ISA 2007

3rd International Seabuckthorn Association Conference

3e Congrès de l'Association Internationale de l'Argousier

Program presentation

Université Laval
Institute of Nutraceuticals and Functional Foods (INAF)

APAQ
L'association des producteurs d'argousier du Québec

Food Development Centre
Growing Opportunities in Food

3rd International Seabuckthorn Association Conference

ISA 2007

is proudly organised by :

Institute of Nutraceuticals and Functional Foods

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The Institute of Nutraceuticals and Functional Foods (INAF) of Laval University leads an innovative multidisciplinary research program on the complex interactions between food components, nutrition and health, and supports the development of safe and effective food products to improve health and prevent disease. INAF creates dynamic synergies between experts from seven major research institutions in Quebec and actively supports networking and collaborative efforts between its members and experts elsewhere in Canada and abroad. Its mission is to generate and apply scientific knowledge with the aim of developing functional foods and nutraceuticals to improve human health through interdisciplinary research, education, technology transfer and communication.

Association des producteurs d'argousier du Québec

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Quebec seabuckthorn growers are part of a dynamic and committed group. Members have access to a multitude of information related to seabuckthorn and its production in Quebec. Moreover, only members may benefit from the results of the promotion program. The Association manages a program aimed at promoting seabuckthorn in Quebec. Throughout this program, members of the association receive privileged information concerning: Network of cultivar trials, Crop management practices, Characterization, valorization and processing of fruits, Mechanization of harvesting practices.

Food Development Centre

Box 1240, 810 Phillips Street, Portage la Prairie, Manitoba R1N 3J9
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The Food Development Centre (FDC) conducts applied contract research and development for the agri-food industry in the area of product and process development, including development of functional foods and nutraceuticals. FDC has a federally (Canadian Food Inspection Agency) licensed pilot plant for processed food production. This allows clients to produce and market their products nationally and internationally. FDC has a strategic partnership with Great Plains Aseptic Processors (GPAP) Ltd. for liquid food processing using Tetra Pak aseptic processing and packaging technology. This creates a unique opportunity for companies to develop liquid foods, including functional beverages and soups from research through pilot scale to full commercialization within the same facility. The major expertise/competencies of FDC include:

- *-Product Development*
- *-Process Engineering*
- *-Pilot Plant Production and Commercialization*
- *-Nutritional Labelling*
- *-Sensory and Consumer Evaluation*
- *-Shelf-Life Testing*
- *-Technology Transfer and Information Services*
- *-HACCP Consulting and Technical Workshops*

WELCOME
TO
QUEBEC CITY

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A MESSAGE FROM THE CO-CHAIRS

Dear Colleagues:

It is truly our great honor to welcome you to the International Seabuckthorn Association Conference, 2007 (ISA2007). We are so glad to see old and new friends get together in next few days to discuss and exchange knowledge and information of common interest on this miracle plant, seabuckthorn.

Among the plants that are now being used as sources of beneficial chemicals with nutritional and therapeutic properties, seabuckthorn is a rising star. We are sure it will get increasing attention from industry and general public after this Conference. This will translate to more demand for seabuckthorn farmers with competitive products and values. Scientific and technological communities will certainly progress towards the development and popularization of manufactured health products.

We would like to thank the local committee, chaired by Sophie Banville, as well as the scientific committee, who worked hard to prepare ISA2007 Conference. We are confident this Conference will be a big success.

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PROGRAM AT A GLANCE

	Morning	Lunch	Afternoon	Evening
Sunday August 12			Convention floor FOYER 13:00 – 17:00 Registration	Convention floor FOYER 17:00 – 19:00 Welcome cocktail
Monday August 13 Session 1	Convention floor SUZOR-CÔTÉ 8:00 Opening Ceremony 8:30-12:00 PRODUCTION Cultivation and Harvesting Practices	Downstairs PLACE MONTCALM 12:00-13:00	Convention floor SUZOR-CÔTÉ 13:00-16:30 PRODUCTION Breeding BORDUAS POSTERS	Convention floor LEDUC-FORTIN MORRICE Private meetings
Tuesday August 14 Session 2	Convention floor SUZOR-CÔTÉ 8:30-12:00 PROCESSING Technologies	Upper floor L'ASTRAL 12:15-13:00	Convention floor SUZOR-CÔTÉ 13:00-16:30 PROCESSING Chemistry BORDUAS POSTERS	Convention floor LEDUC-FORTIN MORRICE Private meetings
Wednesday August 15 Session 3	Convention floor SUZOR-CÔTÉ 8:30-12:00 PRODUCTS, INDUSTRY DEVELOPMENT AND MARKETING	Downstairs PLACE MONTCALM 12:00-13:00	Convention floor SUZOR-CÔTÉ 13:00-16:30 PRODUCTS, INDUSTRY DEVELOPMENT AND MARKETING BORDUAS POSTERS	Convention floor SUZOR-CÔTÉ BANQUET
Thursday August 16	FARM TOUR IRDA Orchards Deschambault	Jardin van den Hende Université Laval	FARM TOUR Ferme Nicole Sainte-Anne-de-Beaupré	APAQ Lamb Roast Ferme Nicole Sainte-Anne-de-Beaupré

Monday August 13
SESSION 1 – AM PROGRAM

8:00-8.30 **Room SUZOR-CÔTÉ**
Opening Ceremony – Welcome/Announcements

8:30-8:35 Technical Session Begins – Introductions
Chairs: Wudeneh Letchamo, Rutgers University & Martin Trepanier, Laval University

SECTION: PRODUCTION / CULTIVATION AND HARVESTING PRACTICES

8:35-9:15	**Keynote Speaker** **SEABUCKTHORN - PRESENT AND FUTURE.** *Thomas S. C. Li, Agriculture and Agri-Food Canada, Pacific Agri-Food Research Center, Summerland, British Columbia* (Canada)	*Paper #086*
9:15-9:35	**Study on Micropropagation of *Hippophae rhamnoides* L.** *Virendra Singh* and R.K. Gupta* (India)	*Paper #003*
9:35-9:55	**Effects of Fertilizers, Mulches and Land Contours on the Growth of Seabuckthorn Cultivars in Organic Farming.** *Merja Heinäaho , Tadeusz Aniszewski, Jyrki Pusenius , Riitta Julkunen-Tiitt* (Finland)	*Paper #001*
9:55-10:15	**Room Borduas - Break**	
10:15-10:45	**The Correlation between Seabuckthorn Berry Quality and Its Altitudes of Occurrence Areas.** *Lu Rongsen* (China)	*Paper #012*
10:45-11:05	**Review on Seabuckthorn Research in the Russian Federation and NIS.** *Natalia Demidova** (Russia)	*Paper #019*
11:05-11:25	**Development of a Branch Shaker to Harvest Seabuckthorn.** *Roger Chagnon, Jérôme Boutin, and Sylvain Fortin* (Canada)	*Paper #016*
11:25-11:45	**Designing and Evaluation of Mechanical Harvester for Scientific Harvesting of Fruits of Seabuckthorn.** *Sanjai K. Dwivedi, Gautam Viswas*, S. Sagar* and Z. Ahmed* (India)	*NO SHOW Abstract removed*
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Monday August 13
SESSION 1 – PM PROGRAM

SECTION: PRODUCTION/ BREEDING

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13:45-14:05	**Seabuckthorn (*Hippophae rhamnoides* L.) Cultivar Establishment and Survival in a Maritime Environment.** *D.B. McKenzie*[*] (Canada)	*Paper #035*
14:05-14:25	**The Enigma of Low Temperature Tolerance in Seabuckthorn.** *Akhilesh K Yadav, Gopal K. Chowdhary, Parul Saxena, Renu Deswa* (India)	*Paper #064*
14:25-15:00	**Room Borduas - Break**	
15:00-15:20	**Creating Alternative Livelihood Option for Improving Socio-economic Status of Hill People through Harnessing *Hippophae* Resources in Uttarakhand.** *Deepak Dhyani* (India)	*NO SHOW Abstract removed*
15:20-15:40	**From the Manitoba *Hippophae* Cultivation, Harvesting, and Marketing Experience.** *Charles Robert, Lucille Robert, and Wudeneh Letchamo* (Canada-USA)	*Paper #092*
15:40-16:00	**Inter-Generic Budding Technique for Control of Suckering and Reduction in Thorn Intensity in Seabuckthorn (*Hippophae rhamnoides* L.).** *Sanjai K. Dwivedi and Z. Ahmed* (India)	*NO SHOW Abstract removed*
16:00-16:20	**Biomass Production of Seabuckthorn (*Hippophae salicifolia*) and its Roles in Income Generation.** *Rajesh Rajchal, Henrik Meilby, Santosh Rayamajhi, Ram Prasad Sharma and Bimal Keshari Paudyal* (Nepal)	*NO SHOW Abstract removed*
16:20-16:40	**Livelihood Impacts of Seabuckthorn Program and its Conservation Status in Mustang District.** *Youba Raj Pokharel* (Nepal)	*NO SHOW Abstract removed*
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Monday August 13
SESSION 1 – POSTER SESSION

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*Paper #*036	**Seasonal Dynamics of Principal Ecophysiological Groups of Rhizospheral Microorganisms from some Romanian Seabuckthorn Biotypes.** *Stefania Surdu, Craita-Maria Rosu, Stefan Comanescu, Dumitra Manea, Ioan Viorel Rati, Elena Truta, Zenovia Olteanu, Maria Magdalena Zamfirache, Lacramioara Oprica, Marius Mihasan* (Romania)
Paper #037	**Characteristics of Mitotic Chromosomes in some Romanian Seabuckthorn Varieties.** *Elena Truta, Stefania Surdu, Gabriela Capraru, Ioan Viorel Rati, Zenovia Olteanu, Maria Magdalena Zamfirache, Lacramioara Oprica* (Romania)
NO SHOW Abstract removed	**New Seabuckthorn Varieties, Pitesti-1 and Pitesti-2** *Paulina Mladin and Eliza Oprea* (Romania)
Paper #059	**Research Regarding the Foliar Assimilating Pigment Amount for Different *Hippophaë rhamnoides* L., Biotypes under Romanian Flora.** *Maria Magdalena Zamfirache, Zenovia Olteanu, Elena Truta, Stefania Surdu, Lacramioara Oprica, Ioan Viorel Rați, Ciprian Manzu, Gurau Milian, Craita Rosu, Titu Zamfirache* (Romania)
Paper #062	**The Quantity of Soluble Proteins at *Hippophae rhamnoides* ssp. carpathica Varieties and Biotypes Harvested in Romania.** *Lacramioara Oprica1, Zenovia Olteanu, Maria Magdalena Zamfirache, Elena Truta, Stefania Surdu, Ioan Viorel Rati, Ciprian Manzu, Gurau Milian, Craita Rosu* (Romania)
NO SHOW Abstract removed	**Standardisation of a Fast Method of Vegetative Propagation of Seabuckthorn (*Hippophae rhamnoides* L.) through Soft Wood Cutting in India.** *Sanjai K. Dwivedi, Hemraj and Z. Ahmed* (India)
NO SHOW Abstract removed	**Heavy Metal and Mineral Concentrations in Different Plant Organs of Cultivated Seabuckthorn (*Hippophaë rhamnoides*, L*)* Cultivars.** *Faruk Ozkutlu, Mensure Ozguven, Nazim Sekeroglu*, and Wudeneh Letchamo*, (Turkey - U.S.A.)

SESSION 1 – ABSTRACTS
(ORAL IN ORDER OF PRESENTATION)

Paper #086

Seabuckthorn - Present and Future.

Thomas S. C. Li, Ph.D.

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Seabuckthorn (*Hippophae rhamnoides* L.) has recently been discovered to have previously unappreciated health benefits. Its berries are extraordinarily rich in vitamins and numerous antioxidant chemicals, and both the juice and extracts are useful for the preparation of a wide range of dietary supplements and fortified foods. Additional constituents in the fruit are exceptionally useful for treating skin conditions. Moreover, the presence of a variety of other medicinal components suggests that a wide range of illnesses may be alleviated by development of new medications based on extracts from the plant. Some attractive seabuckthorn health products have become available in the marketplace.

Among the plants that are now being used as sources of beneficial chemicals with nutritional and therapeutic properties, seabuckthorn is a rising star. Unfortunately, despite research indicating that there is considerable medicinal and market potential, the nutritional and therapeutic properties of seabuckthorn are not yet well known to the scientific and technological communities, and this has retarded progress toward the development and popularization of manufactured health products.

However, with the numerous publications and the up-coming international seabuckthorn conference, seabuckthorn will get increasing attention from industry and general public. This will translate to more demand for seabuckthorn farmers with competitive products and values.

It is well known that Canadian seabuckthorn farmers, with their experience and knowledge, are in a pretty good situation to meet the increasing demand for raw material and value added products.

Keywords: Seabuckthorn, *Hippophae rhamnoides* L., present, future

Paper #003

Study on Micropropagation of *Hippophae rhamnoides* L.

Virendra Singh* and R.K. Gupta

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Studies on the development of micropropagation method were conducted on Indian seabuckthorn (*Hippophae rhamnoides* ssp. *turkestanica*), the most widely distributed and commercially promising form in Indian Himalayas. With active bud explants of seabuckthorn, more than 95% contamination free cultures were established through surface sterilization scheme of 0.1% detergent, tetracycline, 70% Ethyl Alcohol (EtOH) and 0.1% Mercuric Chloride $(HgCl)_2$, whereas with dormant buds 0.1% detergent, tetracycline, 70% EtOH and 0.1% $HgCl_2$, led to more than 90% contamination free cultures. There was an increase in overall explant survival from Murashighe and Skoog's Culture Medium (MS) through ½MS to Woody Plant medium (WPM), and decrease in explant vitrification from ½MS through MS to WPM. Comparison of media-hormone interaction revealed that explant survival was highest on WPM medium (80.6%), closely followed by ½MS (80%) and lowest on MS medium. Overall on MS medium, % multiple shoot, shoot/explant and callusing decreased along successive passages. On ½ MS, a maximum of 1.4 shoots/explant was observed in combination Benzyl Amino Purine (BAP) 0.2: IBA (Indole-3-butyric Acid) 0.01 in 60% of the cultures, followed by maximum of 1.1 shoots/explant in BAP 0.2: IBA 0.01 in 40% of the cultures during PI. Overall on ½ MS medium, % multiple shoots, shoots/explant and callusing along successive passages decreased. On WPM medium, in 60% of the cultures, shoots/explant with a maximum of 14.6 shoot/explant was observed in BAP 1.0: Indole-3-Acetic Acid (IAA) 0.5 ppm, which was followed by 66.7% cultures having maximum of 5 shoot/explant in BAP 0.3: NAA 0.2 ppm combination during PI (first culture). In PII (second culture), combinations BAP 1.0: IAA 0.5 ppm, 80% of the cultures were observed with maximum of 6.5 shoots/explant, followed by 30% cultures in combination BAP 0.3: Naphthalene Acetic Acid (NAA) 0.2 ppm with maximum of 1.7 shoots/explant. In PIII (third culture), BAP 1.0: IAA 0.5, multiple shooting was observed in 80% of the cultures with maximum of 8.7 shoots/explant. Maximum shoot survival of 83.3% was observed with IBA 1.0 ppm. Highest root induction of 66.7% was observed with IBA 1.5 ppm. Among different culture media tested with various growth hormone combinations, WPM medium with 3% sucrose, was found to be suitable for the induction of multiple shoots, with hormone combination of BAP 1.0: IAA 0.5 ppm and WPM with 2% sucrose and 1.5 ppm IBA was found to be suitable for the induction of rooting in seabuckthorn shoots.

Keywords: Seabuckthorn (*H. rhamnoides* ssp. *turkestanica*), Indian Himalayas, micropropagation, media and hormones.

Paper #001

Effects of Fertilizers, Mulches and Land Contours on the Growth of Seabuckthorn Cultivars in Organic Farming

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The effects of different organic cultivation methods on the growth of two Finnish seabuckthorn (*Hippophae rhamnoides* L. *ssp. rhamnoides*) cultivars ”Terhi” and ”Tytti” was studied in an experimental field at coastal area in Merikarvia, western Finland for two years. Cultivation methods included different fertilizers (designed for organic cultivation), mulches (organic and plastic) and land contours (flat vs. low hill surface). Two experiments were done, the first one allowed the estimation of the effects of cultivar, fertilizer, land contour and all their interactions, while the other allowed the estimation of the effects of mulches, land contours and their interactions for the cultivar ”Tytti”. Results showed significant differences between two cultivars, cultivation methods and growing seasons. During the first growing season, “Terhi” formed longer shoots than “Tytti”. Shoot length was greater on the low hills than on the flat surface in both cultivars. After the second growing season`, shoot number increased significantly in both cultivars and stem diameter was significantly higher in “Terhi” than in “Tytti”. The results of mulch experiment indicated that seedlings grown with plastic mulch had more shoots compared to other mulch treatments. Furthermore shoot growth, stem diameter and shoot number increased from the first to the second growing season. The selection of cultivation methods may strongly modify the growth of seabuckthorn and consequently, its economic importance for farmers.

Keywords: *Hippophae rhamnoides*; organic farming; growth; fertilizers; mulches; land contours

Paper #012

The Correlation between Seabuckthorn Berry Quality and Its Altitudes of Occurrence Areas

Lu Rongsen

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Natural Chinese seabuckthorn (Hippophae rhamnoides ssp.sinensis) stands distribute in a very broad areas in China. Many ecological factors influence seabuckthorn berry's quality, among those altitudes play important role. A study on correlation between seabuckthorn berry quality and its altitudes of occurrence areas was carried out. The berry samples were collected from low altitude in the east plain areas to high altitude in the west mountain areas. A special study was conducted in nutural seabuckthorn forest of Wolong valley, Sichuan, China with altitudes from 1900 m to 3100 m. The results shown that the berry quality (such as weight per 100 berries, soluble substances, organic acids, vitamin C, seed oil and pulp oil contents etc.) relies on its altitudes of grown areas. Among those the contents of organic acids and vitamin C obviously rely on their altitudes. In 1900-3100 m the higher the altitude, the higher the contents of organic acids and vitamin C. The results suggest that in the distributed areas of seabuckthorn establishing seabuckthorn plantations in higher altitude areas can produce better quality berries.

Key words: seabuckthorn berries, altitude, correlation

Paper #019

Review on Seabuckthorn Research in the Russian Federation and NIS

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The overview has been done on the basis of 250 publications of Russian and NIS scientists on following topics: natural resources of sbt in the Russian Federation and NIS; sbt ecology, botany and morphology; genetics and breeding; biochemistry; new places of cultivation.

Sbt was started to cultivate in Russia as a decorative plant more then 160 years ago. It appeared in the collections of most of botanical gardens at the end of XIX- beginning XX centuries. The interest as to fruit plant appeared at the same time. Reach biochemical components of all parts of this wonderful plant made it popular and it was widely used in introduction work in different regions of Russia. Resistance to new conditions of cultivation, first of all winter hardiness, is one of the main problems of sbt introduction to the territories of temperate climate.

The productivity of wild sbt is low, biochemical composition of fruit material is not homogeneous and because of high thorns, harvesting of fruits is difficult. Therefore development of new cultivars for the plantations is of great importance. The Russian plant breeders are constantly enriching the sbt gene fund and diversification of methods to make the breeding process more efficient. Some breeding sbt programmes are discussed in the paper.

Keywords: seabuckthorn, research, Russian Federation, introduction, genetics, breeding, biochemical composition.

Paper #016

Development of a Branch Shaker to Harvest Seabuckthorn

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The project began in 2003 and ended in December 2005. Its goal was to develop a branch shaker to harvest the fruit of the seabuckthorn. Research in 2003 and 2004 revealed the proper parameters of frequency, amplitude and duration of vibration to harvest the fruit. Based on our results, we determined that to harvest fruit from the Indian Summer variety efficiently by shaking the branches, we had to use a frequency of 40 Hz, amplitude of 15 mm and a vibration time of 10 seconds. Using these parameters, 90% of the fruit is harvested with little damage to the branch and little debris (leaves, buds, wood) being detached from the branches.

The prototype used in the 2003 and 2004 tests had several shortcomings. The crankshaft principle used to transform the motor's rotating motion to a back and forth movement was practical for testing various amplitudes but put a great deal of stress on the components. Using an electric motor (1.5 kw) made it possible to conduct trials in the workshop and in the field without using an agricultural tractor, but a generator was needed. The positioning of the prototype was slow and difficult. The objective for 2005 was to develop a new shaker prototype that was reliable, economical and fast operating in order to harvest the fruit from the seabuckthorn. The design had to ensure easy, safe use by farm producers.

The experimental prototype developed in 2005 was driven by a hydraulic engine that used a cam to produce the vibration. Although it was in use only a short time, the shaker functioned very well. The quality of the harvested fruit was good if the harvesting was done during the optimal period. Damage to the trees was negligible. Using a branch shaker is an interesting option when harvesting 500 or fewer trees per season.

Paper #088

Genetic selection and introduction of promising *Hippophaë rhamnoides* L cultivars - the American perspective

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Seabuckthorn (SBT) is among the most fascinating plants with numerous valuable applications and flexibility to grow under extreme climatic conditions. From nine known species of SBT in the genus of *Hippophaë* only *H. rhamnoideë* is the most investigated species for its growth, yield, resistance, content of bio-active components, flavor and safety for humans and animals. In the early 1930s German and Russian scientists started genetic improvement program from the wild flora of Altai region of Siberia. The German scientist dropped the idea because "the plant was not easily harvestable" and moved on other fruit species. Russians continued the selection work in Siberian Horticultural Research Institute, and identified more than 50 different cultivars with various agronomic and chemical traits. Our first attempt to identify and introduce selected Siberian *Hippophaë* cultivars for commercial cultivation in the U.S. was made in 1996 using 'Dar Katugne', 'Orangevaja' and 'Tchuiskaja' cultivars from Altai to Washington State in 1997. However, today we have numerous cultivars being identified and introduced from Russia, Germany, Baltic area and Central Asia through nurseries in Oregon and other states. The major objectives of genetic breeding and improvement program are to identify and introduce genetically desirable SBT cultivar(s) with suitable morphological traits, disease and pest resistance, high yielding with acceptable chemical profile and palatability, while adapting to specific N. American growing conditions. Our research has shown that the cultivars ripen at various periods of the year (July, August, Sept. and October) enabling fresh supply throughout the year while providing flexibility for labor distribution. Siberian cultivars in the U.S.A. ripened at the June while German cultivars ripened in Oct/November. Siberian cultivars had relatively low plant height, large sweet berries and less thorny. German and Baltic cultivars had vigorous plant height, thorn, ripened much later and had relative acidic fruit flavor. Growing *Hippophaë* would increase opportunities for alternative and effective organic agriculture, while creating possibilities for biologically active edible food packaging. Ecological and genetic factors contribute to the differences in biological activities and quality of final products of SBT and formulations thereof.

Keywords: breeding, flavor, biologically active, edible packaging, selection, harvesting

Paper #035

Seabuckthorn (*Hippophae rhamnoides* L.) Cultivar Establishment and Survival in a Maritime Environment

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Seabuckthorn trees survived in an ornamental planting at Memorial University of Newfoundland in St. John=s for over 30 years, so it was hypothesized that commercial seabuckthorn berry production could be established under the cool, wet conditions of the boreal ecozone in eastern Newfoundland, Canada. The island's climate is strongly influenced by the cold Labrador Current along the northern coastline. July-August temperatures average 15 ^{o}C while winter temperatures average (-4 ^{o}C). The frost free growing season averages about 130 days. Annual precipitation averages over 1500 mm with about 75% as rain.

In 2001, seven "thornless" cultivars imported from Russia by a Canadian company were established in a 0.2 hectare field trial on newly cleared land at 47^{0}47'N 53^{0}12'W 17m elevation above sea level. The pH 4.5 podzolic soil had a shallow hard pan which created a perched water table, so the hard pan was broken up, limed, and tile drainage installed. Aley (male) and the female cultivars Rodnitchok, Chuyskaya, Karima, Vitaminnaya, Obilnaja, Samarodok, and Zolotistaja were planted at 1850 trees per hectare with 1.5 m within row spacing and 3.6 m between rows in a 1:11 male:female ratio.

There were 16 trees (11 of 325 females, 5 of 33 males) which did not survive their first winter in 2002 due to frost heaving damage followed by diseased roots. All other trees were healthy and had considerable growth over the second growing season. Winter survival was high in 2003-2005, but dropped by 1.7% in 2006. Tree vigour was high in all years for the female cultivars, but Aley did not have vigorous growth for the first few years. Tree height and width were measured each spring and fall. The physical appearance of the trees and berries including berry shape, colour and uniformity were assessed using a 1-5 rating scale. Total berry yield, mean berry weight, percent moisture, seed weight, pH, Brix (soluble solids) and titratable acidity were measured for each cultivar. Once established, all the seabuckthorn cultivars thrived in the cool, wet climate.

Keywords: Seabuckthorn, Russian cultivars, wet climate, boreal ecozone

Paper #064

The Enigma of Low Temperature? Tolerance in Seabuckthorn

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Seabuckthorn (*Hippophae rhamonides*) is a highly low temperature? (LT) tolerant plant and can grow upto -40^{0}C. This could be an ideal model system for deciphering LT signaling network in plant and could be a useful gene resource. Seabuckthorn seeds were grown in 0.5 % agar medium for 20 days and were for various treatments. As C-repeat binding factor (CBF) is the most well worked out transcriptional activator in regulating LT tolerance in plants, hence a reverse transcriptase polymerase chain reaction was done with RNA isolated from 2 hr of cold (4^{0}C) treated Seabuckthorn seedlings. It yielded an amplicon of 644 bp. This amplicon was sequenced and upon BLAST search was found to be homologous to *Brassica napus* CBFs, *Brassica rapa* CBF like protein and dehydration responsive element binding factor (DREB) 2. Hence it was named as HrCBF (*Hippophae rhamonides* CBF). Seabuckthorn seedlings were also given LT (4^{0}C) and freezing (-15^{0}C) treatment to detect cold and freeze induced proteins by resolving these on gels and analyzing any differential expression. A 16.6 kDa polypeptide was significantly up-regulated at -15^{0}C while a 17.4 kDa polypeptide was drastically down-regulated at -15^{0}C in long durations (5 days or more) of freezing stress treatments. Work to analyze the differential expression of CBF and antifreeze activity of freeze induced protein is underway.

Keywords: Seabuckthorn, CBF, antifreeze proteins.

SESSION 1 – ABSTRACTS (POSTERS)

Paper #30

Growth Mechanism for Biomass of Seabuckthorn Stand in Midland of the Loess Plateau

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The growth, biomass and productivity as well as the productivity models of seabuckthorn stand have been studied by standard site sampling in Yan'an, Shaanxi Province, the middle part of the Loess Plateau. The results show as followed: the growth in height, basal diameter and timber volume of seabuckthorn stand do gradually increase with its age prelongting. The average annual timber volume growth and current annual timber volume growth of 20 year-old seabuckthorn stand is 0.2823×10^{-4} and 0.5731×10^{-4} m^3 respectively. The standing biomass of the stand is 33.5818t·hm^{-2}, more than 80.00 percent is main canopy layer of it. The net annual productivity is 369.9454g·m^{-2}, and is only 40.31 percent of potential productivity for precipitation, so seabuckthorn stand in the area has tremendous potential productivity.

Keywords□seabuckthorn; biomass; growth mechanism

Paper #036

Seasonal Dynamics of Principal Ecophysiological Groups of Rhizospheral Microorganisms from some Romanian Seabuckthorn Biotypes

Stefania Surdu[1]*, Craita-Maria Rosu[1], Stefan Comanescu[1], Dumitra Manea[2], Ioan Viorel Rati[2], Elena Truta[1], Zenovia Olteanu[3], Maria Magdalena Zamfirache[3], Lacramioara Oprica[3], Marius Mihasan[1]

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The role of the microorganisms is especially important in soil fertilization, and is essential regarding the circuit of matter in nature. The soil distribution of different ecological microorganism groups depends, in a great part, on the cultivated plant species. The soil microflora has a considerable influence on plant growth and development. Some symbiotic microorganisms which form actinorhizae with seabuckthorn roots can fix the atmospheric nitrogen, thus contributing to the improvement of fertilization of low productive soils. For this reason, in this paper we studied the modification of the spectrum of some ecophysiological microorganism groups implied in the nitrogen circuit in nature (amonifying, denitrificant, aerobic free-living nitrogen-fixing microorganisms or anaerobic nitrogen-fixing microorganisms, and proteolytic microorganisms), in seabuckthorn rhizospherae, parallel to the dynamics of soil nitrogen accumulation. We analyzed a lot of soil types cultivated with different Romanian *Hippophaë rhamnoides* ssp. *carpathica* biotypes: Typic Regosols, Anthrosols, Typic Fluvisols, Mollic Fluvisols. The evaluation of dynamics of ecophysiological microorganism groups, achieved by conventional microbiological methods, evidenced a soil accumulation of amonifying bacteria, comparatively to controls, from 45 x 10^5 to 90 x 10^8, in Typic Fluvisols (Danube Delta), from 150 x 10^7 to 75 x 10^{10}, in Typic Regosols, and from 140 x 10^7 to 15 x 10^{12}, in Typic Fluvisols, from June to October 2006, correlated with the increase, in variable degrees, of nitrogen quantity. This increase, higher in Typic Regosols, was registered to the detriment of the accumulation of aerobic free-living fixators.

Keywords: *Hippophaë rhamnoides* ssp. *carpathica*, biotypes, ecophysiological microorganism groups, nitrogen, soil fertility.

Paper #037

Characteristics of Mitotic Chromosomes in some Romanian Seabuckthorn Varieties

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The seabuckthorn is a dioecious species, with marked sexual dimorphism. The mechanism of sex determinism in seabuckthorn is not yet entirely known. Only two references are in literature concerning the existence of heterosomes in seabuckthorn, but the affirmations are not well argued. Controversies exist even on the diploid chromosome number and on basic number of this species. These are some of reasons for which we studied from cytogenetic point of view certain Romanian varieties of *Hippophaë rhamnoides*, to establish the number and principal morphological characteristics of mitotic chromosomes. The biological material was represented by root tips of plantlets from different Romanian varieties, obtained by seed germination. *Squash* preparations were used for chromosome analysis. The most of metaphases, with a well chromosome spreading, have diploid number 2n=24, although metaphases with other chromosome number were observed, as in Letea 5 variety. In Letea 8 variety, for which detailed measurements were accomplished and karyotype was constructed, the length of haploid set was 26.98 μm, and the total length ranged between 4.07 (pair I) and 1.46 μm (pair XII). According to arm ratio, centromeric index, and relative length we established two chromosome morphotypes, one with the centromere in median position (the pairs I – VI, X, XI) – m chromosomes - and the other with submedian placed centromere (the pairs VII – IX, XII) – sm chromosomes. We specify that 0.1% colchicine, for 3 hours, was applied in this case. In accordance with the values of analysed parameters, the karyotype is symmetric, namely relatively less evolved.

Keywords: dioecious species, *Hippophaë rhamnoides*, karyotype, seabuckthorn mitotic chromosomes

Paper #059

Research Regarding the Foliar Assimilating Pigment Amount for Different *Hippophaë rhamnoides* L., Biotypes under Romanian Flora

Maria Magdalena Zamfirache[1], Zenovia Olteanu[1], Elena Truta[2], Stefania Surdu[2], Lacramioara Oprica[1], Ioan Viorel Rați[3], Ciprian Manzu[1], Gurau Milian[3], Craita Rosu[2], Titu Zamfirache[1]

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Seabuckthorn (*Hyppophae rhamnoide*s), is a plant widely spread through the temperate areas of Europe and Asia, including Romania and it presents real medical, nutritional and microclimate regenerating qualities.

In the existing Seabuckthorn berries biotypes monitoring efforts in the Romanian spontaneous flora, an important biochemical and functional parameter is the foliar assimilation pigment amount (a, b chlorophyll, carotenoidic pigments, as well as the value report between different fractions); this parameter gives information on the intensity of the basic metabolic processes in plants (photosynthesis), information that are interpreted as specific biologic characteristics for the analyzed biotypes and can be correlated to their existing pedoclimatic conditions.

Our investigation was conducted on 7 plant biotypes that existed in the collection of the FRUCTEX SA Bacău Research Center, using the spectrophotometrycall method. The research had shown the result leveling tendency for the plants in the Letea group (3.5 - 4.7 mg a chlorophyll, and 1.3-2.3 mg b chlorophyll), as well as the presence of the highest values of the report between the two types of chlorophyll, close to the maxim value known from literature, or even higher than that (3.4 la Letea kind 5), considered because of this a plant that loves light.

Keywords: seabuckthorn biotypes, assimilating pigments amount, pedoclimatic conditions

Paper #062

The Quantity of Soluble Proteins at *Hyppophae rhamnoides* ssp. *carpathica* Varieties and Biotypes Harvested in Romania

Lacramioara Oprica[1*], Zenovia Olteanu[1], Maria Magdalena Zamfirache[1], Elena Truta[2], Stefania Surdu[2], Ioan Viorel Rati[3], Ciprian Manzu[1], Gurau Milian[3], Craita Rosu[2]

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In the last years, the medicinal values of seabuckthorn absorbed more and more attention attention at domestic and abroad. The species of *Hyppophae* genus are native to the temperate zones of Asia and Europe, where are widely distributed. Seabuckthorn species are important for the strong tolerance at toxic pollutants in the soil, air and can be used to revegetate heavely industrialised areas, too. The quality of the seabuckthorn is often based on the nutritional value of the fruits, which contain most of the valuable health components (carotenoids, lipids, proteins, vitamins, minerals).

This paper presents the results of a study regarding the amount of the soluble proteins at fruits of some seabuckthorn varieties and biotypes. These were harvested by some Romanian regions at different periods of time, in autumn. The protein amount varies in fruits (3,99 mg%-45,35 mg%) and in seeds (1,12 mg%-171,10 mg%) depending on the age of plants, the Romanian geographic regions, the size of the fruits, factors which influenced the metabolic process of plants.

Keywords: *Hyppophae rhamnoide*s ssp. *carpathica*, seabuckthorn biotypes and varieties, soluble proteins.

Tuesday August 14
Session 2 – AM Program

8:30-8.35 **Room SUZOR-CÔTÉ**
Welcome/Announcements
Chairs: Joerg-Thomas Moersel, Technical University Berlin, & Cristina Ratti, Laval University

SECTION: PROCESSING / TECHNOLOGIES

8:35-9:20	**Keynote Speaker** **CURRENT AND EMERGING PROCESSING TECHNOLOGIES FOR SEABUCKTHORN (*Hippophae Rhamnoides L.*) AND ITS PRODUCTS.** *Alphonsus Utioh, Food Development Centre, Portage la Prairie, Manitoba* (Canada)	*Paper #081*
9:20-9:40	**Recovery of Lipophilic Compounds from Seabuckthorn Pomace by SFE.** *Moersel, J.-Th.; Mothes, S.; Wilhelm, S; Mörsel, Cl.; Steen, S* (Germany)	*Paper #005*
9:40-10:00	**Evaluation of Processing and Nutritional Attributes of Seabuckthorn Fruit Fractions of Indian Summer and Sinensis Varieties.** *Haihong Wang and Alphonsus Utioh* (Canada)	*Paper #025*
10:00-10:20	**Seabuckthorn (*Hippophaë rhamnoides* L.) Powders Obtained by Hot-air or Freeze-drying.** *Monica Araya-Farias, Joseph Makhlouf and Cristina Ratti.* (Canada)	*Paper #027*
10:20-10:40	**Room Borduas - Break**	
10:40-11:00	**Supercritical Fluid Extraction of Seabuckthorn (*Hippophae rhamnoides L.*) Seed Oil.** *Haihong Wang and Alphonsus Utioh* (Canada)	*Paper #024*
11:00-11:20	**Changes of Contents of Acids in the Fermentation Process of Seabuckthorn Wine.** *Duanguo Zeng, Changzheng Lu, Pingyuan Lu, Hongzhi Liu and Ning'an Ma* (China)	*Paper #068*
11:20-11:40	**The Influence of Harvest Time on Quality of Lipid-Based Compounds in Seabuckthorn Seed and Fruit Oil.** *S.D. St. George, S. Cenkowski* (Canada)	*Paper #013*
11:40-12:00	**The Natural Antioxydative Activity of Raw Materials, Half-Finished and Final Products Measured in Only One Value.** *N. Groth and K. Heilscher* (Germany)	*Paper #033*
12:00-13:00	**L'Astral Rotative Restaurant - Lunch**	

Tuesday August 14
Session 2 – PM Program

13:00-13:05 **Room SUZOR-CÔTÉ**
Announcements
Chairs: Cristina Ratti, Laval University & Joerg-Thomas Moersel, Technical University Berlin

SECTION: PROCESSING / CHEMISTRY

13:05-13:50	**Keynote Speaker** **CHEMISTRY OF SEABUCKTHORN - NUTRITIONAL, MEDICINAL, AND COSMETIC ASPECTS.** *Joerg-Thomas Moersel, Technical University Berlin* (Germany)	*Paper #006*
13:50-14:10	**Identification and Quantification of a New Sugar Compound in Seabuckthorn (*Hippophaë rhamnoides*) Berries.** *Baoru Yang and Katja Tiitinen* (Finland)	*Paper #079*
14:10-14:30	**Quality and Authenticity of Seabuckthorn Oils Using Succesive UV-Vis, FT-IR, NMR Spectroscopy and HPLC-, GC- Chromatography Fingerprints.** *Socaciu C.*, Trif M., Ranga F., Fetea F., Bunea A., Dulf F., Bele C. and Echim C.* (Romania)	*Paper #074*
14:30-15:00	**Room Borduas - Break**	
15:00-15:20	**Polar Constituents of Himalayan (Ladakh) Seabuckthorn Leaves.** *T. V. Sumitha and A. Banerji* (India)	*Paper #022*
15:20-15:40	**Chemical Composition and Antioxidant Activity of Seabuckthorn (*Hippophae rhamnoides* L.) Fruits Grown in Turkey.** *Sezai Ercisli, Emine Orhan, Memnune Sengul, Ozlem Ozdemir* (Turkey)	*NO SHOW Abstract removed*
15:45-17:15	**Room Borduas - Poster Session 2**	

Tuesday August 14
Session 2 – POSTER SESSION

Paper #015	**Biologically Active Substances in Seabuckthorn and Production of Functional Foods.** *N. Savelyev, V. Makarov, L. Vlazneva, T. Cherenkova*. (Russia)
Paper #020	**Seabuckthorn (*Hippophaë rhamnoides* L.) Pulp Oil Fractionation by Solvent Crystallization Process.** *Luis-Felipe Gutiérrez, Cristina Ratti and Khaled Belkacemi* (Canada)
Paper #026	**Osmotic Dehydration of Seabuckthorn (*Hippophaë rhamnoides* L.) Fruits.** *Monica Araya-Farias, Ophelie Macaigne and Cristina Ratti* (Canada)
Paper #032	**Discussion on Development of Seabuckthorn Functional Food.** *Hu Jianzhong* (China)
Paper #039	**Enzymatic Oil Extraction of Seabuckthorn (*Hippophaë rhamnoides* L.) Pulp.** *Luis-Felipe Gutiérrez, Sandra-Viviana Quesada, Cristina Ratti and Khaled Belkacemi* (Canada)
Paper #042	**Usage of Lipidic Extract from Dried Seabuckthorn Fruit (*Hippophae rhamnoides* L.) in Burns and Wounds of the Members.** *Ion Brad* (Romania)
Paper #043	**Variation in Content of Different Physiological Active Substances, Depending on the Area and the Moment of Harvesting the Seabuckthorn (*Hippophae rhamnoides* L.)** *Ion Brad* (Romania)
Paper #052	**The Capitalization of Seabuckthorn Fruits, Leaves and Copses for Serotonin and Microelements.** *Brad I., Vlasceanu G.A., Brad I.L., Rati L.V., Tamas V.* (Romania)
Paper #055	**Total Lipids and Carotenoids Content in *Hippophaë rhamnoides* L., Different Biotypes, Harvested from Romania.** *Zenovia Olteanu, Maria Magdalena Zamfirache1, Stefania Surdu, Lacramioara Oprica, Elena Truta, Ioan Viorel Rati, Ciprian Manzu, Gurau Milian, Craita Rosu* (Romania)
Paper #056	**Biochemical Characterization of Seabuckthorn (*Hippophae rhamnoides* L.) Growing in Latvia.** *Seglina, D., Ruisa, S., Krasnova, I., Viskelis, P., Lanauskas, J.* (Latvia, Lithuania).
NO SHOW Abstract removed	**Preventive Measures of Radiation Skin Reaction and Hypodermic Cellular Tissue in Treatment of Uterine Cervix Carcinoma (UCC).** *S.V. Korepanov, V.V. Veryaskina, A.F. Lazarev* (Russia)

NO SHOW Abstract removed	**Nutritional Attributes of *Hippophae rhamnoides* (Seabuckthorn) and the Role of Outreach Programs for Sustainable Livelihood in Higher Himalayan Region of Uttarakhand.** *Deepak Dhyani* (India)
Paper #069	**Determination of Flavonol Glucosides and Aglucones in Seabuckthorn Berry by HPLC.** *Li Ruixia, Wu Dacheng, Tai Yuanlin* (China)
Paper #070	**Contents of Flavonol Glucosides in Seabuckthorn Leaves.** *Tai Yuanlin*，*Gao Xushan Tong Yan Li Ruixia, Wu Dacheng* (China)
Paper #077	**NATVIT.** *Emmanuel Cabanes* (France)
Paper #087	**The Nutrient Analysis of the Seabuckthorn Fruits from Different Species Planted in the Middle Loess Plateau.** *Tu Xiaoning, Li Yonghai, Shi Lingfang* (China)

SESSION 2 – ABSTRACTS
(ORAL IN ORDER OF PRESENTATION)

Paper #081

Current and Emerging Processing Technologies for Seabuckthorn (*Hippophae rhamnoides* L.) and Its Products

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Seabuckthorn (*Hippophae rhamnoides* L.) is a hardy deciduous shrub with yellow or orange fruits. It is currently domesticated in many parts of the world like China, Russia, India, Germany, Finland and Canada. Almost all parts of the plant (berries, leaves and bark) have uses in the food, nutraceuticals, pharmaceutical, and cosmetic industries due to their content of essential bioactives. Seabuckthorn berries are usually the main focus for processing because of their high content of essential oils (fatty acids), vitamins, minerals, carotenoids, flavonoids and amino acids required by the human body. The oils extracted (by cold press, solvent or supercritical fluid extraction technology) from the seeds and pulp (components of the fruit) are often considered the most valuable for their content of fat-soluble vitamins, sterols and essential fatty acids. The high content of palmitoleic acid in the pulp oil makes it attractive to the cosmetic industry as an anti-aging agent. Seabuckthorn fruit juice is high in vitamin C and is often extracted by a combination of pressing and clarification technologies, and sold as single strength juice or blended with other fruit juices and sweeteners to produce nutritional and sport beverages. The juice can also be processed into jellies, syrups, and alcoholic drinks. Seabuckthorn leaves contain important nutrients and bioactive components such as flavonoids, carotenoids, and sterols and are often processed by controlled drying for tea blends. The leaves can also be crushed for extraction of essential oil. The bark has also been processed to extract proanthocyanidins. Retaining these nutritional, nutraceutical, pharmaceutical and cosmetic attributes of seabuckthorn and its derivatives is dependent on the applicable processing technologies. Current and emerging processing technologies for seabuckthorn will be presented along with their impacts on preserving the important bioactive components of its products for their nutritional and health benefits.

Keywords: Seabuckthorn berries, Processing Technologies, Seed, Pulp, Bark, Juice, Oil

Paper #005

Recovery of Lipophilic Compounds from Sea Buckthorn Pomace by SFE

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Natural materials, like carotenoides, unsaturated fatty acids, phospholipids and phytosterols are important source of essential ingredients of food and play an important role. Most of them have been produced as by-products directly during whole seed processing. Modern methods and techniques allow selectively the isolation of the lipid phase and the fractionaction of different individual minor components enabling separation and enrichment of by-products.

One modern technique is supercritical fluid extraction (SFE) using carbon dioxide. Addition of suitable modifiers under optimized conditions allows isolation and separation of target compounds. The selective isolation of phospholipids, alkaloids or capsaicinoides has been reported in the literature. This technique has been used to separate whole lipid extracts, e.g. from fruits and vegetables. Due to its high cost, this technique has not been used in the extraction of oilseeds. Modification of the procedure by use of ethanol as a modifier resulted in an improved selectivity of extraction. Beside one-step extraction we also investigated multiple-steps extraction and a continuous extraction processes.

Target of our investigations was seabuckthorn (SBT) and different by-products of SBT processing.

Depending on the extraction parameters different products have been isolated. They have been found to vary in the composition. Beside neutral lipids sterol fractions, highly enriched in carotenoides have been isolated.

Depending on their composition they can be used in food industries or as active ingredient in cosmetics and pharmaceuticals. For technical application a cost-benefit analysis is necessary to decide whether the conventional or SFE is applied. Conventional processes do not produce extract of such qualities but are more cost efficient.

Keywords: Seabuckthorn, SFE, carbondioxide, sterols, carotenoids, neutral lipids

Paper #025

Evaluation of Processing and Nutritional Attributes of Seabuckthorn Fruit Fractions of Indian Summer and *Sinensis* Varieties

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Seabuckthorn (SBT) berries of two major cultivars (Indian summer and *Sinensis*) grown in Canada were used to evaluate their processing and nutritional properties. Pilot processes were developed for puree, pulp and seed fractions. Material balance of processing steps from berries to dried seeds and pulp was also determined. Samples of puree, pulp, seed, and oil from both varieties were analyzed to establish their nutritional value. SBT seed oil of Indian summer variety was extracted by supercritical fluid, solvent and cold extraction. The yield and fatty acids profile of SBT seed oil extracted by different extraction methods was compared. SBT berries can be successfully processed into major fractions of puree, pulp, seeds, and oil. Each fraction has its unique nutritional composition. Puree from Indian summer variety was about 5% higher yield and better appearance, flavor and aroma compared with that from *Sinensis*. The puree, pulp and seed from Indian summer had higher fat, vitamin A and ω-7 fatty acids content than that from *Sinensis*. The puree and pulp from *Sinensis* had higher sodium and vitamin C content than that from Indian summer. Pulp from Indian summer contains 23.5% of oil, compared to 13.7% from *Sinensis* pulp. Indian summer pulp oil has 36.7% of palmitoleic acid (ω-7) in its oil, compared to 33.4% from *Sinensis*. Pulp oils from both varieties were outstanding for their high content of ω-7 fatty acids, which makes SBT berry one of the most important sources of ω-7 fatty acid in the plant kingdom.

Keywords: Processing, Seabuckthorn, Seed, Pulp, Puree, Nutritional value, Fatty acid profile

Paper #027

Sea Buckthorn (*Hippophaë rhamnoides* L.) Powders Obtained by Hot-air or Freeze-drying

Monica Araya-Farias[1], Joseph Makhlouf [2] and Cristina Ratti[1*]

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Seabuckthorn (*Hippophaë rhamnoides* L.) berries contain high amounts of natural antioxidants and medicinal compounds including ascorbic acid, carotenoids, flavonoids as well as essential fatty acids. However, these fruits are delicate and, if not processed, they have a short shelf life. Transforming the fruits into powders may not only concentrate their high nutritional values, but also preserve them for longer times. Convective hot-air drying and freeze-drying were thus investigated in this study as potential processes to obtain powders of seabuckthorn fruits.

Seabuckthorn berries (10 grams) were placed in a hot-air drier (UOP8-G, Armfield, England) in a thin layer, and dried at 50 and 60°C and at 1 m/s, or freeze-dried (Freeze-mobile 25L,Virtis Company, USA) under vacuum and at 20 and 50°C shelf plate temperature. Water loss was determined at different process times. The contents of phenolic compounds, carotenoids and ascorbic acid were also determined in fresh and dried seabuckthorn samples. To complete this study, freeze and air dried products were reduced to powder and their sorption isotherms at 25°C and glass transition temperature were experimentally determined and fitted with the GAB and Gordon and Taylor equations, respectively.

Freeze-drying was a superior method in order to obtain seabuckthorn powders because of the lower residual moisture content as well as better final physical characteristics of freeze-dried berries. Both temperature and drying times affected the remaining phenolic and carotenoids contents of seabuckthorn samples. The temperature had an important effect on hot-air drying and freeze-drying kinetics.

Keywords: seabuckthorn, preservation, carotenoids, phenolic compounds, hot-air drying, freeze-drying.

Paper #024

Supercritical Fluid Extraction of Seabuckthorn (*Hippophae rhamnoides* L.) Seed Oil

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Extraction of seabuckthorn seed oil was performed with supercritical carbon dioxide (SC-CO_2) fluid. In order to investigate the effect of pressure and temperature on the solubility of oil and oil yield, five isobaric (200, 250, 300, 350 and 400 bar) and two isothermal (40 and 50°C) extraction conditions were conducted. The maximum solubility of seabuckthorn seed oil, 12.7 mg oil/g CO_2, was obtained at 50 °C/400 bar with 70 g/min CO_2 flow rate, the maximum oil yield after four hours of extraction at that condition was 11.63% (g oil/100g seed). Oil composition and α-tocopherol content obtained by both supercritical carbon dioxide and petroleum ether extraction were determined. The seabuckthorn seed oil contains about 5.5-6.5% of palmitoleic acid (ω-7), 10.5-12.0% of palmitic acid, 15-17.5% of oleic acid, 31-32% of linoleic acid (ω-6) and 29-32% linolenic acid (ω-3). The linolenic acid content of the SC-CO_2-extracted oil was about 2% higher than that obtained by solvent extraction. The total ω-3 fatty acid from SC-CO_2-extracted oil was also higher than that from solvent extraction. Three different fractions collected from SC-CO_2-extraction had similar fatty acid profiles. However, the α-tocopherol content was much higher in the first fraction (F_1) than that from second (F_2) and third (F_3) fractions. While vitamin A content was higher in F_1 and F_3, β-carotene was higher in F_2 and F_1.

Keywords: Supercritical CO_2, Extraction, Seabuckthorn, Seed oil, Fatty acid, Linolenic acid

Paper #068

Changes of Contents of Acids in the Fermentation Process of Sea Buckthorn Wine

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The seabuckthorn juice is difficult to be fermented in production of seabuckthorn wine because of the high content of acids. To study deacidification of seabuckthorn wine, ion chromatography was used to analysis the variability of acids in production of seabuckthorn wine. It is valuable to the deacidification of other seabuckthorn products.

Keywords: seabuckthorn wine, fermentation process, deacidification, ion chromatography

Paper #013

The Influence of Harvest Time on Quality of Lipid-Based Compounds in Sea Buckthorn Seed and Fruit Oil

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Effect of harvest time on lipid quality of seabuckthorn berries (*Hippophae rhamnoides* L.) has not been documented for the Canadian climate. Seabuckthorn berries ssp. *sinensis* were collected at early maturity (September), maturity (November), and post-maturity (January) during the 2003-2004 harvest year. Whole berries were analysed for physical characteristics, while fruit and seed fractions were analysed for bioactive content. November harvested berries yielded highest values for berry sizes, CIELab factor a* ((+) redness/(-)greenness), and total carotenoid content in the fruit fraction ($P<0.05$). Carotenoid concentration (mg/100 g oil) varied with harvest time as follows: September (498.1), November (817.8), and January (616.8). The CIELab factor (a*) was positively correlated with carotenoid levels ($r_s=0.90$, $P<0.001$). September yielded significantly higher ($P<0.05$) levels of the major vitamin E isomers and phytosterols in the fruit fraction. The three main vitamin E isomers, α-tocopherol (α-T), β-tocotrienol (β-T3), and δ-tocopherol (δ-T) accounted for 91.0% w/w of total isomers. Concentration of α-T, the major isomer (388.3 mg/100 g oil) decreased by 13.1 and 29.8% by November and January, respectively. Beta-sitosterol, δ5-avenasterol, and δ7-avenasterol accounted for 97.0% of identified sterols in the fruit fraction. Concentrations of β-sitosterol, the major sterol (928.4 mg/100 g oil) decreased by 25.4% and 22.2% by November and January, respectively. Seed characteristics and bioactive compounds did not vary significantly with respect to harvest time ($P<0.05$). These results have identified the most suitable level of maturity for the optimization of certain compounds and the losses that may occur with winter harvest, commonly practised in the Canadian Prairies.

Keywords: bioactive, carotenoids, fatty acids, harvest, oils, phytosterols, seabuckthorn, tocopherols, tocotrienols

Paper #033

The Natural Antioxidative Activity of Raw Materials, Half-finished and Final Products Measured in Only One Value – RPF

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The appeal for reproducible standardized half-finished and final products released at the First ISA-Conference 2003 in Berlin has not been replied. There is no standard to evaluate the various products for any application in the wide fields of phytomedicine and functional foods.

Antioxidative components, helping to neutralize free radicals are the most important health promoting parts of all seabuckthorn products. Wilde fruits contain not only major antioxidant molecules but also a great quantity of substances with antioxidant activity, such as flavonoids, flavones and polyphenols. To measure only their native antioxidant capacity, the radical protection factor (RPF) was used. This method is already used in cosmetically recognized products from cosmetic industry.

The RPF approach, using the quantitative Electron Spin Resonance ESR method has opened a way to evaluate and to compare seeming equal and different products as well for medical and nutraceutical purposes. The results disclose faults and mistakes caused by the raw material itself, by insufficient procedures in the post-harvesting treatments as well as seabuckthorn processing industries.

RPF is the most common but not the only technological approach to work with. A list of references for analytical dates is proposed to work with uniformly in the world of seabuckthorn including the relativity in the applications of bioprocesses and bioproducts.

Keywords: antioxidants, free radicals, RPF, ESR, natural antioxidative activity, testing quality

Paper #006

Chemistry of Sea Buckthorn - Nutritional, Medicinal, and Cosmetic Aspects

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Seabuckthorn is known as a unique source of high valued compounds like oils, juice and active compounds. The chemical properties of this plant have been of interest to people for hundreds of years. To determine the chemical composition hundreds of experiments have been carried out and a great number of samples have been analysed. Today, we understand better what types of ingredients are the reason for the manifold application and the use of seabuckthorn. Vitamins, unique composed lipids, high yields of active dyes, antioxydative compounds (e.g. flavonoides, tocopheroles), and bioactive constituents (hiporamin) are known to be among these interesting elements. The last years of seabuckthorn research showed that more bioactive substances with more complex structures are inside the berry. Conjugates of phenolic compounds with sugars and proteins seem to be the two of those constituents.

In human nutrition, seabuckthorn is mostly used as raw material for production of juice and juice based products. Also liquors or wine are produced from the berries. Seabuckthorn berries are used to produce dishes. Over the last years, seabuckthorn semi-products became an important part of food supply chain and play an important role in regional and international trade.

We know from historical and actual documents that seabuckthorn is widely used in traditional medicine in China, Tibet, Mongolia and other areas of Asia. Nepalese scientists reported on many pharmaceutical applications. And actual research is done in many countries (e.g. Finland, Germany, India and Russia). But introduction to Western medicine is still missing. The reasons may be missing knowledge on this plant among medics but also a general philosophy question of Western medicine. But growing interest shows a change in this situation and we can await a development of seabuckthorn from 'only dietary' to also 'medicinal plant'.

Totally different situation is found in cosmetics. Looking on European or Asian market we find hundreds of products – mostly based on oil-water emulsions. Beside lotions and crèmes, there are also products available on the market for cleaning, washing, make-up, or decorative cosmetics. It seems to be no area in cosmetology were we miss seabuckthorn. Looking on prices and earnings this group of products is one of the most important. So, seabuckthorn became a product spread in different fields of application with great scientific, practical and economic importance. And we should never forget – this is only one side of the plant – it's an important cultivated plant bringing environmental benefits and social-economic profit to many people around the world. So, it's really a 'wonder plant' that deserves our attention.

Keywords: Seabuckthorn, lipids, bioactive compounds, processing, medicine, cosmetics, nutrition

Paper #079

Identification and Quantification of a New Sugar Compound in Sea Buckthorn (*Hippophaë rhamnoides*) Berries

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Sugars are important components influencing both the sensory and nutritional properties of seabuckthorn berries. Both the content and composition of sugars vary considerably among different subspecies of seabuckthorn. In addition to the commonly known fructose, glucose and sucrose, sugars of varying identities have been reported of seabuckthorn berries. In the present study, a major unknown sugar compound was isolated from seabuckthorn juice by a solid phase extraction procedure followed by a preparative HPLC method. The isolated sugar compound was identified to be ethyl β-D-glucopyranoside by GC-MS and ^{1}H and ^{13}C NMR. The identification was confirmed by co-injection of the synthesized compound with seabuckthorn sample in gas chromatography. In berries of *H. rhamnoides* ssp. *rhamnoides* the level of ethyl β-D-glucopyranoside increased during the harvesting period accompanied by a decrease in glucose content. This indicates the active role of a biochemical pathway converting glucose into its derivatives. In contrast, the level of this compound remained negligible in berries of *H. rhamnoides* ssp. *sinensis* through the harvesting period. The presence and relative abundance of ethyl β-D-glucopyranoside is an important chemotaxonomic feature characterizing different subspecies of seabuckthorn.

Keywords: Seabuckthorn, *Hippophaë rhamnoides*, Sugars, Ethyl-β-D-glucopyranoside, Chemotaxonomic characteristics

Paper #074

Quality and Authenticity of Seabuckthorn Oils using Succesive UV-Vis, FT-IR, NMR Spectroscopy and HPLC-, GC- Chromatography Fingerprints

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Considering the high demand for Seabuckthorn (SB) oils as high functional, healthy oils, the quality and authenticity of such oils from different countries, obtained by different technologies and storage conditions represent an important point for their standardization and functionality evaluation. SB oils (*H.r. ssp. carpatica*) of whole berries, pulp or seeds obtained by different procedures (solvent extraction, cold-separation), free or microencapsulated, kept in UV-light (6 hrs) or heated (105 C, 1 hr) were investigated. Controlled falsification with sunflower oil was also realized in parallel. All experimental variants were submitted to a battery of spectrometry (UV-Vis, FT-IR and NMR) and chromatography (GC-FID, GC-MS, HPLC-UV, HPLC-PDA and LC-MS) determinations, which aimed the identification of best biomarkers of quality and authenticity.

Specific and accurate lipid fingerprint (fatty acids, phytosterols and tocopherols) was identified by FT-IR, NMR, GC-MS and GC-FID while modifications in the carotenoid and polyphenol composition was done using HPLC-PDA, HPLC-UV and LC-MS, respectively. UV-Vis spectrometry made in two types of solvents (polar and non-polar) was able to fingerprint the main groups of compounds (polyphenols and carotenoids) and to identify only the strongest modifications of quality during light and thermal degradations. The impact of oxidation processes and the protective effect of microencapsulation were best monitored by FT-IR and NMR. All collected data were statistically processed and the best quality-authenticity biomarkers were selected, in relation to the performance of the analytical measurement. A minimal battery of tests for a proper fingerprint of SB oil quality and authenticity was proposed.

Keywords: seabuckthorn oil, authenticity, fingerprint spectrometry FT-IR, UV-Vis, NMR, HPLC, GC.

Paper #022

Polar Constituents of Himalayan (Ladakh) Seabuckthorn Leaves

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Substantial amounts of flavonoids have been reported from seabuckthorn occurring in different parts of the world. However not many phytochemical investigation from Indian seabuckthorn have been reported. In the present study, investigation on Indian seabuckthorn leaves (SBL) (*Hippophae rhamnoides* from Ladakh, Himalayas) was carried with special reference to flavonoids. The polar fractions (methanolic) of SBL gave prominent reactions for phenolics but contrary to other reports, only weak reaction was obtained for flavonoids. Adsorption and gel-permeation chromatography, complexation, selective precipitation was used to separate the individual constituents. Since flavonoids and phenolics usually occur in the bound forms, the polar fractions of SBL was subjected to hydrolytic conditions using a variety of reagents (*e. g.* acetic acid, oxalic acid, HCl, sulphuric acid) at different concentrations, temperatures and time intervals. Optimum conditions for hydrolysis were established. Isorhamnetin and quercetin were identified (UV, NMR, MS, HPLC, TLC) as the main flavonoids. Dramatization of the flavonoids (methylation and acetylation) was carried out to confirm the identities. Very substantial amounts of gallic acid were also isolated. Glucose was identified as the main carbohydrate from the hydrolysate. Prior to hydrolysis the amounts of free flavonoids and phenolic acids were very small. Thus, it is inferred that flavonoids and phenolics are present in bound form such as gallotannins and glucosides. In order to isolate tannins, extraction was carried out with 70% aqueous acetone at room temperature. The solvents were removed at below 45^0 C. Column chromatography using Sephadex, SiO_2 and centrifugal chromatography (chromatotron) were used. Phytosteroids (*e.g.* sitosterol, stigmasterol), triterpenoids (*e.g.* ursolic acid), β-carotene (only in small amount), querbrachitol were some of the other compounds isolated from SBL fractions. A detailed study on antioxidant activity of compounds and fractions of SBL was carried out and compared with those other phenolics and flavonoids. Dyeing potential (for food and textiles) were also evaluated. The isolation, characterization, antioxidant and dyeing activities of SBL constituents will be discussed.

Keywords: Seabuckthorn, Flavonoids, Phenolics, Isorhamnetin, quercetin, gallo-tannins, ursolic acid, natural dyes, antioxidants, nutraceuticals.

Paper #015

Biologically Active Substances in Seabuckthorn and Production of Functional Foods

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Seabuckthorn is a very important polyvitaminic crop. The lack of investigations on biochemical estimation of new seabuckthorn cultivars and those technological indices which are necessary for production of natural functional foods determines the urgency of this paper. The biochemical composition of 25 seabuckthorn cultivars was studied. The ascorbic acid content in the investigated cvs varies 44.8 (in Mosaika) to 168.4 mg/100g (350 let Michurinsky); as for vitamin P – 33.0 (Ocharovanie) to 141.0 mg/100g (Krasnoplodnaya), carotin – 1.1 (Ulubka) to 4.95 mg/100g (Pamyat Indiry). The cvs with their contents of soluble solids more than 12.0% were isolated. The formula and production practice of natural and functional foods from the seabuckthorn was developed. All these products have higher contents of vitamins and biological active substances. Antioxidant activity is more than 600.0 mkg/ml. "Stewed fruit from Seabuckthorn, dietary and low caloric". It has higher carbohydrate contents (1.24%), "Jelly from Seabuckthorn with Lactulose". It has higher vitamin C cont (90.0 mg/100g), "Pears in Nectar from Seabuckthorn" with contents of arbutin (6.5% per dry weight) and chlorogenic acid (18.0 mg/100g). These products are tonic and make digestion better. In general they are classified as prophylactic against overweight, diabetes and methabolic disturbance.

Keywords: Seabuckthorn cultivars, biologically active substances, vitamins, processing.

Paper #020

Sea Buckthorn (*Hippophaë rhamnoides* L.) Pulp Oil Fractionation by Solvent Crystallization Process

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Seabuckthorn is recognized as the plant with the highest level of palmitoleic acid. This fatty acid constitutes about 40% of the total fatty acids (FA) in the seabuckthorn pulp oil (SBPO), followed by palmitic acid, which reaches typically 35%. In order to obtain oil fractions enriched in unsaturated fatty acids (UFA), SBPO was fractionated using solvent crystallization with acetone. Different crystallization temperatures were investigated (15, 5, -1, -5 and -10ºC) under controlled cooling rate of 2.5ºC/min without agitation. The liquid and solid fractions were analyzed for their fatty acid (FA) and triacylglycerol (TAG) compositions. Their melting profiles were characterized by differential scanning calorimetry (DSC). In liquid fractions, FA analysis indicated that as the crystallization temperature decreased, the UFA increased, while saturated fatty acids (SFA) decreased. The fractionation at -10ºC yielded 35.8±0.3%w/w of liquid fraction with the highest and lowest concentrations of UFA and SFA (73.6% and 26.4%, respectively). At this temperature, palmitoleic and palmitic acids were 48.3% and 22.2%, respectively. In solid fractions however, UFA and SFA reached their minimal and maximal concentrations (39.9% and 60.1%, respectively) at a crystallization temperature of -1ºC. Liquid and solid fractions exhibited different TAG compositions. Liquid fractions were richer in TAG molecules with acyl carbon number of 48 having 2 and 3 double bounds (C48:2 and C48:3) than solid fractions, which contained higher amounts of C48:1, C50:1 and C50:2. The melting curves of liquid and solid fractions showed multiple endothermic transitions, as observed normally in DSC analysis of vegetable oils.

Keywords: Seabuckthorn, *Hippophaë rhamnoides*, solvent fractionation, palmitoleic acid, melting curves, fatty acids, triacylglycerols.

Paper #026

Osmotic Dehydration of Sea Buckthorn (*Hippophaë rhamnoides* L.) Fruits

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Seabuckthorn presents interesting economic potential due to its well-known nutraceutical properties. In spite of its high nutritional content, seabuckthorn fruits are fragile and rapidly perishable, limiting its production at large scale. The development of an efficient conservation process is thus of significant importance in terms of commercial strategy.

The effect of osmotic dehydration in combination to hot-air or vacuum drying was investigated regarding the physicochemical characteristics of seabuckthorn fruits. First, a comparison of different pre-treatments was done in order to optimize the seabuckthorn skin permeability during osmotic dehydration. For this purpose, fruits were treated by different techniques: immersion in liquid nitrogen, steam blanching, freeze/thaw cycles, or no treatment (control samples). From these results, immersion in liquid nitrogen was found to be the best treatment to maximize skin permeability and to increase sugar gain during osmotic dehydration. The second part of this study was the evaluation of drying kinetics during osmotic dehydration of seabuckthorn fruits pre-treated with liquid nitrogen, followed by vacuum or hot-air drying. Loss of vitamin C, carotenoids and phenolic compounds was also measured to test the effect of drying methods on the nutritional characteristics of seabuckthorn.

Sugar intake and partial dehydration of seabuckthorn samples increased with osmosis time and reached a maximum value after 5 h treatment. The post drying method (vacuum or hot-air) showed a marked impact on the remaining moisture content of seabuckthorn samples. The final moisture content was significantly lower in air-dried samples than vacuum-dried ones.

Keywords: seabuckthorn, preservation, osmotic dehydration, drying, pre-treatments.

Paper #032

Discussion on Development of Seabuckthorn Functional Food

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Functional food has three functions: nutrition, sense enjoyment and regulation of physiological activity. Edible types of seabuckthorn containing protein, fat, sugar, water, mineral, and vitamin have the potential to develop diversified functional foods. In the developing strategy, much more attention should be paid to study the functional elements, develop the functional foods to meet the need of customers, and design many forms of foods. Through the research and development of seabuckthorn functional foods, the human nutritional level can be improved, as well as the job efficiency can be promoted for a harmonious society construction in China.

Keywords: seabuckthorn; functional food; development

Paper #039

Enzymatic Oil Extraction of Sea Buckthorn (*Hippophaë rhamnoides* L.) Pulp

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Seabuckthorn pulp contains interesting health-beneficial oils. This oil is currently obtained by pressing, centrifugation and solvent extraction with hexane or supercritical carbon dioxide of the fruits. Enzymatic oil extraction was thus investigated in this work due to its technological advantages in comparison to current methods. It eliminates solvent consumption, reduces energy requirements, and enables high yields of good quality oils. Three commercial enzymes (Pectinex Ultra SP-L, Celluclast 1.5 L and Viscozyme L) were evaluated for oil extraction from the seabuckthorn pulp obtained after juice separation. Extractions were carried out for 24 h at pH 5.0 and 50ºC, using different enzyme concentrations. The obtained crude oils were analyzed for their fatty acid (FA) and triacylglycerol (TAG) compositions, and fractionated using solid-phase extraction. The melting profiles of different oil samples were characterized by differential scanning calorimetry (DSC). The average oil yields obtained with Viscozyme L (18.6%w/w) and Pectinex Ultra SP-L (17.0%w/w) were significantly higher (p<0.01) than those attained with Celluclast 1.5L (13.9%w/w). For all enzymes, the FA profiles of oils were characterized by high concentrations of palmitoleic (~40%) and palmitic (~35%) acids, with minor proportions of linoleic (~10%) acid. These oils were mainly rich in TAG with acyl carbon number of 48 (~56%) and 50 (~39%), with trace amounts of 46 and 52. Lipid fractionation of crude oils yielded about 97% of neutral lipids. The melting curves of the oils showed the presence of three major endotherms melting separately between -30ºC and 20ºC, for which melting temperatures were -24ºC, -4ºC and 10ºC.

Keywords: Seabuckthorn, *Hippophaë rhamnoides*, enzymatic oil extraction, melting curves, fatty acids, triacylglycerols, solid phase extraction (SPE).

Paper #042

Usage of Lipidic Extract from Dried Sea Buckthorn Fruit (*Hippophae rhamnoides* L.) in Burns and Wounds of the Members

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Our previous researches distinguished the richness of the extracts from Seabuckthorn "pharmacy plant", especially oil containing various active physiological substances. In Central Military Hospital from Bucharest, for a large number of patients with burns and plagues of the members used the optimized seabuckthorn oil (diluted with ¼ *oleum helianthus*, *oleum parafini* and were added vitamin A, E as well as azulene), after the classical local and preparatory treatment. We mention that serious burns, including face and eye, caused by high voltage electric shocks, lightning, and explosions of gas cylinders, acetylene lamp and even scalded shank were amazingly cured. Other types of wounds cured with seabuckthorn oil are: shank trophic ulcer, shank necrosis, cicatrisation of the stump after inferior members' amputation.

It was observed that the regeneration and cicatrisation processes were accelerated and the curing parameters were improved; the oil has anti–inflammatory, antiseptic and immunizing effect. The treatment technique is simple (apply locally), there are no side effects or contraindications, it is not psycho traumatic. The necessary time to be hospitalized is reduced because the wounds cure faster.

Introducing the optimized extract of *Hippophae rhamnoides* is a step forward in the approach to find new specific treatments for burns and other wounds in order to help as much as possible the harmed tissue become healthy again.

Keywords: burns, wounds, cicatrisation, treatment, seabuckthorn oil.

Paper #043

Variation of Sea Buckthorn (*Hippophae rhamnoides* L.) Active Substances Content with Geographic Region and Harvesting Time

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In Romania, seabuckthorn grows spontaneously: sub-Carpathian areas and the Danube Delta. Fruits, stems and roots of seabuckthorn plants were taken from sub-Carpathian areas and the Danube Delta between August and February, for a complete full analysis.

The results showed high acidity expressed in malic acid, high values of total nitrogen, minerals and lipids. From August to February, the quantity of ascorbic acid increases, with dried fruits containing over 200mg%. It is also remarkablethe content of oleic, linoleic and linolenic acids, the last two being precursors of the prostaglandin. Gross fat content is quite high, while free amino acids content tend to decrease. It was noticed an increase in carotenoide content, B1 vitamin, and nicotinic acid. The cafeilchinic products, after a slight increase, they decrease to the initial values at the end of the studied harvesting time.

The oil extracted from fruits has a high content of carotenoids, mainly provitamin A, β-carotene, and important quantities of γ-carotene, violaxanthin and cryptoxanthin.

When the fruits are picked up in colder months, there are less carotenoids which are important for provitamin A, but there are more without provitamins.

The fruits harvested from the sub-Carpathian areas proved to be richer in physiologically active substances compared to the ones from the Danube Delta, also those harvested in colder months, compared to the warmer ones. The multitude of physiologically active substances, including microelements, inframicroelements, and serotonin, explain some therapeutic effects absolutely characteristic to seabuckthorn mixtures.

Keywords: seabuckthorn, harvesting time, geographical area

Paper #052

The Characterization of Seabuckthorn Fruits, Leaves and Copses in terms of Serotonin and Microelements

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The content of microelements in seabuckthorn fruits, leaves and copses was determined through neutron activation. Also, the content from fruits and leaves was analyzed by atomic absorption, for 11 seabuckthorn bio-types.

The content in the dry matter was analyzed from the ashes of the seabuckthorn, depending on the harvesting time. The variation in serotonin content was analyzed depending on the origin of the fruits (three geographic regions). Estimations were made regarding:

- ways of processing different plant organs;
- the spectacular biological effects of seabuckthorn;
- the perspective for serotonin as an imunoinductor in different diseases.

The effects of seabuckthorn are the result of a large number of active physiologic substances, like hydro- and lyposoluble vitamins, hormones and phytohormones, amino-acids (including the essentials), provitamins A, carotenoides, serotonin, melatonin. The use of seabuckthorn products prove its action as immune-inductor because their compounds act simultaneously, in a synergic and harmonic way.

The majority of our research was done together with research centers: industrials, medical and production units.

Serotonin's effects are well known: immune-inductor, energizing, anti-depressive, chemical mediator, with implications in different disabilities like insufficiency in transmitting the information through the nervous system to all the organs and especially to the muscles.

The serotonin with the other substances from seabuckthorn is recommended for sickness or discomfort, too. Mostly concerning the severe conditions that affect the XXI century: cancer, HIV, depression, anxiety, suicide tendencies, insomnia, alcohol abuse, schizophrenia, chemical or biological agent, and the social pollution, too.

Keywords: seabuckthorn, serotonin, fitotherapy, immunity, metabolism

Paper #055

Total Lipids and Carotenoids Content in Different Biotypes of *Hippophaë rhamnoides* L., Harvested in Romania

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Seabuckthorn berries are well known in Eastern Europe for their juice healthful components but they are also a unique source of rare and valuable lipids. The antioxidant activity of oil is stronger because of higher carotenoids levels. In this paper we present the results of total lipids and carotenoids content in seabuckthorn fruits and seeds harvested from two Romanian areas (Sulina, different places located at heights between 0.8m and12m; Buzau, different places located at heights between 278m and 454m). Seabuckthorn berries were harvested at full biological maturity. Lipids were extracted with ethyl ether and evaluated gravimetrically after the solvent was removed. Carotenoids, after the elimination of all carotenoids denaturizing substances, were extracted in diluted acetone and estimated spectrophotometrically. The total lipids content of whole berries varied from 15.28g/100g dry matter to 38.42g/100g dry matter and of the seeds from 15.04g/100g dry matter to 32.41g/100g dry matter. Carotenoids content of whole berries varied from 15.03mg/100g dry matter to 136.13mg/100g dry matter. Total lipids and carotenoids content show a meaningfull variation due to biotypes and pedoclimatic conditions of the harvested plants ecosystem.

Keywords: *Hyppophae rhamnoide*s, seabuckthorn biotypes, fruit lipids, seed lipids, fruit carotenoids

Paper #056

Biochemical Characterization of Sea Buckthorn (*Hippophae rhamnoides* L.) Growing in Latvia

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Seabuckthorn fruits are among the richest sources of vitamins, minerals, organic acids, polyphenols and other biologically active substances useful for human nutrition. The plantations of seabuckthorn have been increasing during the latest 10 years in Latvia. Therefore the objective of this work it is actually to test the content of biologically active compounds in seabuckthorn cultivars grown in Latvia. Our country is located near the Baltic Sea, in the place of the trials, the Dobele district. The annual sunshine is 4522 hours; the sum of active temperatures is 2423 ^{o}C; the absolute minimal temperature is -36 ^{o}C, which occurs only after each 5-10 years. The aim of the study was to determine the content of soluble solids, total acids, vitamin C and E, total carotenoids and phenolic compounds in cultivars adapted to Latvian climate: 'Avgustinka', 'Prozrachnaya', 'Botanicheskaya Lyubitelskaya', Luchistaya', 'Trofimovskaya' and 'Podarok Sadu'. The seabuckthorn cultivars grown in Latvia are from Russian origin. The venue of the research was the Fruit and Berry Processing Center of Latvia State Institute of Fruit-Growing. Biochemical analyses were made during in 2004 - 2005. On average biochemical content of all cultivars was: soluble solids - 8.3 ^{o}Brix, total acids - 3 %, vitamin C - 84.9 mg 100g^{-1}, vitamin E - 23.2 mg 100g^{-1}, total carotenoids - 14.5 mg 100g^{-}1, total phenolic compounds - 126.1 mg 100g^{-1}. As a result, the highest content of biologically compounds was found for cultivars 'Trofimovskaya' and 'Podarok Sadu'.

Keywords: seabuckthorn, soluble solids, acids, carotenoids, phenols, vitamin C, E

Paper #069

Determination of Flavonol Glucosides and Aglucones in Sea Buckthorn Berry by HPLC

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The extraction and acid-catalyzed hydrolysis of seabuckthorn berries were reported in this work. The contents of flavonol aglucones in solutions obtained from the extraction and the hydrolysis were determined by HPLC. It was experimentally found that the contents of quercetin, kaempferol, and isorhamnetin in one gram of seabuckthorn berry were 0.025, 0.015 and 0.035 mg, respectively. At the same time, the acid-catalyzed hydrolysis of one gram fruit during three hours produced 0.383 mg of quercetin, 0.025 mg of kaempferol, and 0.992 mg of isorhamnetin. The ratio of aglucone obtained by extraction to that by acid-catalyzed hydrolysis was 6.52 %, 60.2 % and 3.52 % for quercetin, kaempferol, and isorhamnetin, respectively. It is concluded that the main part of aglucone in seabuckthorn berry is in the form of flavonol glucosides and the free aglucone can be obtained only after the acid-catalyzed hydrolysis, especially for quercetin and isorhamnetin.

Keywords: seabuckthorn berries, flavonol glucosides, aglucones, HPLC

Paper #070

Contents of Flavonol Glucosides in Sea Buckthorn Leaves

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The extraction of seabuckthorn leaves were carried out in methanol and other solvents. Contents of flavonol glucosides and aglucones in seabuckthorn leaves and their extracts were determined by HPLC. Only 2.6 microgram quercetin was found in the methanol extract of one gram of seabuckthorn leaves. Acid-catalyzed hydrolysis of seabuckthorn leaves during three hours produced a great amount of free aglucone, which mainly included quercetin, kaempferol, and isorhamnetin. It was experimentally found that the contents of quercetin, kaempferol, and isorhamnetin in one gram of seabuckthorn leaves were 1.562, 1.498 and 2.398 mg, respectively. At the same time, two hours of acid-catalyzed hydrolysis of the extract leaves (one gram) produced 1.448 mg of quercetin, 0.514 mg of kaempferol, and 1.455 mg of isorhamnetin. It was known from this result that the main form of aglucone in flavonoids of seabuckthorn leaves is the flavonol glucoside, but not the free aglucone, which can be obtained only after the acid-catalyzed hydrolysis. This conclusion is very similar to that in the case of seabuckthorn berry.

Keywords: seabuckthorn leaves, flavonol glucosides, aglucones, methanol, HPLC

Paper #077

NATVIT

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Seabuckthorn *(Hippophae rhamnoides*) is an important medicinal and nutritional product. NATVIT has focused its attention on seabuckthorn. Based in the French Alps it has become an orchard growing process and an important research program. Climatic and soil conditions in the Alps are ideally suited for high quality fruits production. This paper provides a background on the uses and the value of seabuckthorn and explores the potential of a seabuckthorn orchard and processing industry in the Alps region.

For the last ten years, we have been developing plants, growing culture and our own seabuckthorn products made from berries and oil. Examples of available commercial products are: seabuckthorn juice as a vitamin supplement, blend of seabuckthorn and apple syrup and seabuckthorn capsules.

Together with CRMBM (Centre de Résonance Magnétique Biologique et Médicale), we have been collaborating on projects using nuclear magnetic resonance (NMR) spectroscopy as one of the most powerful techniques for analytical and structural chemistry. NMR helps to determine the origin of samples from signals of sugars and lipids. NMR allows identification and quantification in a single analysis of the majors compounds.

Recently, we have grown different seabuckthorn varieties like Hergo, Leiokora… and selected Argalp 700 to offer the best product with high level of vitamin C with an interesting taste.

Keywords: seabuckthorn, plants, product, Nuclear magnetic resonance (NMR)

Paper #087

The Nutrient Analysis of the Seabuckthorn Fruits from Different Species Planted in the Middle Loess Plateau

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This paper deals with coarse proteins, the coarse fatty acid, the fresh water content and the total acidity of the seabuckthorn fruits; the vitamin and sugar content in its pulp and juice, the amino acid content in seabuckthorn juice, the composition of the fatty acid of seabuckthorn seeds, the composition of the fatty acid in the pulp etc. Thus this paper provides the fundamental database for further development of seabuckthorn in these areas.

Keywords: middle Loess Plateau, seabuckthorn fruits, composition analysis

Wednesday August 15
SESSION 3 – AM PROGRAM

8:30-8.35 **Room SUZOR-CÔTÉ**
Welcome/Announcements
Chairs: Stefan Cenkowski, University of Manitoba & Baoru Yang, University of Turku

SECTION: PRODUCTS, INDUSTRY DEVELOPMENT AND MARKETING

8:35-9:20	**Keynote Speaker** **DEVELOPMENT AND MARKETING OF SEABUCKTHORN PRODUCTS.** *Baoru Yang, University of Turku* (Finland)	*Paper #082*
9:20 - 9:40	**Seabuckthorn - Processing and Product Overview.** *Alphonsus Utioh* (Canada)	*Paper #093*
9:40 - 10:00	**Utilization of Seabuckthorn Fruit Pulp and Juice as Functional Food Ingredients.** *Leslie Hudson, Janice Meseyton, Haihong Wang and Alphonsus Utioh* (Canada)	*Paper #041*
10:00 - 10:20	**Strategies in Seabuckthorn (*Hippophae rhamnoides*) Product Development and Marketing for Global Health, Fitness and Cosmetic Applications.** *Wudeneh Letchamo, Alphonsus Utioh, Paul A. Lachance, Thomas G. Hartman* (USA-Canada)	*Paper #007*
10:20 - 10:40	**Room Borduas - Break**	
10:40 - 11:00	**Assessment Report on the Seabuckthorn Market in Europe, Russia, NIS-Countries and China. Results of a Market Investigation in 2005.** *Axel Waehling* (Germany)	*Paper #009*
11:00 - 11:20	**21st Century Advances in Quality, Standardization, and Regulatory Aspects of Genetically Improved Siberian *Hippophaë* Fruit Juice.** *S.A. Muchkortov*, E. Filimonova, V. Porogin, A. Shebalin, and W. Letchamo* (Russia - Canada)	*Paper #091*
11:20 - 11:50	**Innovation in the Agri-Food sector– Strategies and resources** *Francine Masson, Canada*	
11:50 - 13:00	**Room Place Montcalm - Lunch**	

Wednesday August 15
SESSION 3 – PM PROGRAM

13:00-13:05 **Room SUZOR-CÔTÉ**
Announcements
Chairs: Baoru Yang, University of Turku & Stefan Cenkowski, University of Manitoba

SECTION: PRODUCTS, INDUSTRY DEVELOPMENT AND MARKETING

13:00 - 13:20	**The Effect of Irrigation, Cultivars and Mulch Type's on Nutrient Availability and Vegetative Growth of Seabuckthorn (*Hippophae rhamnoides* L.).** *Carl Boivin, Hélène Rousseau Jacques-André Rioux and Daniel Bergeron* (Canada)	*Paper #051*
13:20 - 13:40	**Design of a Mechanical Harvester for Seabuckthorn Berries.** *D.D. Mann*, D.S. Petkau and T.G. Crowe* (Canada)	*Paper #073*
13:40 - 14:00	**Introducing Seabuckthorn in the Province of Quebec – Production challenges.** *Martin Trepanier* (Canada)	
14:00 - 14:20	**Introduction of Non-Traditional Crops to a Jurisdiction - The Newfoundland and Labrador Program.** *Richard .R. Oram* (Canada)	*Paper #78*
14:20 - 14:40	**German Seabuckthorn Association - Its Roles and Activities.** *T. Moersel* (Germany)	
14:40 – 15:00	**EAN-Seabuck: A Successful Story of Seabuckthorn International Cooperation.** *Hermoso, M.* (Germany)	*Paper #011*
15:00 - 15:15	**Room Borduas - Break**	
15:15 - 16:00	**Panel Discussion** **CHALLENGES AND OPPORTUNITIES FOR SEABUCTHORN INDUSTRY IN CANADA.** *Facilitator - Alphonsus Utioh (Canada)*	
16:00 - 17:30	**Room Borduas - Poster Session 3**	

Wednesday August 15
SESSION 3 – POSTER SESSION

Paper #011	**Ean-seabuck: A Successful Story of Seabuckthorn International Cooperation.** *M. Hermoso* (Germany)
Paper #048	**Investigations Regarding the Cicatrizing Action of the Gels with Tamarix Gallica Compared with *Hippophae rhamnoides.*** *Denisa Mihele, Daniela Raiciu, St. Manea, and Anca Pop* (Romania)
Paper #049	**Research Regarding the Gemoderivatives of Tamarix Gallica on the Gastric Secretory Activity and Motility on Rats.** *Denisa Mihele, St. Manea, Anca Pop, and Daniela Raiciu* (Romania)
Paper #053	**Aspects of Utilization Seabuckthorn (*Hippophae rhamnoides*) in the Feeding of Lambs for Fattening and Treatment of Different Diseases.** *I. Brad , G.A. Vlasceanu, L. Nastase, and D. Barbu* (Romania)
NO SHOW Abstract removed	***Hippophae* as a "Business Card" of Altaivitaminy Pharmaceutical Company.** *Y. A. Koshelev, and E. S. Batashov* (Russia)
Paper #090	**Development of *Hippophae* Based Slow Release Active Packaging for Healthy Diet and Flavor.** *W Letchamo and K. Yam* (USA)

Paper #082

Development and Marketing of Sea Buckthorn Products

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Seabuckthorn has a long history of application in traditional Tibetan and Mongolian medicines. For decades seabuckthorn has been listed in the Chinese Pharmacopea as a medicinal plant. Medicines based on seabuckthorn extracts have been developed and marketed in China and Russia. The unique composition and health effects of seabuckthorn are increasingly recognized in western countries. Seabuckthorn berries and berry fractions are used as bioactive ingredients for foods, food supplements and personal care products. Opportunities and challenges coexist in the product development and marketing of seabuckthorn. Improving health consciousness of the consumers presents great potential market for seabuckthorn. The quality of raw materials is of crucial importance to guarantee the efficacy and safety of the products. In addition to the great compositional variation among different subspecies, cultivars and varieties of seabuckthorn, environmental factors at the growth sites strongly influence the quality of the berries. There is a considerable risk of damaging sensitive components and introducing harmful contaminants during the harvesting and pre-handling of the raw materials. Careful screening and optimization of processing technologies ensure that bioactive components are maintained and enriched in the natural forms. Standardized and constant compositions, together with well substantiated health claims are essential for successful marketing of seabuckthorn products. Particular attention shall be paid to the regulatory aspects when developing and marketing seabuckthorn products for specific markets.

Keywords: Seabuckthorn, *Hippophaë rhamnoides*, Product development, Processing technology, Marketing, Health products, Health food regulations

Paper #093

Seabuckthorn (*Hippophae Rhamnoides* L.) Processing and Products Overview

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Seabuckthorn (*Hippophae rhamnoides* L.) (SBT) has become a crop of interest for many countries. Almost all parts of the seabuckthorn shrub can be used in the food, nutraceutical, pharmaceutical and cosmetic industries. SBT fruits have high amounts of vitamins, minerals, flavonoids, carotenoids and fatty acids, and it can be processed into dried fruits, infused fruits or fractionated into puree, seed and pulp. SBT juice contains high levels of vitamins A, C, iron and antioxidants; it can be produced as a single strength juice or blended with other fruit juices and sweeteners to produce nutritional and sport beverages. It can be further processed to concentrated SBT juice, jellies, syrups, dried to SBT juice powder, fermented into SBT wine and other alcoholic drinks, SBT soy sauce, SBT vinegar. SBT pulp contains high amounts of palmitoleic acid (ω-7), which make pulp the unique characteristic. Dried pulp can be incorporated into nutritional bars and bakery products to enhance their nutritional value and produce an attractive aroma and colour. SBT pulp and seed oil are the most valuable products for their fat-soluble vitamins, sterols and fatty acids; they can be applied directly in food, pharmaceutical and cosmetic industries. They also can be produced as encapsulated products as a functional food or processed into micro-encapsulated oil as a functional ingredient. Seabuckthorn leaves are used for some tea blends and body care products. The leaves can also be crushed for extraction of essential oil and falvonoids. The bark and seed has also been used to extract proanthocyanidins. Seabuckthorn products and some of their nutritional value and potential health benefits will be outlined in this presentation.

Keywords: Seabuckthorn fruit, Processing, Product, Seed, Pulp, Bark, Juice, Oil

Paper #041

Utilization of Seabuckthorn Berry Pulp and Juice as Functional Food Ingredients

Leslie Hudson, Janice Meseyton, and Alphonsus Utioh*

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Seabuckthorn (SBT) berries are considered functional food due to their high content of unsaturated fatty acids, vitamins, carotenoids, flavonoids and dietary fibre. Processing SBT berries for seed oil results in nutrient rich co-products (juice and pulp). SBT berry pulp is high in dietary fibre while the juice is rich in vitamin A and C; hence they can be used as functional ingredients in the food industry. Prototype food products were developed with the co-products of SBT berry processing. Dried berry pulp was used in an unbaked cereal bar and the clarified juice was used for beverage development. The berry pulp and juice are very tart, strongly flavoured and bright orange/red; thus present unique product formulation challenges. Pulp and juice from two SBT varieties (Indian Summer and Sinensis) were evaluated. Pulp and juice from Indian Summer berries were more tart and more orange/red than that from Sinensis; nutritional differences also existed between the two varieties. Indian Summer berry pulp and juice were used in both final formulations for bar and beverage products. The berry pulp was incorporated into the bar at 2, 4, 6 and 10%. Increasing the level of pulp affected bar appearance, flavour and texture. Initial results indicate SBT berry pulp may contribute humectant properties to the bar. Beverages containing 30, 35 and 45% SBT berry juice (10.9° brix) were formulated. Adding 30% juice produced a pleasantly tart and fruity beverage with an attractive opaque orange colour. It is important to minimize heat processing to preserve colour and vitamins of the product.

Keywords: *Hippophae,* Indian Summer, Sinensis*,* dietary fiber, pulp, juice, beverage, bar, functional food

Paper #007

Strategies in Sea Buckthorn (*Hippophae rhamnoides)* Product Development and Marketing for Global Health, Fitness and Cosmetic Applications

Wudeneh Letchamo[1*], Alphonsus Utioh[2], Paul A. Lachance[2], Thomas G. Hartman[3]

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The objective of the presentation is to demonstrate historical background of SB development, its evolutionary roles in various cultures and periods, recent developments in product formulations, new methods of delivery and applications. The paper also presents current trends in new product development, QA/QC methods and effective strategies for global marketing and delivery of SB and its products. Comparative facts, figures with new trends from Europe, Asia and N. America are shown. We shall also show how factors, such as the type of species, cultivars, chemotypes, ecology, harvesting and processing methods etc, may influence the quality and efficacy of SB products. Risks associated with the choice of cultivars (Russian, European or Chinese origins) in product development are discussed.

Various processing methods, such as freeze drying, solvent extraction, fermentation, cold pressing, CO_2 or supercritical, freon, and water extractions, boiling and powdering show significant differences in the quality and composition. SB contains a unique composition of oil, amino acids, more than 25 minerals (N, P, K, Ca, Mg, Fe, Zn, I, Mn, Mo, Se, etc.), serotonin, flavonoides, terpens, alkaloids, vitamins (A, B, C, E, K), polyphenols, carotenoids, sitosterols, lycopene, triterpenoids, volatile oil, and enzymes. SB fruit and seed oil contain nearly 90% unsaturated fatty acids including linolenic acid (Omega 3), linoleic acid (Omega 6), oleic acid (Omega 9), palmitoleic acid, etc. The development of rationally formulated SB products will add to the solution of the challenges in health, longevity, fitness, diabetes, depression and obesity in developed nations, where there is surplus food, but most diets fall short of the necessary vitamins, minerals, amino acids and enzymes. Most children in developing countries suffer from malnutrition, malaria, tuberculosis, allergies, and immune illnesses. Health supplements containing SB can be formulated to support healthy growth and supplied at affordable prices in many countries. Furthermore, products containing SB can be developed as supplement for pets and veterinary applications. A summary of the recent advances in new products formulation, quality assurance, and new areas of applications, adhering to the Pharmacopoeias and WHO safety and efficacy principles, along with global marketing strategies is presented.

Keywords: Lipids, sitosterols, cosmetic, wound healing, anti-ageing, anti-freeze, tonic, adaptogen

Paper #009

Assessment Report on the Seabuckthorn Market in Europe, Russia, NIS-Countries and China
Results of a Market Investigation in 2005

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The commercial cultivation and exploitation of seabuckthorn berries using its secondary compounds such as flavonoids, vitamins and carotenes for high quality food products or even to produce basic products such as juices is differently developed in Europe, Asia, Russia and the New Independent States (NIS) countries. The aim of this paper is to present a market study on the seabuckthorn products and give an overview of market strategies.

For the investigation of the seabuckthorn industry, NIG GmbH Magdeburg developed a detailed questionnaire in English language, which was further translated into German, Chinese and Russian. The questionnaire (based on theoretical aspects of data) aims at market studies. The questionnaire has been widely distributed among key actors and core partners identified in the seabuckthorn business in Europe and Asia together with the Forest Institute in Archangelsk and the International Center for Research and Training on Seabuckthorn (ICRTS) in Beijing.

The information requested in the questionnaire covers cultivation area, products sold (fresh, frozen berries, leaves), price, and market, processing of berries and leaves, types of half-products and their market, as well as final products, their price and market. The information derived from the questionnaire provides a broad overview of the market situation, shows the development of the seabuckthorn industry provides information on different marketing strategies for seabuckthorn products in the investigated countries.

Keywords: Sea Buckthorn market, berries, half and final products, prices, production amount, Europe, Russia, China,

Paper #091

21st Century Advances in Quality, Standardization, and Regulatory Aspects of Genetically Improved Siberian *Hippophaë* Fruit Juice

S.A. Muchkortov[1]*, E. Filimonova[1], V. Porogin[1], A. Shebalin[1], and W. Letchamo[2]

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The fruit juice of genetically selected Siberian *Hippophaë* has enjoyed continuous popularity as a byproduct of health oil production in Russian Siberia and the former Soviet Union. Since the early 19th century, introduction of commercial viable *Hippophaë* in Russia, products formulated thereof have been successfully marketed as "natural remedy and adaptogen" for health related problems, exercise challenges,\, research in space flight programs, and common beverage in Russia.

Being a non-legume, *Hippophaë* is able to fix atmospheric nitrogen through its root nodules, where the plant is cultivated in the Russian Federation without applying synthetic fertilizers, insecticides or pesticides. Hence, the cultivation and processing of *Hippophaë* formulations can be considered as "Certified Organic" or "Kosher Certified" following free modern consumer demands in the industrialized countries. The objectives of our paper is to demonstrate how new Russian business is able to adapt scientific and technological advances based on recent and earlier scientific results and regulatory standards put forward to develop reliable, clean and established *Hippopha* products. We will demonstrate how the new Russian businesses are able to benefit from almost a century old former Russian scientific research results to produce the World's best Siberian *Hippophaë* cultivars based juices and formulations thereof. The Siberian *Hippophaë* juice is famous for its health promoting effects for ordinary citizens, as an adaptogen in space travel, sports, and combat military performance, and personal care formulations, biologically active slow release packaging system and cosmetic formulations. The paper presents results on established Russian regulatory aspects based on more than 70 years of 'Russian State Pharmacopoeia Regulatory publications' that serve as a regulatory organ for standardization, safety, microbial, heavy metals and pesticide levels to monitor the safety and quality for humans and animal wellbeing. Our findings on chemical, microbiological, and heavy metal concentrations, pesticides, and other biochemically significant traits, focusing on "biologically active health food packaging" as natural preservation is presented.\

Keywords: Space travel, adaptogen, amino acids, health, sport nutrition, antioxidant, natural flavor

Paper #051

The Effect of Irrigation, Cultivars and Mulch Type's on Nutrient Availability and Vegetative Growth of Seabucktorn (*Hippophae rhamnoides* L.)

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Soil nutrient availability, leaf nutrient status, and vegetative growth of six *Hippophae rhamnoides* L. cultivars ('Askola', 'Hergo', 'Golden Rain', 'Mary', 'Sunny' and 'Tatjana') were measured in 2004 and 2005, under combinations of irrigation regimes and mulch types, on Île d'Orléans, Québec, Canada. Irrigation was triggered by tensiometers when soil moisture tension reached either 25 kPa or 60 kPa. Black plastic and chipped tree residues were compared as mulching materials. Experimental design was a split-strip-split-plot, with irrigation in main plot, cultivar in subplot and mulch in subsubplot. Factorial combinations were replicated three times in plots bearing ten plants each, for a total of 720 plants. Irrigation regime and cultivars had no significant effect on soil N, P, K, Mg and Ca. Plastic mulch significantly increased N mineralization, whereas wood mulch led to significant increase in soil K content. In 2004, foliar Mg levels were significantly greater on plastic than on wood mulch, whereas both foliar K and Ca were enhanced by wood mulch. In 2005, wood mulch led to a significantly greater foliar K level only. In 2004, all cultivars' increment in circumference was greatest under a combination of wood mulch and soil moisture tension of 25 kPa, whereas in 2005 this irrigation regime improved only this parameter for 'Hergo' and 'Tatjana cultivars'. In 2004, height growth of 'Hergo', 'Sunny' and 'Tatjana cultivars,' was more important on plastic than on wood mulch, whereas 'Golden Rain' grew best on wood mulch. In 2005, all cultivars grew better on wood mulch.

Keywords: Seabuckthorn, *Hippophae rhamnoides*, irrigation, mulch, soil nutrient availability, leaf nutrient status, tensiometer

Paper #073

Design of a Mechanical Harvester for Seabuckthorn Berries

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Recent interest in commercial production of seabuckthorn in the Canadian Prairies requires an economical harvesting solution. A hydraulically-controlled shrub shaker has been designed and tested for removal of these berries. Harvesting trials were conducted over four consecutive harvesting seasons beginning in 2000 using the "Indian Summer" variety of seabuckthorn. For each harvest season, changes were made to the prototype harvester to address issues such as berry removal efficiency, minimization of shrub damage, berry collection efficiency, and maneuverability. With the Mark I prototype, vibration parameters of 25 mm amplitude and 26 Hz frequency were found to optimize the ratio of berries to debris removed. With the Mark II prototype, special attention was paid to the damage inflicted by the harvester to the shrubs. Shaking at 25 Hz and 25 mm caused less damage to the shrubs than shaking at 20 Hz and 36 mm. The goal of the Mark III prototype was to increase maneuverability of the harvester and to add the capability to collect the berries as they fell from the shrub. A rigid platform was connected to the front of a John Deere industrial compact excavator. Collection efficiency was less than 70% and many of these berries were damaged by impact with the rigid platform. Maneuverability was poor because the harvester had to approach each individual shrub perpendicular to the row of shrubs. The Mark IV prototype consisted of a flexible collector mounted to the side of the harvester that enabled the harvester to drive parallel to the row of shrubs. Collector efficiency was 56% because the shrubs had been allowed to sucker and the collector could not be extended past the centerline of the row.

Keywords: seabuckthorn, berry, harvesting, shrub, shaker, *Hippophae rhamnoides* L.

Paper #078

Introduction of Non-Traditional Crops to a Jurisdiction The Newfoundland and Labrador Program

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The recent interest in diversifying the Agrifoods Industry in Newfoundland & Labrador has led to the development of a program to introduce new crops. The program moves crops through a series of phases enroute to establishing them as mainstream commercial crops in the jurisdiction. These phases include crop selection, research & development, industry development , pre-commercial and commercialization. Sea Buckthorn is at the research & development phase in the programs; activities in this phase include: variety selection (7 Russian; 3 German; 6 Latvian and 1 Canadian), plant propagation, field trials and pilot commercial seabuckthorn orchards. Field trials planted in the fall of 2002 (Russian, German and Canadian varieties) and in the spring of 2005 (Latvian varieties) at Wooddale focuses on observational growth, timing of pollen dispersal, pest and disease problems, fruit maturity and fruit yield. Pilot commercial seabuckthorn orchards focuses on testing the selected varieties in different geographic and climatic zones and building capacity through human resource development within the region. Through a public call for expressions of interest, four pilot commercial seabuckthorn orchard sites have been selected on the island portion of Newfoundland & Labrador. The East Coast site (near St. John's), the Central site (near Grand Falls-Windsor) and the South Coast site (near St. Alban's) were planted in 2003 and the West Coast site (near Corner Brook) in 2005. These pilot sites are 1.5 ha and have all seventeen (17) varieties of seabuckthorn in the program represented in them. All sites were in high precipitation zones ranging from 1000 to 1500 mm per year, typical of the Canadian Boreal ecozone.

Keywords: Diversification, Sea Buckthorn, Jurisdiction

Paper # 011

EAN-SEABUCK: A Successful Story of Seabuckthorn International Cooperation

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Hippophae rhamnoides (seabuckthorn) is native to Europe and Asia. It has been used for centuries in traditional Russian and Chinese medicine and it is rich in bioactive compounds, such as vitamins, minerals and essential oils. The plant offers a huge potential as raw material for premium food, cosmetic and pharmaceutical products. However, commercial cultivation and exploitation is poorly developed in some areas due to a lack of know-how in harvesting and processing technologies and marketing. In other areas (Europe), there is a shortage of raw material.

During the last two years, the European project EAN-SEABUCK, financed by the European Commission under the 6th Framework Programme, has been dedicated to the successful establishment of an integrated cooperation network between Europe and Asia, including Russia and the Newly Independent States for a joint sustainable utilisation of seabuckthorn. The program goal has been to improve technical knowledge and know-how on seabuckthorn production, from cultivation and harvesting to processing and product development, leading in the long-term to the establishment of a solid seabuckthorn industry. Current research has been assessed, as well as the production and marketing situation, and the best available technologies have been identified. Training modules on the different topics has been designed, collecting feedback to optimise training effectiveness. Training has been successfully carried out in areas of China, Russia and Uzbekistan addressed to seabuckthorn farmers and processors. A win-win situation has been achieved by mobilising scientific and technological capacities to the benefit of the seabuckthorn international community.

Keywords: *Hippophae rhamnoides*, Sea Buckthorn, Seabuckthorn, network, sustainability, international cooperation

Paper #048

Investigations Regarding the Cicatrizing Action of the Gels with *Tamarix Gallica* compared with *Hippophae rhamnoides*

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We investigated the cicatrizing action of the gels with gemoderivatives from *Tamarix gallica* (french tamarisk) in concentration of 5%, compared with gels from the *Hippophae rhamnoides* (seabuckthorn), in the same concentration. Taking into account that the oil extracted from *Hippophae rhamnoides* has cicatrising properties, in the present paper we studied if *Tamarix gallica*, very frequent in Romania, has the same properties.

The assesment of the cicatrising action was done for the gel with the gemoderivative from *Tamarix gallica* in concentration of 5% compared with the gel from oil of *Hippophae rhamnoides* in concentration of 5%. The gels were prepared with Carbopol 990 and triethanolamine 0,5%. The experimental study was done on white Wistar rats, aged 5-8 months, weighing 200±10 g, epilated on the dorsal side. The burns were provoked under ethilic ther anaeshesia with a metallic device with the diameter of 1 cm, heated at 105˚C (221˚F). The treatment was applied for 14 days.

The complete healing of the wounds provoked by burning, at the untreated controls, was produced in 15-16 days. The healing of the wounds of the animals treated with the *Hippophae rhamnoides* gel was produced after 8-10 treatment days and for the animals treated with *Tamarix gallica* gel, after 9-10 days. The gels obtained from the oil of *Hippophae rhamnoides* and from the gemmoderivative of *Tamarix gallica* have a close cicatrising action.

Keywords: Seabuckthorn, *Tamarix gallica,* cicatrizing action.

Paper #049

Research Regarding the Gemoderivatives of *Tamarix gallica* Compared with *Hippophae rhamnoides* on the Gastric Secretory Activity and Motility on Rats

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We studied the effect of the gemoderivatives from fresh shoots of *Tamarix Gallica* (French tamarisk) as compared to seabuckthorn (*Hippophae rhamnoides*) on the gastric secretory activity and motility.

The assesment was made for the derivative of *Tamarix gallica* and seabuckthorn (*Hippophae rhamnoides*) after the elimination of the glicerin-alcoholic solution. From the dry extract we obtained aquase solution in concentration of 5%, 1 ml/100 g body weight animal.

The solution extracted from *Tamarix gallica* lowered the volume of the gastric secretion by 29.7% , the seabuckthorn extract solution decreased by 33.4% and the gastric acidity by 30.5% and 35.4% for *Tamarix gallicaand* and seabuckthorn, respectively. The gastric motility of the animals treated with *Tamarix gallica* was lowered by 31.9% and the stimulated with $MgSO_4$ intestinal transit - by 17.7% and for seabuckthorn by 21.6% and 15.4%, respectively. The decrease of the gastric acidity by the gemoderivatives of *Tamarix gallica* and the seabuckthorn is due to the presence of the flavones and anthocyanosides, the decrease of intestinal motility is due to the presence of the tannins.

The extracts from the gemoderivative of the seabuckthorn and french tamarisk decreased the gastric secretion volume, gastric acidity, and the unstimulated and $MgSO_4$ stimulated intestinal motility. Tamarix and seabuckthorn presented a pronounced gastro-protective effect in the experimental ulcers provoked by indometacin.

Keywords: Seabuckthorn, *Tamarix gallica,* gastric acidity, intestinal motility.

Paper #053

Aspects of Utilization Seabuckthorn *(Hippophae rhamnoides)* in the Feeding of Lambs for Fattening and Treatment of Different Diseases

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The paper presents the results of experiment concerning the use of the *Hippophae rhamnoides* in feeding trials of lambs submitted to fattening and in the veterinary medical treatment of skin wounds. The trials were performed on male lambs (Suffolk and Tigaie), in experimental lots of 50 head each over the copurse of 90 days.

In Lot l the mixed feed recipe with a content in amounts up to 5 % pulvis seabuckthorn. The young sheep of Lot l achieved a mean daily weight gain of 251 g. Young sheep of Lot II achieved a mean daily weight gain of 175 g.

Sea bucthorn oil was used in trials as a topical medical treatment. The best results were achieved with seabuckthorn oil on the infected pododermatitis of sheep at 130 head and in the treatment of skin wound by mechanical action (lesion) at 350 head.

Keywords: Seabuckthorn Oleum, Pulvis *Hippophae rhamnoides*, Treatment, Nutrition, Pathogen

Paper #090

Development of *Hippophae* Based Slow Release Active Packaging for Healthy Diet and Flavor

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Food spoilage has always been one of the leading concerns for health and food shortages worldwide. Interest is also growing in plant-derived food additives and preservatives as replacement to synthetic antioxidants like BHA and BHT to slow down the oxidative deterioration of food and pharmaceuticals. seabucktorn (*Hippophae rhamnoides*, L.) extracts including oil, tea or extracts from the leaves, bark and roots have shown valuable biological activities, including antimicrobial, antimycotic, antioxidative, bioregulatory and numerous health benefits. Present food packaging practice provides passive external protection against degrading factors such as light, moisture, insects and limit oxygen or heat, while direct incorporation of antimicrobial agents into the food surfaces as coating layer can result into a rapid diffusion to the food matrix, and the coatings may have only a preservative or antioxidative effect.

The objective of our present study is to overcome the above mentioned limited benefits, and develop active slow release edible food packaging system that will actively provide food protective, antioxidative and additional health and mood improvement, and flavor supporting traits. We conducted replicated experiments in a bakery by directly mixing 1 %, 5 % and 15 % *Hippophae* fruit/seed cake powder into to 1 Kg of wheat powder. The control or untreated group was 100 % wheat powder, and all the variants were baked under similar conditions. The flavor, color, smoothness, general acceptability general consumer tasters, and shelf life were recorded. In order to verify the quantitative effectiveness of the treatments against microbial spoilage, we conducted total plate count.

Our results indicate that the addition of *Hippophae* seed cake powder extended shelf life, limited the development of total plate count, and improved the flavor consistency and acceptability of the bread compared to the control group. The lowest microbial plate count was obtained at 15 % *Hippophae* concentration, while keeping its "freshness" for ten more days without any additional treatment. Unlike the control group the 5 % and 15 % treatments had smoother surfaces without any surface cracking or disintegration of the whole bread, while 1 % treatment was less though better compared to the control group. None or lowest CFU was counted in treated variants while the highest CFU was recorded for the control group. After the storage the consumer acceptance was remained the same for the treated variants. The original fresh look, smoothness, flavor and moisture content were intact. The future work should include the elucidation of changes in structure, chemical changes in the bread and determination of some of the major components that are involved for the biological activity. The result will help future development of renewable and sustainable standardized *Hippophae* based food, pharmaceutical and personal care preservatives that might also impart positive influence on natural flavors.

Keywords: Active food packaging, antioxidant, antimicrobial, flavor, seabuckthorn, health, preservation

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Manitoba Agri-Health Research Network (MAHRN) is a consortium of world-class research and development facilities collaborating on functional food and nutraceutical research and commercialization projects around the globe.

Together the Canadian Centre for Agri-Food Research in Health and Medicine, Richardson Centre for Functional Foods and Nutraceuticals and the Food Development Centre offer research and product development capacity that is unique and unsurpassed in Canada.

To learn more and explore business opportunities with MAHRN, contact *Terry Buss, MAHRN Co-ordinator, at 204-266-1330 or email: terry.buss@gov.mb.ca.*

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Le Manitoba Agri-Health Research Network (MAHRN) est un consortium d'installations de recherche et de développement reconnu à l'échelle internationale qui collabore sur des projets de recherche et de commercialisation sur les aliments fonctionnels et nutraceutiques au niveau mondial.

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Pour en apprendre davantage et pour explorer des possibilités d'affaires avec le MAHRN, veuillez communiquer avec *Terry Buss, coordonnateur du MAHRN, au 204-266-1330 ou par courriel à : terry.buss@gov.mb.ca.*

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