Pedreschi, F., Aguilera, J.M. 2000. J. Food Process Engineering **23** 127-143 (2000)
Sodini, I., Remeuf, F., Haddad, S., & Corrieu, G. (2004). The relative effect of milk base, starter, and process on yogurt texture: A review. *Critical Reviews in Food Sciences and Nutrition, 44*, 113-137.
Steffe, J. F. (1996). *Rheological methods in food process engineering*, East Lansing, USA: Freeman Press, p. 418.
Tamime, A.Y., Robinson, R.K. 1999. Yoghurt Science and Technology. Woodhead Publ., Cambridge.

COMPARISON OF DIFFERENT SEA BUCKTHORN BERRY VARIETIES ON THE BASIS OF PHYSICAL PROPERTIES

T. Lõugas
Department of Food Processing, Tallinn University of Technology, Ehitajate tee 5 Tallinn 19086 ESTONIA

ABSTRACT

Sea buckthorn (*Hippophae rhamnoides* L., *Elaeagnaceae*) as an edible berry has a long history of application as a food both in Asia and in Europe.
To describe the berries for different kind of purposes (transportation, processing) some chemical and physical analyses (the moisture content, dimensions and size distribution of the berries and also puncture resistance) were carried out.

INTRODUCTION

Sea buckthorn is a bush with berries from yellow to red in colour which has been used for centuries. These berries contain a large variety of substances especially those that are biologically active and have antioxidant properties.
In ancient Greece, sea buckthorn leaves added to horse fodder were well reputed to result in weight gain and shiny hair; thus, the Latin name "*Hippophae*" meaning shining horse.
Sea buckthorn occurs as a native plant distributed widely throughout temperate zones between 27° and 69° N latitude and 7° W and 122° E longitude including China, Mongolia, Russia, Great Britain, France, Denmark, Netherlands, Germany, Poland, Finland, Sweden, and Norway (Li and Schroeder, 1996).
During the last 10 years the cultivation of sea buckthorn in Estonia is turned more popular – there is over 500 ha sea buckthorn plantations. There are two research institutions in Estonia – the Experimental Station at Rõhu (experiments with sea buckthorn since 1998) and Polli Horticultural Research

Centre in Estonian University of Life Sciences – who study the different growing conditions and crop yield. Mostly are growing in Estonia the sea buckthorn varieties, which are developed under leading professor Trofimov in institute near the Botanic Garden of Moscow University.
The study on physical properties, such as size, weight and crushing strength of berries are required for the development of the grading system for berries.
The objective of this work was to give an overview and to compare different sea buckthorn varieties on the assumption of their physical characteristics in years 2005-2007.

MATERIALS AND METHODS

Sea buckthorn berries were harvested in seasons 2005, 2006 and 2007 from different cultivars grown in Estonia. The varieties with Russian origin were marked as AVR – Avgustinka, BOA – Botanicheskaja Aromatnaja, BOL – Botanicheskaja Ljubitelskaja, BOR – Botanicheskaja, HPR – Gibrid Pertchika, OTR – Otradnaja, PSR – Podarok Sadu, TRR - Trofimovskaja, VOR – Vorobjevskaja; and varieties with German origin were marked as ASK – Askola, DOR – Dorana, HER – Hergo and SIR – Sirola.

The moisture content was characterized using halogen moisture analyser HR83 (Mettler Toledo, Switzerland).
The geometric mean diameter (D_g) and the degree of sphericity (□) of the fruits were calculated according to Mohsenin (1970).
The mass of the berries was weighed by a chemical balance AB204 (Mettler Toledo, Switzerland).
The puncture resistance of sea buckthorn berries was characterized using a texture analyzer TA-XT2i (Stable Micro Systems, UK).
Some chemical analyses were also carried out. All the chemical and physical experiments were described by Lõugas (2006).

RESULTS AND DISCUSSION

The experiments were carried out with 13 sea buckthorn berry varieties, but unfortunately not with all varieties in all years. The first crop from German varieties was obtained in 2006, next year two varieties failed according to hard winter. And also some Russian varieties were not covered for all the years.
The moisture content was measured in all species of sea buckthorn berries. The values for Russian varieties were in the range of 81.3-85.8 %, 79.7-83.0 % and 81.3-87.3 % in 2005, 2006 and 2007, respectively; 79.5-82.0 % and 81.0-82.4 % in 2006 and 2007, respectively for German varieties.

Three principal dimensions, namely length, width and thickness, were measured using a micrometer. For Russian varieties the length of the berries was between 10.64-13.71 mm in 2005, 10.74-13.34 mm in 2006 and 9.88-12.46 mm in 2007; and the width of the berries was in the range of 7.79-9.03 mm in 2005, 8.10-9.70 mm in 2006 and 7.74-9.38 mm in 2007. The smallest berries belonged to variety PSR. For German varieties the length of the berries was 9.31-10.72 mm in 2006 and 8.45-10.51 mm in 2007; and the width of the berries was in the range of 6.45-8.44 mm in 2006 and 6.53-7.80 mm in 2007. The smallest and the biggest berries were in variety HER and SIR, respectively.

According to the formulas (Mohsenin, 1970) were calculated geometric mean diameter (Dg) and sphericity (Φ). With these parameters it is possible to evaluate the shape of the berries. It could be pointed out, that the berries with German origin were smaller than the berries with Russian origin.

Most spherical berries for Russian varieties in 2005 were in AVR variety; simultaneously most oval berries were in variety BOL, in 2006 also BOR and TRR and in 2007 BOR and BOL, respectively. The sphericity for two German varieties (HER and SIR) is quite average, but the rest are oval berries.

In 2005 the mass of the berries is between 0.49-0.85 g, in 2006 0.42-0.77 g and in 2007 0.49-0.73 g. The German varieties had lower values of mass – for ASK, DOR and HER 0.23-0.30 g and for SIR 0.46-0.48 g, respectively.

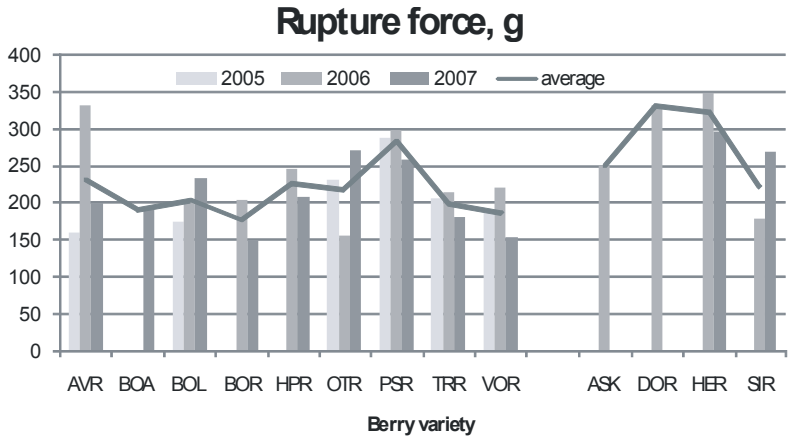

Figure 1.
The rupture force of the berries

The rupture force of sea buckthorn berry varieties is shown in Figure 1. Previous studies have been shown that the puncture resistance of the berries is influenced by freezing and defrosting (Lõugas, 2006). As all the characteristics of the berries are influenced by climatic and other conditions, we can see that the

puncture resistance is not the exception. The summer 2006 was sunny and warm – the moisture content of the berries was little bit lower compared to other years, and the rupture force had due to that higher values. And also could be pointed out that smaller berries (PSR and German varieties) had higher rupture force.
Physical properties of berries vary with the species and in some extension also with years. As a result of present work we could not point out considerable differences between berry varieties – there were some tendencies, but it was not enough to make final conclusions. More experiments are needed for variety selection.
Among some chemical analyses we have been determined the content of vitamin C, β-carotene, reducing sugars, titratable acidity. Also all these values varied among the varieties and years.

REFERENCES

Li, T. S. C., Schroeder, W. R. (1996) Sea Buckthorn (*Hippophae rhamnoides* L.): A Multipurpose Plant. *HortTechnology,* Oct./Dec., 370-380

Lõugas, T. (2006). Study on Physico-Chemical Properties and Some Bioactive Compounds of Sea Buckthorn (*Hippophae rhamnoides* L.). PhD thesis in Tallinn University of Technology, TUT Press, Tallinn, 113 p.

Mohsenin, N. N. (1970). Physical Properties of Plant and Animal Material. Gordon and Breach, New York

RHEOLOGICAL MEASUREMENTS FOR STANDARDIZATION OF VISCOSITY OF TEST BOLUS AND FOODS FOR PATIENTS SUFFERING FROM DYSPHAGIA

Krisztina Mészáros MD[1], Zsuzsa Varga PhD[2],
Péter Kárpáti Ch.E.[3], Tamás Hacki MD, PhD[4]

[1]Head & Neck Surgery Department of National Institute of Oncology, H-1122 Budapest, Ráth Gy. u.7-9. Hungary Tel/fax: +36-1-224-8600/+36-1-224-8620 kmesz@hotmail.com
[2]Semmelweis University, Faculty of Health Science, Department of Dietetics, H-1088 Budapest, Vas u. 17. Hungary,
[3]Anton Paar Ltd., H-8200 Veszprém, Tűzér u.71/1. Hungary,
[4]University of Regensburg, Department of Phoniatrics and Pediatric Audiology, D-93053 Regensburg, Franz Josef Strauss Allee 11, Germany