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RESEARCH ON THE THERAPEUTIC EFFECT OF SEA BUCKTHORN HIPPOPHAË RHAMNOIDES L. AND OIL EXTRACTED FROM THESE

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Abstract

Research has been made regarding the quality of common sea-buckthorn fruits (Fructus Hippophae) harvested manually from underbrush growing spontaneously in the Cluj-Bistrita area. In order to achieve proper storage, the common sea-buckthorn fruits were partially dried at 50 to 60°C, and then packed into paper bags. Gross chemical composition was determined by using methods of feed analysis. Obtained results have shown structure values closely resembling those recorded by literature. During the second phase of the research, common sea-buckthorn fruit oil was extracted by using petroleum ether heated at 60-degree Celsius in water bath. The oil was 34-35% of the fruits' dry matter. The chemical profile of fatty acids within the oil structure was determined by gas chromatography. It was noticed that the common sea-buckthorn oil contains a remarkable quantity of unsaturated fatty acids (oleic, linoleic and linolenic). Extraction residues (common sea-buckthorn grit) was recommended for lying hen feed, which could determine an increase in body weight and egg production. The oil has also been useful in veterinary medicine for external use in the treatment of soft-tissue destructive pathology (mastitis) and in human medicine, helping with the treatment of burns, psoriasis and decubitus sores. Results have been remarkable. We highly recommend increasing the use of common sea-buckthorn fruits, common sea-buckthorn oil and common sea-buckthorn grit, both in animals and humans.

Key words*:* sea-buckthorn oil, fatty acids, external use

INTRODUCTION

The flora of our country is extremely rich in medicinal plants. Among the species of great importance for the active principles contained the sea buckthorn *Hippophaë rhamnoides L* is also found. Direct observations, made over time, as well as numerous studies on sea buckthorn, have led to the highlighting of substances with special physiological effect, rare or non-existent in other plants. The properties of these substances found in sea buckthorn fruits are addressed to all diseases of the body related to malnutrition (poor absorption and metabolic processing of food) and the immune system, as well as diseases caused by stress (Thomas et al., 1996). Due to its exceptional qualities, the complexity of the active substances it contains, sea buckthorn finds applications in pharmacology to obtain a wide range of drugs used in human and veterinary medicine (Brad, 2002).

Among the components of sea buckthorn, fruits are the most important, concentrating in them the active principles of the plant. Sea buckthorn is a vascular and nervous trophic, coronary protector, has antiscorbutic action due to the high content of vitamin C, antiulcer action, dermato-generative effect, anti-inflammatory, slightly bactericidal. It is a general tonic, good antianemic, stimulates the body's immunity, it is also used in neoplasms, hormonal disorders that occur at menopause, in osteoporosis associated with various tinctures. Sea buckthorn fruits contain vitamin C, twice as much as in rosehips and ten times more than in citrus, carotenoid substances (α and β carotene, zeaxanthin, cryptoxanthin, physalis), vitamin E, B1, B2, PP , folic acid, vitamin P (flavonoids) in the form of glycosides of everator, isoramnetol and kemferol, provitamin D, phytosterols, inositols (Sabir et al., 2005). The oil is rich in oleic, linoleic, linolenic, palmitic acid and triterpene substances such as ursolic and oleanolic acid. It also contains macro- and microelements, especially Ca, P, Mg, F. The average oil content of whole sea buckthorn fruits is 8-12%. In veterinary medicine, sea buckthorn oil has been tested in the treatment of ovine necrobacillosis, in infectious pododermitis, in the treatment of wounds caused by mechanical haircuts (Kaushal et al., 2011). After the oil extraction, the process residue remains, which can be used in animal feed, being a rich source of proteins with high biological value, energy substances, minerals and vitamins.

MATERIAL AND METHOD

The following determinations were made for fruits: organoleptic characteristics, hectoliter weight, and crude chemical composition. When examining the organoleptic characters, the color, smell, dimensions, uniformity and integrity were observed by direct examination.

The drying of the fruits for storage was carried out progressively, in two stages: the determination of the hectoliter mass was performed after STAS 6123 / 2-73. Two determinations were performed in parallel and the average was calculated expressing the result in kg/hl.

The determination of the dry matter content consists in drying the sea buckthorn fruits at a temperature of 105°C to a constant mass.

Fat extraction was performed using the Soxhlet extractor. In the composition of raw fat, in addition to the actual fat, there are other substances: waxes, steroids, phosphatides. At extraction, the solvent carries with it fat and other substances: vegetable pigments, fat-soluble vitamins, resins, essential oils. The crude fat was determined by weighing the crude fat: by distilling the solvent and weighing the remaining fat in the flask.

The protein was determined by the Kjeldahl method, based on the transformation of organic nitrogen into inorganic nitrogen. By multiplying

the amount of nitrogen determined by a factor of 6.25, the so-called "crude protein" was obtained.

The determination of total nitrogen was performed in three steps: mineralization of the sample, alkalization of the sample, distillation of ammonia and collection in sulfuric acid - 0.1 N solution and titration.

Non-nitrogenous extractive substances were determined by difference, using the relation: SEN (%) = SU - (Pb + Gb + Ceb + Cb).

Crude cellulose was determined by the Weende method.

The principle of the method for the determination of crude ash consists in incinerating the samples in the calcination furnace at a temperature of 550^{o}C.

To determine the quality of the oil obtained from sea buckthorn fruits, the gas-chromatographic determination of the methyl esters of fatty acids was performed by trans-esterification of the lipids in the sample.

A Shimadzu GS 17 A gas chromatograph with FID detector and Chrompack capillary column, specialized for the determination of fatty acids, was used for the determination.

The acidity index is the number of mg of potassium hydroxide (KOH) required to neutralize the free fatty acids in one gram of oil.

This index changes according to the duration and storage conditions of the oil. Fresh oils have a very low acidity.

The acidity index increases with the age and the degree of rancidity of the oil and shows the degree of hydrolysis of the fat.

The acidity index was determined by titration with a basic solution in the presence of phenolphthalein as an indicator. As reagents, were used: potassium hydroxide 0.1 N solution; neutralized mixture of ethyl alcohol-ethyl ether 1: 1; phenolphthalein, 1% alcoholic solution.

The titration was performed until a pink color was obtained.

The acidity index was obtained based on the titration factor, the volume of the hydroxide used for titration, the mass of the product taken into consideration and K used in alkaline solution of 0.1 N.

To obtain the oil, finely ground fruits were used and as solvent the petroleum ether with evaporation by heating on a sand bath.

Crude sea buckthorn oil obtained was used as such or in a mixture with petroleum for the treatment of the following diseases: one case of severe psoriasis (in the trunk), 5 cases of skin burns caused by hot water or gas flame, a case of fungal dermatitis in humans, a case of mastitis in cows, located in a quarter of the mammary gland with nipple necrosis, rebellious to treatment.

RESULTS AND DISCUSSION

On organoleptic examination, dried sea buckthorn fruits had a very variable size, shape and color.

The hectolitre weight was 28.8 kg.

The results obtained from the analysis of the raw chemical composition are presented in Table 1.

Table 1

Gross chemical composition (%) of the sea buckthorn fruits studied

DM	Protein	Fat	Cellulose	NES	Ash
88,89	20,25	22,77	9,16	33,52	3,19
100	22,78	25,62	10,30	37,71	3,59

The dry matter content of dried fruits was within normal limits. The crude protein had high values that exceed the values in the literature attributed to the cultivated varieties (Oprica et al, 2007).

The crude fat, in the amount of 25.62% of the dry matter, had values much lower than the values given by the specialized literature.

The values found in the determination of raw fat place sea buckthorn fruits among those of plant species which are a significant source of oil with medicinal properties.

Crude cellulose, relative to dry matter, was elevated due to fruit seeds.

Non-nitrogenous extractive substances (SEN), which are known to consist of carbohydrates, had high values.

They give the oil processing residues important nutritional qualities. The content in mineral substances (raw ash) was around 3.8% of the dry matter, a value similar to other specialized data.

Sea buckthorn oil obtained from the researched fruits contains significant amounts of essential fatty acids, especially from vitamin F group (table 2) and confirm other literature data (Yang and Kallio, 2001).

They certainly give it therapeutic properties and by oral administration.

Table 2

Concentration of fatty acids with C16, C17 and C18 in the analyzed sea buckthorn oil

Fatty acid	Abreviation	Retention time (min)	Concentration (%)
Acid palmitic	C16: 0	9,89	36,71
Acid palmitoleic	C16:1	10,4	25,30
Acid heptadecanoic	C17:0	12,1	-
Acid stearic	C18:0	14,45	-
Acid oleic	C18:1	14,8	28,92
Acid linoleic	C18:2	15,8	6,47
Acid linolenic	C18:3	17,26	2,44

The results obtained from the treatments performed were the following: cases of burns in which the crude oil was used or solved in a very short time, the oil prevented the formation of blisters and total healing in 1-3 days, depending on the severity of the burn; the use of the oil in the treatment of mastitis in cows had healing effects, after 18 days of applications with raw sea buckthorn oil there was healing; the treatment of psoriasis, with severe generalized rash, had the effect of removing crusts and suppuration, starting epithelialization after about a week of skin applications and after two months epithelialization became almost normal. The oil was applied twice a day to the wound.

The acidity index of sea buckthorn oil obtained from relatively dried and preserved fruits for 6 months, determined in oil after 3-4 weeks after extraction was 4.34 mg KOH / g oil. The value obtained is much lower than that given by different authors for the oil resulting from pressing, extraction with organic solvents or extraction with CO2.

CONCLUSIONS

Research on the value of sea buckthorn fruits (*Hippophae fructus*) has shown that they have significant oil content.

It has been shown that the oil is more efficiently separated from finely ground fruit with heated and evaporated petroleum ether by heating in a sea bath, than from fruit crushed by grinding (larger granulation) and by heating the solvent in a sand bath.

The oil extracted in the Soxhlet apparatus with petroleum ether was analyzed by gas chromatograph. The results obtained showed that it has an increased content of polyunsaturated fatty actions, especially from vitamin group F.

The treatment of 1-2 degree skin burns, with crude oil, led to complete healing in 1-3 days. The use of sea buckthorn oil, mixed with oil 1: 9, in the treatment of psoriasis has led to very good results, which is why we recommend its use in such conditions. The high level of protein in the composition of the meal justifies its successful use in animal feed.

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