Technical Session II -1:

Seabuckthorn nutrition and processing

Chairmen: Professor **Thomas Moersel,** Professor **Bi Yang**

09:30–09:50 P13. Dietary Supplementation of Sea Buckthorn Berry Puree to Subjectswith Hypercholesterolemia: Effects on Plasma Metabolomic Profil and Gut Microbiota
Yang Baoru

09:50-10:10 P14. Combination of Seabuckthorn phenolics and probiotics protect against intestinal inflammation-in vivo studies.
Gargi Dey

10:10-10:30 P15. Chinese Sea Buckthorn Leaves Are Potential Natural Resources of Antioxidants
Wei Juan

10:30-10:50 P16. Seabuckthorn Products – Closer Look on European Community Market
Thomas Moersel

10:50-11:20 Coffee Break

11:20-12:40 Technical Session II-2:

Seabuckthorn nutrition and processing

Chairmen: Professor **Yang Baoru,** Professor **Zhang Yumei**

11:20–11:40 P17. Effect of saliva on the aroma of Chinese sea buckthorn puree P
Li Jixin

11:40-12:00 P18. Prediction of sea buckthorn fruit quality changes during freezing by measuring dielectric properties
Hu Jingming

12:00–12:20 P19. Cold Pressing Separation Method for Extracting Oil from Sea Buckthorn
Zhao Shengchen

12:20-12:40 Chairman Remarks

13:00-14:00 Lunch Break

PROGRAM 24 MAY 2023

14:10-15:30 Technical Session III:

Ecology and Policy

Chairmen: Professor **Ruan Chengjiang,** Professor **Veli Markku Korteniemi**

14:10–14:30 P20. Ecological Study on Three Species of Natural Sea Buckthorn Forests in China
Lu Rongsen

14:30–14:50 P21. Sea buckthorn (Hippophaë rhamnoides L.) - promotion of this crop in Poland
Maciej Dolata

14:50–15:10 P22. Research on Full Valorisation of Sea Buckthorn (Hippophae rhamnoides L.) in Estonia
Reelika Rätsep

15:10-15:30 P23. Seabuckthorn Physiological characteristics in a hot and dry climate(central Greece)
George Nanos

Conclusions

15:45-16:00 Coffee Break

16:00-17:00 Conclusions

Chairman: Professor **Lu Shunguang**

16:00-16:10 Session Remarks from Prof. **Virendra Singh**

16:10-16:20 Session Remarks from Dr. **Thomas Moersel**

16:20-16:30 Session Remarks from Prof. **Yang Baoru**

16:30-16:40 Session Remarks from Prof. **Ruan Chengjiang**

16:40-17:00 Final remark from Prof. **Lu Shunguang** on ISA-2023

Conclusion

17:00-19:00 Closing Ceremony - Greetings

Presenting Excellent Presentation Award

19:30 -21:00 Dinner

PROGRAM 25 MAY 2023

Thursday 25 May 2023

08:00	Departure from Grand Hotel Palace to Archaeological site of Vergina, visit the Museum accompanied by an English speaking guide and continue our technical trip to Agios Prodromos which is located at the foot of Mountain Holomonta in Chalkidiki. We will visit Seabuckthorn plantations and will discuss about the harvesting methods.
18:00	Return to the Grand Hotel Palace in Thessaloniki
20:00	Dinner

SHENXING
神兴

THE INTRODUCTION OF
HEBEI SHENXING SEABUCKTHORN RESEARCH INSTITUTE

Hebei Shenxing Seabuckthorn Research Institute, started in 1995, located in Shijiazhuang, capital of Hebei Province, which is a technology-based private enterprise dedicated itself in R&D of seabuckthorn series products. The company is engaged in the business of developing seabuckthorn series products, technical services, health food processing and sales.

Since founded, numbers of resident experts enjoyed good reputation in seabuckthorn field who successively hosted the scientific research topics, we established a whole system of seabuckthorn scientific research,formed a good technical inheritance, our young and middle-aged scientific researchers have grown to a new generation of academic backbone.

----Core technology

After more than 20 years of development, the institute has accumulated rich experience in the research fields of beverage, health food and medicine, and has a series of core technologies:

1. Super-critical CO2 extraction,
2. Macro-porous adsorbent resin,
3. Membrane separation.

----All around and deep development of SBT

1.Identification of raw material, the quality test and control of semi-finished products & finished products.

2. Preservation technology for Seabuckthorn raw material
3. Purification technology for Seabuckthorn Flavone
4.Take the lead to achieve binary supercritical fluid extraction of seabuckthorn whole fruit.
5. Take the lead to achieve a new product mainly made from OPC.
6.Cooperation with Hebei Institute for Drug Control, completed the Ch.P 2005 Iof quality standard for seabuckthorn.

On this ground, we successively obtained 26 drug registration licences（there's one State CategoryINew Drug, one State CategoryIINew Drug, two State Category VI New Drug） and 8 health food registration licences (soft capsule, tablet, oral liquid, raw materials cover seabuckthorn fruit oil, seabuckthorn seed oil, flavone, OPC, puree, concentrated juice, etc.), 1 certificate of invention patent for Seabuckthorn Wine. Besides, we also had more than 40 kinds of seabuckthorn scientific research reserve projects and made great records.

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Website：www.seabuckthorn.cn
E-mail: seabuckthorn@vip.163.com

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SHENXING

ABSTRACTS

P1. Multi-omics Revealing Lipid Biosynthesis Mechanism of Seabuckthorn Organs

Chengjiang Ruan , Jian Ding, He Li, Wei Du, Jingbin Li

Institute of Plant Resources, Dalian Minzu University, Dalian116600,China

Abstract:

Oils from sea buckthorn (*Hippophae* L.) fruits are rich in omega-3, 6, 7, 9 fatty acids, flavonoids, vitamin E and other bioactive components. However, seeds of sea buckthorn are very small, with low oil content (7-10%), which leads to seed oil yield is less than 52.5kg per ha; the percentage of palmitic acid in pulp oil of sea buckthorn is up to 39%, which is not good for human health. There were significant differences in the oil contents and the proportion of different fatty acid components between pulp and seeds of seabuckthorn.

The combined methods of RNA-seq and qRT-PCR revealed a coordinated regulation mechanism of multigenes involved in the high accumulation of palmitoleic acid and oil in sea buckthorn berry pulp, in which the continuing high expression of *Δ9D* and the sustained low expression of *KASII* and *FAE1* genes contributed to the enrichment of C16:1 fatty acids in sea buckthorn pulp; the coordinated regulation mechanism of source (*GPD1*) and peel (*DGAT*) genes for lipid biosynthesis in sea buckthorn pulp and seeds. High accumulation of C18 unsaturated fatty acid in sea buckthorn seed oils originates from low expression of *FATB* and *Δ 9D* genes and high co-expression of *KAR*, *KASII*, *SAD*, *FAD2*, *FAD3*, *FAD7* and *FAD8* genes.

The genome size of 'Shiyou 1' was about 1.27G, and the proportion of repetitive sequences was 72.35%. A total of 26429 coding genes were predicted (99.8% of the genes could predict the function). Comparing transcriptomics and co-expression analysis showed main transcription factors involved in regulating lipid biosynthesis in sea buckthorn seeds, suchasABI3, ABI4, AGL15, WRI1, FUS3, SWEET, Dof4, WRKY6, GRF8, etc.

miRNAs involved in gene expression regulation of lipid biosynthesis in sea buckthorn seeds were identified, such as miR164d-*ARF2*, miR168b-*Δ9D*, novel miRNA-108-*ACC*, novel miRNA-23-*GPD*1, novel miRNA-58-*DGAT1* and novel miRNA-191-*DGAT2*; Construction of regulatory network among miRNAs and TFs during sea buckthorn seed developmentwere constructed, such ashrh-miRn215-*WRI1* (c102336_g1_i1) miRn19-*ABI4* (c132411_g1_i1) and hrh-miRn79-*FUS3* (c124799_g1_i2). Hrh-miRn458 regulates oil biosynthesis in pulp and seeds of sea buckthorn via targeting transcription factor WRI1.

LncRNAs involved in the oil synthesis of different organs of sea buckthorn were identified, in which six modules, LINC39069-ath-miR157a-5p-SCL32, LINC35803-ath-miR156i-BH094, LINC20980-ath-miR398a-3p-IDM1, LINC7158-novel_186-ARFI, LINC21206-ath-miR858a-ERF6andLINC45543-novel_226-WRI11, involved in seed development.

Multi-omics data of sea buckhorn provide scientific basics for understanding molecular mechanism of sea buckthorn development and lipid biosynthesis, but also for improvement of high yield and quality of seabuckthorn.

Key words: seabuckthorn; lipid biosynthesis; key genes; miRNA; lncRNA

Chengjiang Ruan (1972-), male, Ph.D, Professor. Mainly engaged in molecular mechanism ofimportant traits, breeding, cultivation, and processing and utilization ofwoody oil trees.

P2. Investigations on Fungi in Context with Sea Buckthorn Dieback in Northern Germany

Carolin Popp[1], Sabine Kind[1], Alicia Balbín-Suárez[1], Falk H. Behrens[2], Michael Fischer[2], Wilhelm Jelkmann[1]

1.Julius Kühn Institute, Institute for Plant Protection in Fruit Crops and Viticulture, Schwabenheimer Str. 101, D-69221 Dossenheim;

2.Geilweilerhof, D-76833 Siebeldingen: Germany

Abstract:

Since recent years sea buckthorn plants (*Hippophae rhamnoides* L) are increasingly affected by dieback symptoms. The cause of final plant death is still unknown. Affected are wild plants along the coastline of the Baltic Sea as well as cultivated plants in plantations resulting in serious losses of up to 100 %. External symptoms comprise wilt, single branches with dried-out leaves and fruits, shoots shrinkage, black-reddish discoloration and lesions of the bark, and discolorations are evident in cross sections of the shoot. A joint-project, HippRham, started in 2020 to reveal the cause of sea buckthorn dieback and to develop possible control strategies.

As result from an extensive isolation approach, *Hymenopleella* and *Diaporthe* were the most frequently isolated fungal genera from symptomatic shoot samples, both not identified in asymptomatic samples. In contrast, *Aureobasidium*, *Cladosporium*, *Alternaria*, *Epicoccum*, and *Penicillium* were identified from both symptomatic and asymptomatic, neighboring, plants. *Hymenopleella* and *Diaporthe*

ABSTRACTS

together with selected potential pathogens according to literature are recently tested in infection trials in the greenhouse.

In addition to the classical isolation approach, a culture-independent sequencing approach was applied to identify potential pathogens that are causing or contributing to the disease including those fungi that are recalcitrant to isolate. DNA extracts generated for 151 shoot, 86 root and 70 soil samples derived from different locations were used for ITS1 metabarcoding. Here we report on results of current research including those of isolation and infection trials together with results of mycobiome analyses.

Key words: *Hippophae rhamnoides* L; dieback; fungi; isolation; mycobiome; metabarcoding; Germany

P3. Development of Several New Seabuckthorn Beverages

Yumei Jiang, Yu Zhang, Yonghao Chen, Yuanyuan Cui, Xiangjin Kong, JuanWei, Jixin Li , Yang Bi College of Food Science and Engineering, Gansu Agricultural University, Lanzhou 730070, Chin

Abstract:

The fruits of Chinese seabuckthorn (*Hippophae rhamnoides* ssp. *sinensis*) are rich inactive ingredients that are beneficial to human health. However, its beverages can be too sour due to high acidity, which negatively affects taste and consumer appeal. To address this, new seabuckthorn drinks using bio-acid reducing, low-acid fruit and vegetable juice, or honey to soften the overly acidic taste of Chinese seabuckthorn, meet current consumer demand for both health and taste.

Schizosaccharomyces pombe is a fission yeast that can reduce the sour taste of beverages by converting malic acid to ethanol and carbon dioxide. The acid reduction process of seabuckthorn pulp with *schizosaccharomyces pombe by* single-factor combined with response surface design to optimize, which was able to reduce 55.11% of total acid and 75.36% of malic acid in Chinese seabuckthorn pulp, while maintaining lower sugar levels and more varieties and content of flavors, without affecting the color qualities in the fermented samples.

Chinese seabuckthorn pulp was used to produce amixed juice with 'Huangguan' pear orcelery. The formulation of two mixed juice was optimized with evaluation indicator from fuzzy mathematical sensory, and the effects of pasteurization and HHP sterilization on the quality of mixed juices were compared and discussed. The results of high hydrostatic pressure (HHP) sterilization showed that HHP did not significantly affect total soluble solids (TSS), total acid (TA) and pH in the mixed juice. HHP-treated samples had higher total phenolic content, better flavour, colour andaroma. However, pasteurisation had a more negative effect on the aroma composition of the samples, with a decrease in linalool and an increase in nonanal, resulting in over cooked and cooking odors.

When seabuckthorn pulp was used to produce mead, which provided a nitrogen source for mead fermentation and improved the fullness, color, and aroma qualities of mead.

Seabuckthorn meads and astragalus seabuckthorn meads were made in the study, and aged using HHP, microwave, and ultrasonic methods. The results showed that allaging treatments improved the physicochemical properties and aroma quality of samples, with HHP-aged samples having the highest ratings for odor, taste, texture, andcolor. HHP-treated samples showed higher CIELAB parameters, total phenol, flavonoid content, and slight changes in TSS and alcohol content compared to SO2-treated samples. The potassium ferricyanide reducing power, DPPH radical scavenging rate, total antioxidant capacity, and content of aroma of the HHP-treated samples increased by32.14%,10.27%,11.54%, and36.63%, respectively. Among aroma compounds, esters, terpenoids, and alcohols were significantly improved by HHP. The increase inethylesters indicates the aging activity of HHP on the seabuckthorn mead. Additionally, PLS-DA analysis showed that the HHP treatment enhanced the fruity, floral, and sweet almond flavors of the samples, indicating an improvement in the aroma quality of seabuckthorn mead.

Key words: Chinese sea buckthorn drinks; *Schizosaccharomyces pombe*; bio-acid reducing; mixed juice; high hydrostaticpressure; seabuckthron mead

P4. Introduction of China's Main Seabuckthorn Cultivars for Plantations

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Abstract:

China has not only discovered and cultivated new species (subspecies) from nature to rationalize the

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classification system of seabuckthorn natural resources, but also greatly enriched the cultivars of seabuckthorn available for artificial cultivation in China by means of "selection, introduction and breeding" for the past 40 years. Those seabuckthorn cultivars include introduced, selected and hybrid ones.

Since 1980s, China has introduced about 50 seabuckthorn cultivars, most of which were from Russia, and only a small part of them were introduced from Mongolia, Germany and some Nordic countries. The Russian macro-fruit cultivars introduced by China are mainly 'Chuyskaya', 'Orangevaya', 'Samorodo', 'Velikan', 'Prevoschodnaya' and 'Solnechnaya', etc., whereas the cultivars introduced from Mongolia are only 'Ulaangom', 'Chandman', etc..

The selection of seabuckthorn cultivars is obtained by selection breeding, including two ways: selection from the excellent types of wild seabuckthorn in China and selection from the offspring (seeds) of the introduced foreign excellent cultivars. Based on the wild resources of *H. r. sinensis*, 'Hongxia', 'Juda', 'Jufeng', 'Fengningxiong', and 'Manhanshanxiong' were selected; and based on 'Chuyskaya' introduced from Russia, 'Liaofu 1', "Zongqiu', 'Baiqiu' were selected, and 'Ulaangom' introduced from Mongolia, 'Wulanshalin' was selected. From Northern Europe material, 'Shenqiuhong', 'Zhunagyuanhuang', 'Wucifeng' were selected.

Among them, the special economic cultivars have increased the weight of 100 fruits by 1~4 times, the fruit yield by 1~2 times, and the yield per *mu* (1 *mu* =1/15hm2) by 1.0~1.5t. There were 4 cultivars reaching the target of thornless selection.

There are about 20 hybrid cultivars of seabuckthorn obtained by cross breeding and promoted in production in China. Most of the cultivars are Mongolian-Chinese seabuckthorn hybrid cultivars obtained from interspecific crosses, such as 'Hualin 1', 'Mengzhonghuang', 'Mengzhonghong', 'Dalate', 'Mengzhongxiong', 'Ezhonghuang', 'Ezhongxian', etc..

From the perspective of establishing seabuckthorn industrial material forests or plantations, the suitable seabuckthorn materials in China include both the aforementioned introduced, selected and hybrid cultivars, as well as the elite types of different native resources like *H. r. sinensis*, *H. r. mengolica*, and *H. r. turkestanica*. Among them, the introduced and selected cultivars are mostly macro-fruit ones, and many traits of hybrid ones are between macro-fruit cultivars and native types of common resources. In the specific configuration, appropriate seabuckthorn cultivars should been strictly adapted to the local conditions in China in order to achieve the expected yield and quality of seabuckthorn as well as the ecological benefits.

Key words: seabuckthorn; plantations; cultivars; selection; introduction; breeding

Shunguang Lu (1966-), male, MBA, Professor. Deputy Director of CACSD, Secretary General and Board member of ISA

P5. Flight Dynamic and Damage of Sea Buckthorn Fruit Fly (*Rhagoletis Batava*) in Organic Sea Buckthorn Orchards in Latvia

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Abstract:

Sea buckthorn fruit fly (*Rhagoletis batava*) is a monophagous sea buckthorn fruit pest that has been causing severe economical damage in continental Europe since early 2000s.

Damage has been spreading from European part of Russia in the southwest direction.

Existence of aggressive subspecies originating in central Asia and spreading towards Western Europe is suspected.

To assess flight dynamic of sea buckthorn fruit fly in orchards in Latvia, said flies were trapped using yellow glue traps in various organic sea buckthorn orchards from 2020 to 2022.

In parts of orchards where traps were deployed no chemical control was used. Sea buckthorn fruit flies were counted from detection up to harvest of fruit. Percentage of intact fruit at harvest was determined to assess damage level.

Over three year observation period 2021 stood out as a year of unusually low sea buckthorn fruit fly flight activity. The amount of damage sustained to the crop roughly corresponded to the flight activity in given orchard in a given year. Curiously, in one of the sites low flight activity happened in a year of very poor fruit set, which would have been unfavourable for sea buckthorn fruit fly development. One can suspect that many pupae had entered prolonged diapause because of some climatic cues indicating poor development of host plant. Such adaptation is known to be present in European cherry fly (*Rhagoletis cerasi*).

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When SBFF were present in significant numbers, their flight activity spanned from the first ten day period of July up to unknown point in time after harvest in late August, as sea buckthorn fruit flies were caught up to the last assessment before termination of observations.

Flight dynamic observed did not perfectly match up with the one described in Germany where flight maximum was observed approximately four weeks after the first sea buckthorn fruit flies were caught and overall flight continued for a shorter period of time. In Latvian conditions the flight dynamic of sea buckthorn fruit flies was skewed, most sea buckthorn fruit flies flew relatively early in the season reaching the maximum flight activity just two weeks after emergence, but few flies were detected much later in the season.

Keywords: Tephritidae; fruit flies; insect development; flight dynamic; Latvia

P6. Distribution of Seabuckthorn in Nepal

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Abstract:

The review of herbaria voucher specimens recorded three species of Seabuckthorn in Nepal: *Hippophae salicifolia* D.Don, *H. tibetana* Schlecht and *H. rhamnoides* L. However, the former two species have frequently been collected and reported from the 24 northern mountainous districts. We carried out MaxENT modeling to assess the present and future distribution of these two species. The MaxENT result verified the distribution of species only from 18 districts, resulting in skeptic on its distribution in 24 districts. To appraise the distribution record of the species in country, ground truthing, intensive consultations and field observations are immediate. National level survey of the species' distribution, use and conservation complements the conservation initiatives adopted by the agencies. Precise prediction of the distribution of species using MaxENT, ecological survey and community consultations is useful for decision makers, especially for those whose conservation and management activities range for national level.

Keywords: Seabuckthorn; modelling; mountains; distribution; conservation; Nepal

P7. Development of Integrated Approach for Mass Trapping of *Rhagoletis Batava* in Organic Seabuckthorn Orchards

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Abstract:

The land area planted with seabuckthorn (*Hippophae rhamnoides* L.) has expanded in Poland in the last decade, particularly under organic management, due to increasing demand for berries. This trend has been paralleled by higher occurrence of different plant pests and pathogens, including the seabuckthorn fruit fly (*Rhagoletis batava*), a tephritid species causing important damage as it develops in the berries. In order to develop a strategy for the control of the fruit fly in organic orchards, an initial monitoring was carried out to assess the pest population dynamic in orchards located in different Polish regions, using standard chromotropic yellow sticky traps. Following, trials testing several active substances that could potentially target different phases of the insect biological cycle were tested, without observing a sufficient efficacy. Since tools for mass trapping are not available, trials were carried out testing different kinds of traps, both commercial and homemade, supplied with different attractants that are known to be suitable for other fruit fly species. These included traps with attractants suitable for the cherry fruit fly (*R. cerasi*, *Ceratitis capitate)* as well as supplied with an ammonium phosphate solution. Moreover, trials aiming at optimisation of traps deployment in the orchard in relation to the density and positioning on the tree were also carried out, showing that about 80 traps/ ha were necessary to have a consistent trapping of adults.

As a result of all the trials, a technology able to reduce the damage and, overall, the population size of the fruit fly in organic seabuckthorn orchards, but applicable also to conventional ones, was developed and will be presented.

Keywords : seabuckthorn orchard; *rhagoletis batava;* attractants; biocontrol; mass trapping; monitoring; Poland

P8. Cross disciplinary research on sea buckthorn plantation in southern and northern Finland: the TYRNIRAKI Project

Baoru Yang,* Maaria Kortesniemi, Heikki Kallio

ABSTRACTS

*Presenting author:

The ecological impact of sea buckthorn has been proven by the successful practice of large-scale sea buckthorn plantation in China in combating water and soil erosion. As a country in Northern Europe, Finland has a unique environment with light conditions associated with the high latitudes and temperatures influenced by both the latitude and the Baltic Sea. During the past two decades, University of Turku has performed long-term open field cultivation tests to study the impact of growth environment on the composition of berries and leaves of sea buckthorn by establishing sea buckthorn plantation in southern and northern Finland. The Food Chemistry study is further extended to multidisciplinary research in the TYRNIRAKI Project. TYRNIRAKI aims to investigate the complex interplay of interactions between the sea buckthorn plant and the environment including climate, latitude, soil, and microbe. In southern Finland, sea buckthorn plantations are established in multiple farms situated on the shore of the Gulf Finland of the Baltic Sea. In northern Finland, the most northern sea buckthorn plantation has been established on the bank of the River Teno in Utsjoki. Samples of soil, berries and leaves are collected and analysed annually. Using modern state-of-art analytical methods such as omics technologies, the study will create new findings on the following multidisciplinary scientific questions: 1) the impact of sub-arctic latitude and climate on the biology and biochemistry of sea buckthorn; 2) the long-term effects of sea buckthorn plantation on soil properties including physical properties, nutrients, microbial composition; 3) the molecular mechanisms of the interaction between sea buckthorn and environment leading to the specific outcomes of metabolomics profiles of berries and leaves; 4) the potential of sea buckthorn to reduce and prevent nutrient flow from the farm field to the Baltic sea. Through long-term cross-disciplinary research in TYRNIRAKI, we will improve our understanding on multiple aspects of sea buckthorn in the context of Nordic environment and climate change.

Keywords: Effects on ecosystem, growth latitude, sea buckthorn, soil microbiota, chemical composition, bioactive compounds

P9. Sea Buckthorn Fruit Quality from Greek Orchards

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Abstract:

Sea buckthorn cultivars of Siberian origin are grown in commercial orchards in central Greece, Karditsa region. Cultivation practices are similar between the farms and include weed management without herbicides, light pruning, light fertilization and irrigation (minor quantities until harvest and with various water quantities postharvest during the hot summer period in the area).

Fruit quality of nine cultivars was evaluated at commercial harvest (end of June to early July 2018). Fruit mass ranged from 0.56 (cvs. Zivko and Altayskaya) to 1.29 (cv. Augustine) g/fruit with mean value of 0.80±0.23 g/fruit. Fruit percent dry matter ranged from 17.6 (cv. Essel) to 26.7% (cv. Zivko) depending on the cultivar and cultivation practices, mainly irrigation and fertilization. Fruit % dry matter mean value was 22.65±2.91 with the seven out of the nine cultivars having fruit dry matter >20% . Skin color also differed significantly between the cultivars studied with hue values ranging from 50 (cv. Zivko, reddish color) to 74◦ (cv. Avgustine), thus from reddish to orange-yellowish skin. The skin color also had relatively clear color with Chroma values >54. Soluble solids content (SSC) ranged from 8.1 (cv. Ognivo) to 11.5% (cv. Tsuskaya) with mean value of 10.3±1.01. All but one cultivars had SSC values ≥9.4%, a high concentration compared to internationally published values. Acidity ranged from 1.35 (cv. Tsuskaya) to 2. 14% (cv. Chechek) with mean value of 1.70±0.30. Dry cultivated 'Chechek' fruit was smaller, with higher dry matter, similar SSC and higher acidity compared to irrigated 'Chechek' fruit. Sweetness index (SSC/Acidity) ranged from 4.39 (cv. Ognivo) to 8.53 (cv. Tsuskaya), a wide range but still low for a sweet fresh fruit. 'Tsuskaya' fruit were of good size, color, dry matter and the best sweetness for fresh consumption of all cultivars studied under relatively similar climatic conditions and cultivation practices.

Sea buckthorn fruit quality characteristics could have been affected from irrigation volume applied until harvest (minor quantities) and yield per plant. Overall, sea buckthorn fruit quality from various cultivars of Siberian origin grown in central Greece can be characterized as superior in addition to the early ripening period in the region.

Keywords: *Hippophae rhamnoides*; fruit mass; dry matter; skin color; sweetness

P10. Hippophae (salicifolia, neurocarpa, rhamnoides caucasica, rhamnoides sinensis) and Elaeagnus (angustifolia, umbellata, pungens) seed germination

ABSTRACTS

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Abstract:

This paper was for the first time conducted in a germinator in order to pioneer forest trees (*Hippophae* and *Elaeagnus genuses*) and to determine the percentage and rate of seven type's seed germination. For this purpose, seeds provenance in Iran and China were placed in the research center of Khorasan Razavi state. At the end (25-day) number and percentage of germination, were calculated. Means of germination percent were 92, 3, 89, 94, 0, 4 and 0 of *Hippophae salicifolia*, *Hippophae neurocarpa*, *Hippophae rhamnoides* subsp *caucasica*, *Hippophae rhamnoides* subsp *sinensis*) and *Elaeagnus angustifolia*, *Elaeagnus umbellata*, *Elaeagnus pungens*, respectively. The highest germination rate or total number of germinated seeds per day was observed in *Hippophae rhamnoides* subsp *caucasica*, *Hippophae rhamnoides* subsp *sinensis* and *Hippophae salicifolia*. In order to equal conditions, comparison between seven species in germinator was contacted without any treatment. We found out that treatment is mandatory for *Hippophae neurocarpa*, *Elaeagnus angustifolia*, *Elaeagnus umbellata*, and *Elaeagnus pungens*.

Keywords: Seaberry, Russian Olive, Seabuckthorn, *Hippophae*, Iran, ISA

P11. Performance of Russian seabuckthorn varieties during 4 years in Lahaul valley, cold desert of Himachal Himalaya

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ABSTRACT

Occurrence of thorns, small fruit size and low fruit yield Indian seabuckthorn has been the main constraints in domestication of local seabuckthorn in Indian Himalayas. In order to meet growing needs for raw material for industries, therefore, there was a need to introduce and evaluate mild thorny and high yielding Russian seabuckthorn (*Hippophae rhamnoides* spp. *mongolica*) varieties, which are globally cultivated and domesticate atleast 2-3 exotic seabuckthorn varieties through integration into cropping systems of high altitude cold deserts of Himachal Pradesh and rest of other Himalayan states.

In order to evaluate and domesticate the 2-3 most suitable Russian seabuckthorn varieties having desirable economic characters and adaptation to local conditions, seeds of 10 seabuckthorn varieties of Russian origin, having few thorns, high fruit yield, high oil content, pest/disease free, were imported from Russia in 2013. Seeds of exotic seabuckthorn varieties were imported through NBPGR, New Delhi. Their morphological and biochemical features were taken from Russian institutes. They were sown under nursery conditions in April 2014 at university farm at Kukumseri (2750 m asl) in Lahaul. There was a faster growth of seedlings during second year than the first year of growth (height of plants). After 2 years of growth, most of the varieties showed promising results. However, exotics NX4 (39.8 cm), NX11 (39.7 cm) and NX5 (37.9 cm) showed better growth (height) than others (36.4-31.5 cm) after 2 years of growth under nursery conditions. No diseases/pests were recorded in any exotic under nursery conditions.

After 2 years of growth under field conditions, exotics showed high rates of survival (88-100%) under field conditions. The exotic NX-3 (88.6 cm), NX-7 (72.6 cm) and NX-6 (62.8 cm) showed better growth (height) than others. NX-7 (1.76 cm), NX-11 (1.47 cm) and NX-6 (1.45cm) showed better stem diameter than others. NX-2 (3.5cm),NX-3 (3.5 cm) and NX-6 (3.4) showed better leaf length than others. NX-5, 8 and 6 showed better leaf width than others. Whereas exotic NX-8 (13.63 cm), NX-3 (11.6 cm) and NX-10 (10.6 cm) showed better east spread than others. NX-7 (11 cm), NX-8 (9.7 cm) and NX-10 (9.1 cm) showed better south spread than others. Over all, NX-6, NX-7 and NX-11 showed better growth parameters than others and Drilbu, a local selection. Till now, no exotic have shown occurrence of diseases and pests and thorns. However, further field studies are required for selection of promising 2-3 Russian seabuckthorn varieties.

Keywords: Performance, Russian seabuckthorn, Lahaul valley, cold desert, Himachal Himalayas.

P12. STUDIES ON THE PROPAGATION IN VITRO OF GERMAN VARIETIES OF SEA BUCKTHORN AND NATURALIZATION

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ABSTRACTS

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In the last decades, separate attempts have been made to study the possibilities of clonal reproduction in vitro of sea buckthorn varieties of various geographical origins. Biotechnological methods are used for accelerated reproduction and preservation of valuable agricultural crops. However, the clonal micropropagation of sea buckthorn (Hipopphae rhamnoides L.) is quite difficult due to a number of factors in the form of polyphenol isolation, hidden pathogens in explants, vitrification, and difficulties in rooting. In this regard, the aim of our research was to optimize the cultivation conditions of H. rhamnoides L. ssp. fluviatilis v. Soest in vitro and adaptation of micro-plants to ex vitro conditions. The research was carried out on the basis of the UBF GmbH laboratory on plant varieties Hergo and Leikora. Young vegetative shoots with 1-2 internodes grown in indoor conditions were used as primary explants. The explants were sterilized with meliseptol, 0.1% mercury chloride solution, sodium hypochlorite in combination with Tween 20.

For cultivation, media were used according to the prescriptions of Murasige and Skoog (MS), Gamborg (B5), McCowns Woody Plant (WPM) with the addition of mesoinosite, sucrose, agar and growth regulators, polyvinylpyrrolidone (PVP) 100 mg/l, a mixture of ascorbic and citric acids in a ratio of 1:1.5 – 25 mg/l.

Cultivation was carried out in the mode of a 16-hour day with an illumination of 2.5-3.5 kcd and a temperature of 22 ± 2 °C.

Sea sand was used to root the propagated shoots with subsequent adaptation to soil conditions. Planting in the open ground was carried out in the third year after the adaptation of plants to ex vitro conditions.

As a result of the study, it was noted that the introduction of young shoots of container plants from indoor conditions contributed to high sterility and viability, regardless of the variety and methods of sterilization. There was no growth of explant and development processes on MS nutrient media. On media with a mineral composition according to the WPM recipe, the death of the apex of shoots was observed from the 10th to the 30th day of cultivation. Explants planted on medium B5 were superior in growth and development of other micro-plants, apical and axillary shoots were correctly formed, without signs of vitrification. The optimal combination of benzyladenin (BA) 0.5-2.5 μM, kinetine 0.5 μM and 1-naphthyl acetic acid (NAA) 0.1 μM at the breeding stage allowed to obtain up to 6 micro-gears from one cultivar.

It was found that at the stage of micro-propagation, sea buckthorn shoots actively form the root system. This feature makes it possible to exclude the rooting stage from the technology of clonal micropropagation.

At the stage of transferring microplants into the ground, significant losses of up to 50% were observed, however, seedlings adapted to greenhouse conditions, well tolerated planting in the field and have already wintered 2 winters. The resulting seedlings were well transferred to the open ground, where they successfully grow for 2 years.

Keywords: in vitro, sea buckthorn, clonal micro-reproduction, nutrient medium, growth regulator.

P13. Dietary Supplementation of Sea Buckthorn Berry Puree to Subjects with Hypercholesterolemia: Effects on Plasma Metabolomic Profile and Gut Microbiota

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Abstract

Extensive studies have shown potential protective effects of sea buckthorn berries on the cardiovascular system. However, the mechanisms behind such effects are not well understood. In clinical intervention study, we investigated the impact of dietary intervention with sea buckthorn puree on patients with hypercholesterolemia using non-targeted omics approach, focusing on plasma metabolomics profile and gut microbiota. A total of 56 subjects consumed a daily dose of 90 g sea buckthorn berry puree for 90 days, and plasma metabolomic profile was analysed at different phases after 0 (baseline, Day 0), 45 (Day 45), and 90 days (Day 90) of intervention by using proton nuclear magnetic resonance spectroscopy (^{1}H NMR). Gut microbiota composition was analyzed at the Day 0 and Day 90 by using high-throughput sequencing. The plasma metabolic profile was significantly different at Day 45 as compared to the baseline (Day 0), which was then followed by a clear trend of returning to the baseline metabolomic profile when the intervention

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extended from D 45 to Day 90. Despite this, the levels of several key plasma metabolites such as glucose, lactate, and creatine were lowered at Day 90 compared to the baseline levels, suggesting an improved energy metabolism in those patients. In addition, intervention with sea buckthorn puree enriched butyrate-producing bacteria and other gut microbes linked to lipid metabolisms such as *Prevotella* and *Faecalibacterium* while depleting *Parasutterella* associated with increased risks of cardiovascular disease. The results indicate that sea buckthorn berries have potential in modulating energy metabolism and the gut microbiota composition in hypercholesterolemic patients. The findings of this study shed new lights on the pathways and mechanisms associated with the impacts of sea buckthorn on human metabolism.

Keywords: Gut microbiota, Hypercholesterolemia, *Hippophaë rhamnoides*, Lipid metabolism, Energy metabolism, Plasma, NMR metabolomics, Sea buckthorn puree,

P14. Combination of Sea buckthorn phenolics and probiotics protect against intestinal inflammation-*in vivo* studies

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Dietary polyphenols and probiotic bacteria are two of the most potential bioactive components known to influence human gut health. The reciprocal interaction of probiotic strains and polyphenols appears to have an additive or synergistic effect on host health. Coupling of polyphenols with probiotic bacteria, with synergistic benefits of both bioactive components can be considered as a promising approach in the management of a number of gastrointestinal diseases. The present work was conceptualized keeping in view this two-way interaction between probiotics and dietary polyphenols.

The aim of the current study was to develop probiotic-fortified, sea buckthorn-based functional beverage that would effectively eliminate or render protection against intestinal inflammation.

The effects of malt supplemented sea buckthorn juice (SBT+M), on the protective and *in vivo* anti-inflammatory effect of *Lacticaseibacillus rhamnosus* GG (LR) against intestinal inflammation using the trinitrobenzene sulfonic acid (TNBS) induced colitis models were investigated in zebrafish (*Danio rerio*). Fishes were fed with the standard fish pellets coated with the experimental beverages twice a day for 30 days. Intra rectal administration of 170mM of TNBS was conducted to develop TNBS-induced colitis. The zebra fishes were sacrificed and intestinal tissues were stored for further assessment. Administration of the test beverages attenuated several effects of TNBS-induced colitis, including disrupted intestinal barrier integrity, impaired tissue anti-oxidant status and expression of colitis associated pro-inflammatory markers. The results reveal that SBT+M+LR had a significant protective effect against mucosal damage, as demonstrated by a reduction in histopathological score. SBT+M+LR exhibited remarkable anti-oxidant properties by increasing the activity of the CAT, SOD, GPx, and GSH enzymes, which were impaired due to TNBS administration. SBT+M+LR treatment substantially prevented toll-like receptor (TLR)-2, TLR-4, and TLR-5 expression in the colon. Inflammatory mediators (NF-κB, TNF-α, IL-1β, IL-6, IL-8, CCL20, MPO and MMP9) as well as anti-inflammatory cytokine (IL-10) were measured in colonic tissue. Administration of the test beverage resulted in a decrease of NF-κB, TNF-α, IL-1β, IL-6, IL-8, CCL20, MPO and MMP9 and an increase of IL-10 expression. The protective impact of SBT+M+LR confirms that SBT phenolics play a supporting role in improving the immunomodulatory activities of LR *in vivo*. These findings provides insight into the mechanisms involved in modulating inflammatory cytokines by synergistic probiotic-phenolic combinations vs individual components in the treatment of experimental colitis. In addition, the current study emphasizes the importance of SBT+M as a carrier matrix for LR in order to retain and enhance its functional potential against experimentally induced colitis.

Future research efforts should be focused on designing tailored and technologically possible non-dairy products that target specific diseases along with meeting market needs.

P15. Chinese Sea Buckthorn Leaves - Potential Natural Resources of Antioxidants

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Abstract:

Chinese sea buckthorn (*Hippophae rhamnoides* ssp. *sinensis*) is a subspecies of *H. rhamnoides* L. and is widely distributed in Eurasia. It is also the most

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important subspecies of sea buckthorn in China, covering about 85% of the total area, and its leaves are rich in antioxidant compounds. In this study, we compared the antioxidant components of Chinese sea buckthorn, Tibetan sea buckthorn *H. tibetana* and 'ShenQiuHong'berries and leaves. The purified ethanol extract (PEE) of Chinese sea buckthorn leaves was determined by ultra high performance liquid chromatography-tandem mass spectrometry UHPLC-MS . The *in vitro* and cellular antioxidant activity and the effect of PEE on the life cycle of *Caenorhabditis elegans* were further investigated. The results showed that more VE, carotenoids, polyphenols and flavonoids were present in Chinese sea buckthorn leaves, which were at least 5-fold, 11-fold and 7-fold higher than those in the berries. In addition, Chinese sea buckthorn leaves have the highest Vc, VE, carotenoids, phenolics and flavonoids among these three leaf types.

And PEE contains high levels of quebrachitol, isorhamnetin-3-O-glucose-7- O-rhamnoside, kaempferol-3-O-sophorabin-7-O-rhamnoside, quercetin-3-O-rutoside at 15.6 mg/g, 11.41 mg/g, 8.61 mg/g and 8.41 mg/g respectively. PEE effectively scavenged 1,1-diphenyl-2 -trinitrophenylhydrazine (DPPH) free radicals with a 50% inhibitory concentration (IC50) of 0.123 mg·mL-1, which was 1.28 greater than the positive control Trolox. In addition, PEE showed comparable ferric reducing antioxidant power (FRAP) and oxygen radical absorbance capacity (ORAC) to Trolox. It also exhibited high cellular antioxidant activity in HepG2 cells. In addition, PEE significantly prolonged the average lifespan of *C. elegans*, reduced the level of lipofuscin accumulation, improved its motility and stress resistance, without significantly affecting reproductive ability. Further research showed that PFE significantly increased the activities of catalase (CAT) and superoxide dismutase (SOD) in *C. elegans*, reduced the levels of reactive oxygen species (ROS) and malondialdehyde (MDA). Taken together, Chinese sea buckthorn leaves have a much higher content of VE, carotenoids, polyphenols and flavonoids than berries and other sea buckthorn leaves. In addition, Chinese sea buckthorn leaves are rich in quebrachitol and flavonoid glycosides, exert potent antioxidant activity *in vitro* and in cells, and prolong the lifespan of *C. elegan*. This study could provide the theoretical basis for the development of Chinese sea buckthorn leaves as a natural resources of antioxidant dietary supplements used in the food industry.

Key words: Chinese sea buckthorn; leaves; antioxidant compounds; antioxidant activity; anti- aging activity

Juan Wei (1982-), male, Ph. D, Associate Professor. Mainly engaged in functional components and nutrition of seabuckthorn.

P16. Seabuckthorn Products – Closer Look on European Community Market

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Abstract:

The European sea buckthorn market is characterized by many differences. The cultivation is predominantly ecological and the products themselves represent a niche product. As a result, consumers place special demands on sea buckthorn products in terms of quality. Sea buckthorn is perceived by the public as a particularly healthy food. In connection with this, it is expected that these products are free from undesirable accompanying substances, contaminants and additives.

During the routine examination of raw materials, semi-finished products and finished products, we found to varying degrees that even products that were labeled as ecologically produced are contaminated with residues of pesticides and chemicals. This effect also occurs to a greater extent in the case of imported goods from third countries or other EU member states. As a rule, it can be stated that the residues found are of the order of magnitude that can be attributed to unintentional contamination of the raw materials or the processed products. From our observations, the following categories of substances in particular are to be classified as critical: residues from pesticides, polyaromatic hydrocarbons, plasticizers, chemical starting materials.

Based on the legislation of the European Union on organic farming, we try to determine together with our clients where the substances entered can come from. The following typical ways of contamination are evident for the raw goods that were produced in relatively close proximity to German processing plants:

Contamination by drifts at neighboring conventional farms. In particular, this provides explanations for contamination with pesticides.

Previously unexplained contamination with polyaromatic hydrocarbons. So far we have not been able to establish any connection with processing technology, location or other parameters.

Plasticizers and other chemicals used in the cleaning or manufacture of items that come into contact with the

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product. A risk position arises here, particularly when using plastics for storage or transport.

Entries of unknown type of chemicals. The contamination of former chemical sites, military training areas and open- cast lignite mines, including the associated power plants, plays a decisive role here, particularly in eastern Germany.

If one evaluates the found experimental data, one sees that a relevant toxicological risk does not exist. On the other hand, one has to admit that exposure to these substances is undesirable from the consumer' s point of view and therefore does not improve the reputation of sea buckthorn products.

Key Words: European seabuckthorn products; routine examination; organic production

P17. Effect of saliva on the aroma of Chinese sea buckthorn puree

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Abstract:

The flavor quality of sea buckthorn puree is important. However, aroma perception during eating is a complex process. In this study, sea buckthorn puree was added to water, saliva or artificial saliva (two types of artificial saliva, one with α-amylase and one without). The aroma components of Chinese sea buckthorn (Hippophae rhamnoides ssp. sinensis) fruit puree were analyzed by headspace (HS) solid-phase microextraction (SPME) and gas chromatography (GC-MS). The results showed that 89 kinds of aroma components were identified in the puree, including 27 hydroxyl compounds (11 monoterpene alcohols, 2 aromatic alcohols and 2 phenols), 7 aldehydes (2 monoterpene aldehydes), 6 ketones (2 sesquiterpene ketones, 1 monoterpene ketones), 23 esters (4 aromatic esters), 16 alkanes (5 sesquiterpenes), 7 acids and 3 aromatic hydrocarbons (1 sesquiterpene). When the puree was reacted with saliva or artificial saliva, many new compounds were formed and some disappeared. Some flavors can be converted into 31 new compounds by saliva in the oral cavity. 4-Methyl-undecane, α-phellandrene and E- 6,10-dimethyl-5,9-undecadien-2-one were formed only after the addition of artificial saliva (no alpha-amylase added). 22 new flavors were formed after the addition of artificial saliva (α-amylase added). And 17 new aromas were formed only after the addition of α-amylase, including 7 aromatic compounds (72.65% of the total). It was interesting to note that E-1-(2,6,6-trimethyl-1,3-cyclohexadien-1-yl)-2-buten-1-one, phenol and (trans)-linalool oxide (pyranoid) of the 17 aromas were formed after the addition of human saliva. Aromas converted by saliva were mainly identified as alcohols, terpenes, aldehydes, esters and acids. Carbonyl compounds were the most abundant flavors, accounting for 93.34% of the total 17 flavors. Taken together, the flavor components of Chinese sea buckthorn puree changed significantly during salivation. These results provide the basis for the extensive use of sea buckthorn fruit in food processing and food flavor research.

Key Words: Seabuckthorn; puree; aroma; retronasal; saliva

P18. Prediction of Sea Buckthorn Fruit Quality Changes During Freezing by Measuring Dielectric Properties

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Abstract:

Sea buckthorn berries were often preserved by freezing prior to processing, and the quality of the fruits deteriorated with prolonged storage. Determination of dielectric properties was a non-destructive testing technique that can predict changes in fruit quality during freezing, but how the quality and dielectric properties of sea buckthorn fruits change during freezing and their interrelationships have not been reported.

In this study, the relationship between quality attributes and dielectric parameters of sea buckthorn fruit (*Hipophae rhamnoides* L.'Shenqiuhong') was determined at different freezing temperatures (-13, -30, -35 and -40 oC) and different freezing times (15, 30, 45, 60, 75 and 90 d).

The results showed that the water content (WC), the content of total soluble solids (TSS), soluble sugars (SS), titratable acids (TA), ascorbic acid (AA), total flavonoids (TF) and total phenolics (TP) of fruits decreased faster with longer freezing time and higher storage temperature. At the same detection frequency, the values of parallel equivalent capacitance (Cp), complex impedance (Z), susceptance (B), conductance (G), parallel equivalent reactance (X) and parallel

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equivalent inductance (Lp) of fruits decreased, while the values of parallel equivalent resistance (Rp), quality factor (Q) and dielectric loss coefficient (D) increased with increasing freezing time. The values of nine dielectric parameters of the fruits increased with decreasing temperature.

Principal component analysis showed that two principal components could represent the dielectric parameters of frozen sea buckthorn fruits, and the accumulated variance contribution rate was more than 80%.

Grey relation analysis can also determine the characteristic frequencies of the best dielectric parameters corresponding to each quality attribute of fruits during freezing.

The coefficient of determination of the TP prediction equation was greater than 0.7, the coefficient of determination of the WC, SS, TA, AA and TF prediction equations was greater than 0.6, and the coefficient of determination of the TSS prediction equation was greater than 0.5.

The validation results for 90 days of freezing showed that the mean relative errors between predicted and measured values for WC, TSS, SS1C, TA, AA, TF and TPC were 2.44%, 3.39%, 2.38%, 15.81%, 10.16%, 24.01% and 4.81%, respectively.

The average relative error between predicted and measured values of TA, AA and TFC was greater than 10%, which was not good, while the average relative error between predicted and measured values of WC, TSS, SS and TP was less than 5%, which was good. In conclusion, the WC, TSS, SS and TP of sea buckthorn fruits during freezing can be predicted by measuring the dielectric properties.

Key words: sea buckthorn; frozen storage; quality attribute; dielectric property; prediction Jingming Hu (1975-), male, Associate Professor. Mainly engaged in harvesting, processing of seabuckthorn

P19. Cold Pressing Separation Method for Extracting Oil from Sea Buckthorn Fruits

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Abstract:

This thesis presents a comparative study of the cold pressing separation method for extracting oil from sea buckthorn. The study aimed to review the effectiveness of the cold pressing separation method in extracting oil from sea buckthorn fruit, as well as to assess the quality and nutritional value of the resulting oil.

The study involved the following steps: (1) Fruit preparation, (2) crushing, (3) pressing, and (4) separation.

The results of the study showed that the cold pressing separation method was an effective method for extracting oil from sea buckthorn fruit. The oil yield obtained from the cold pressing separation method was comparable to that of other extraction methods, such as solvent extraction and supercritical fluid extraction. The resulting oil was also found to be of high quality, with a bright orange color, characteristic sea buckthorn flavor, and high levels of nutrients, such as carotenoids, tocopherols, and phytosterols.

In conclusion, the cold pressing separation method is a promising method for extracting oil from sea buckthorn fruit, which has several advantages over other extraction methods. The method is environmentally friendly, does not require the use of chemicals or solvents, and preserves the natural taste, aroma, and nutritional value of the oil. The findings of this study contribute to the growing body of knowledge on the cold pressing separation method and its potential applications in the food industry.

Key words: cold pressing separation method; extracting fruits oil; nutritional value; sea buckthorn

P20. Ecological Study on Three Species of Natural Sea Buckthorn Forests in China

LU Rong-sen WU Xiao-gang ZHU Dalin LU Shu

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Abstract

China is the country with the most abundant sea buckthorn resources in the world, occupying the first place in terms of area and species There are still a large number of seabuckthorn primitive wild forests in northwest and southwest of China. It is very important to study their living condition and function in forest ecosystem. In the wild population of *Hippophae*, *Hippophae rhamnoides subsp. sinensis*, *Hippophae rhamnoides subsp. yunnanensis* and *Hippophae rhamnoides subsp. gyanzensis* have relatively large natural forest populations. *H. rhamnoides subsp. sinensis*, is the largest and most widely distributed species of *Hippophae*. In the Four Giels Mountain National Nature Reserve of Xiaojin County, Sichuan, the total area of Seabuckthorn forest is about 50,689 mu

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(about 3,379.3 hectares), accounting for 12.49% of the total vegetation coverage area. It is an important part of the forest ecosystem in the reserve. The study found that the highest altitude of sea buckthorn distribution in China is 4070 meters, among which there are a large number of ancient trees, more than 100 years of trees estimated to be thousands. The largest tree is about 321 years old. Therefore, both the area and the number of the oldest trees of the natural sea buckthorn forest in the Four Girls Mountain National Nature Reserve in Xiaojin County of Sichuan exceed that of the seabuckthorn forest in Yunnan and in Tibet. A large number of birds live on seabuckthorn fruit in the *H. rhamnoides subsp. sinensis*, forest in winter. So far, the *H. rhamnoides subsp. sinensis* forest has been concentrated in contiguous patches with good growth and normal results. It is the largest and best preserved natural forest of *H. rhamnoides subsp. sinensis* in the world. It has high scientific value, ecological value, cultural tourism value, worthy of all levels of competent departments in the government and all the people to protect it.

Key words: *H. rhamnoides subsp. sinensis*; *H. rhamnoides subsp. yunnanensis*;; *H. rhamnoides subsp. gyantsensis*; Distribution pattern; The oldest trees; The Largest natural forest

P21. Sea Buckthorn - Promotion of This Crop in Poland

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Skierniewice;

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Abstract:

Sea buckthorn has been experiencing a renaissance in Poland. In 2022, sea buckthorn consumption in Poland increased by 38%. Growers, processors and scientists were involved in its promotion. The popularization of sea buckthorn in our country is part of a wider promotion of berries, fruit and vegetables. Berries are promoted (positioned) as "Polish superfruits". Fruits and vegetables are promoted as the basis of everyday nutrition, as "half the battle". Sea buckthorn is among the three most anticipated berry crops of 2022. Among the species gaining in popularity, only haskap and Polish minikiwi were more popular in last year.

The number of sea buckthorn consumers in Poland increased from over 2,5 million to 3,5 million in 2022. Consumption of sea buckthorn preserves before the season was declared by 8%, and after the season by 11% of the population aged 15+. This means an increase in the number of consumers by nearly one million, i.e. by 38%. Sea buckthorn in Poland is positioned as a "golden defender", "No. 1 among superfruits". Sea buckthorn fruit as one of the most nutritious and rich in vitamins. The high content of vitamin C, antioxidants and other health-promoting compounds makes sea buckthorn considered a functional food. Specialists emphasize that it contains ten times more vitamin C than lemon and preserves it in products.

Sea buckthorn juice may support chemotherapy, reduce the risk of heart disease. Sea buckthorn oil provides all four omega fatty acids. It is rich in many nutrients. Sea buckthorn contains over 190 health-promoting compounds beneficial for the proper functioning of the human body, including vitamins (B, C, F, K, P, A, D, E), anthocyanins, flavonoids, fatty acids.

It also contains significant amounts of iron, calcium, magnesium, potassium, copper and zinc. It is full of antioxidants, hence the promoted term - "microphytopharmacy". In Polish realities, sea buckthorn fits very well into the whole group of berries, superfruits, such as chokeberry, cornel, haskap, blueberry or blackcurrant.

The revival of interest in sea buckthorn motivates our producers. In Poland, a small group of producers of these fruits has been working in close cooperation for years. They deal with the production and processing of sea buckthorn fruit, the development of technology and its improvement. As a result of 30 years of work, with the support of several research centers, we have a range of preserves in Poland. The most popular sea buckthorn preserves include juices, jams and oils.

The consumption of berries is increasing due to the growing awareness of the advantages of the whole group of species (the so-called superfruits). The pandemic has clearly increased health awareness. Currently, the market in Poland is expanding with species such as sea buckthorn, haskap, minikiwi or cornel. Kantar Public's research places them among the most anticipated berry fruits. Seasonal consumption of these fruits often exceeds pre-season declarations. This proves the high dynamics of interest growth.

Key words: sea buckthorn; nutritional and health benefits; promotional campaigns; superfruit; Poland

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P22. Research on Full Valorisation of Sea Buckthorn (*Hippophae Rhamnoides* L.) in Estonia

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Abstract:

Sea buckthorn (SBT) is very common and widely cultivated fruit crop in Estonia. Especially, the organic SBT has an important share in the fruit production, and this is because until recent years, there have been no significant pests and diseases in our climate conditions. Recently, the SBT fruit fly has spread from southern parts of the world to northern SBT cultivation areas, including Estonia, causing remarkable loss of fruit yield and quality.

The study on methodologies of raw material-specific processing of SBT fruits and harvest side-streams, and possibilities of complete valorisation was conducted at the Polli Horticultural Research Centre of Estonian University of Life Sciences, Estonia. First, the proportion of fruits and harvest side streams, like leaves and branches of three organically grown SBT cultivars (Botanitsheskaya, Maria, Tatyana), was calculated. In addition, the damage of SBT fruit fly was evaluated.

The average fruit weight was determined, antioxidant activity and the content of total polyphenols (spectophotometric methods), carotenoids and tocopherols (using HPLC method) were analysed. The microencapsulation by spray drying of bioactive compounds from SBT pomace and juice was carried out, also the SBT pomace powder was used in meatballs (dried and ground pomace with seeds) for creating value-added minced meat product. In addition, the possibilities of using the leaves of SBT for animal feed additives were considered for full valorisation of SBT.

Key words: sea buckthorn cultivars; bioactive compounds; pomace; leaves; encapsulation; full valorisation; Estonia

P23. SEA BUCKTHORN PHYSIOLOGICAL CHARACTERISTICS IN A HOT AND DRY CLIMATE (CENTRAL GREECE)

George D. Nanos, Persefoni Maletsika

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Various sea buckthorn Siberian cultivars are being cultivated in the hot and dry central Greece over the last decade. Many farmers have planted more than one cultivars and some orchards are not irrigated over the summer period (postharvest). Hippophaes Hellas S.A. was interested to evaluate the heat and drought resistance of each cultivar, so the resistant cultivars should be expanded in future orchards, while actions could be undertaken to reduce stress for the sensitive cultivars. Leaf physiological parameters were evaluated during 2018 at harvest (late June), one month later (late July, but rain events may have modified our results) and late September (after the summer heat and drought stress and going towards leaf senescence). Minolta colorimeter parameter a* (measurement of real green color) was not correlated with chlorophyll content, thus a* values are not useful to evaluate chlorophyll content. Shoot % dry matter (DM) was also evaluated in late September. Irrigated cultivars showed increased shoot DM compared to dry cultivated ones, which possibly means increased productivity for next spring. 'Klavdia' shoots, although well irrigated, had very low shoot DM and low specific leaf weight (SLW) compared to 'Avgustine' and 'Zivko' shoots from the same orchard. In September, 'Klavdia' and 'Tsuskaya' (compared to irrigated 'Chechek' plants) shoots and leaves seemed to be heat stressed (although irrigated) and the plants were not well prepared for next growing period. Lack of irrigation over the summer decreased SLW but did not affect chlorophyll content in September. Late July, due to lack of fruit ('sinks') and due to abnormal rain events, leaves showed increased SLW without a clear change in chlorophyll content. 'Altayskaya' leaves came from an orchard growing in a cooler environment and they were senescing since late September. In conclusion, various cultivars withstand, especially when irrigated, the dry and hot summer of central Greece keeping leaf functions until at least late September and getting successfully prepared for next spring's bloom and growth.

Keywords: Hippophae rhamnoides, specific leaf weight, leaf chlorophyll content, shoot dry matter, Siberian cultivars

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NOTES

NOTES


Serres
Drama
Xanthi
RODOPI
Komotini
EVROS
Alexandroupolis
Kavala
PELLA
Edessa
Kilkis
Florina
Thessaloniki
IMATHIA
Veroia
Kastoria
Kozani
Katerini
Polygyros
CHALKIDIKI
AGION OROS
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THESPROTIA
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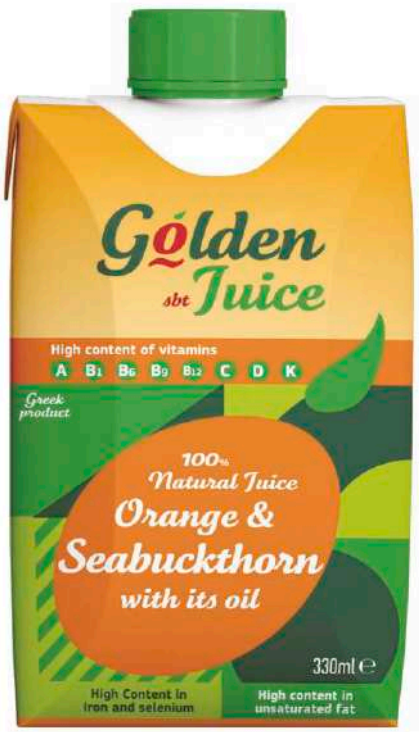
Golden Food



100% natural orange juice and Seabuckthorn with its oil

High nutritional value
Tetra Prisma Aseptic DreamCap 330 ml.
100% Greek product .
No additives and preservatives

Nutritional claims:

- High content in unsaturated fats Ω3 Ω6 Ω7 Ω9)
- High content in vitamins A B1 B2 B6 B9 B12 C D K.
- High content in Fe Se.
- Vegan
- Non GMO

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