Journal of Ethnopharmacology 213 (2018) 183–190

Contents lists available at ScienceDirect

Journal of Ethnopharmacology

journal homepage: www.elsevier.com/locate/jethpharm

Review

The beneficial health aspects of sea buckthorn (*Elaeagnus rhamnoides* (L.) A.Nelson) oil

Beata Olas*

Department of General Biochemistry, Faculty of Biology and Environmental Protection, University of Lodz, Pomorska 141/3, 90-236 Lodz, Poland

ARTICLE INFO

Keywords:
Elaeagnus rhamnoides (L.) A.Nelson
Oil
Fatty acids
Health

ABSTRACT

Ethnopharmacological context: Plant oils are known to have biological activity. This review paper summarizes the current knowledge of the composition of sea buckthorn (*Elaeagnus rhamnoides* (L.) A.Nelson) seed and pulp oil and its beneficial health aspects.

Materials and methods: In vitro and in vivo studies on humans and animals have found sea buckthorn oil to have a variety of beneficial properties to human health, and indicate that it may be a valuable component of human and animal nutrition. Various bioactive substances are present in all parts of sea buckthorn, and these are used traditionally as raw material for health foods and as nutritional supplements. The oil, berries, leaves and bark have medicinal properties, and the fruits have a unique taste; these parts can be processed to make oil, juice, jam, jellies and candies, as well as alcoholic and non-alcoholic beverages.

Results: Sea buckthorn oil may be extracted from the seed or the pulp. The mature seeds contain 8–20% oil and the dried fruit pulp about 20–25%, while the fruit residue contains about 15–20% oil after juice extraction. These oils have high concentrations of lipophilic constituents, most commonly unsaturated fatty acids (UFAs), phytosterols and vitamins A and E. These components have a multifunctional effect on human health, with the fatty acids playing an important function in modifying cerebrovascular and cardiovascular disorders. The oil also has anti-oxidant, anti-inflammatory and anti-depressive properties.

Conclusion: Sea buckthorn is a unique plant. Its beneficial properties against cardiovascular disorders have been attributed to its high UFA content and range of phytosterols, especially beta-sitosterol. However, its different action on the human organism remain unclear, and further well-controlled, high-quality experiments with human subjects are required to determine the prophylactic and therapeutic doses of sea buckthorn oil for use in clinical studies. Additional studies are also needed to understand the action by which the oil exerts its beneficial properties, i.e. its cardioprotective and anti-cancer activity.

1. Introduction

Sea buckthorn (*Elaeagnus rhamnoides* (L.) A.Nelson) is a bush or small tree. It belongs to the *Elaeagnaceae* family, which is naturally distributed throughout Eurasia from the Baltic Sea and North Sea in the west to Central Asia in the east (Xing et al., 2002). Although a unique mixture of bioactive compounds is found throughout the plant, this is especially the case for the fruits, which are known as seaberry or Siberian pineapple (Teleszko et al., 2015). In vitro studies, and in vivo human and animal models, have found the juices, jams and oil derived from the fruits to have a range of beneficial anti-inflammatory, anti-cancer, antioxidant and anti-atherosclerotic effects; these have been attributed to the presence of phenolics, vitamins, minerals, amino acids, fatty acids and phytosterols (Zeb, 2006; Basu et al., 2007; Kumar et al., 2011; Suryakumar and Gupta, 2011; Xu et al., 2011; Christaki, 2012; Teleszko et al., 2015; Wang et al., 2016).

Plant oils are usually lipophilic or hydrophobic materials which can be extracted with nonpolar solvents such as hexane. The presence of highly nutritional and medicinal components in the oil from sea buckthorn fruits has prompted a growth of interest in its potential as a functional food product (Ding et al., 2016). Oil can be extracted from the seeds and the pulp (Zeb, 2006; Christaki, 2012): the mature seeds contain 8–20% oil, the dried fruit pulp (flesh and peel) about 20–25%, and the fruit residue contains about 15–20% oil after juice extraction (Kumar et al., 2011; Christaki, 2012). These oils have high concentrations of lipophilic constituents, predominantly unsaturated fatty acids

Abbreviations: HDL, high density lipoprotein; LDL, low density lipoprotein; MUFA, monounsaturated fatty acid; PUFA, polyunsaturated fatty acid; SFA, saturated fatty acid; UFAs, unsaturated fatty acids

* Correspondence address: Faculty of Biology and Environmental Protection, University of Lodz, Pomorska 141/3, 90-236 Lodz, Poland.
E-mail address: beata.olas@biol.uni.lodz.pl.

https://doi.org/10.1016/j.jep.2017.11.022
Received 30 August 2017; Received in revised form 17 November 2017; Accepted 17 November 2017
Available online 21 November 2017
0378-8741/ © 2017 Elsevier B.V. All rights reserved.

(UFAs) in triglyceride form, phytosterols and vitamins A and E; these have a positive influence on human health, especially on the cardiovascular system (Kumar et al., 2011; Olas, 2016a, 2016b). However, it is important to emphasize that the precise cardioprotective influence of the oil on the human organism remains unclear, and although some papers offer a glimpse into its effects (e.g. Johansson et al., 2000; Lehtonen et al., 2011), further animal studies are needed to better appreciate the true value of sea buckthorn as a source of medical and nutritional compounds. For example, Basu et al. (2007) found sea buckthorn seed oil to have anti-atherogenetic properties.

The yield and composition of the oil depend on extraction technique, solvent type and environmental factors. Kumar et al. (2011) list four extraction techniques that may be employed for the isolation of pulp and seed oil: petroleum-ether solvent extraction, screw pressing, aqueous extraction and supercritical fluid extraction with the use of carbon dioxide. In contrast, it is not possible to obtain oil from the seeds by aqueous extraction, or from the pulp-flakes by screw pressing, and the two methods of extraction produce oils with the lowest amounts of nutritionally-important components. Supercritical fluid extraction is an advanced method for seed oil extraction which results in greater concentrations of total carotenoids and individual tocopherols from the pulp-flakes and seed oil, and of phytosterols (β-sitosterol and campesterol) from the seed oil; however, this technique has no effect on the concentrations of phytosterols extracted from pulp-flake oil (Kumar et al., 2011). In addition, oil content, and hence the antioxidant activity of the product, will also be affected by the morphology of the fruit, such as its colour and size, as well as the choice of harvesting time (Yang and Kallio, 2002; Christaki, 2012) and the choice of production process (Kasparavicience et al., 2004).

For diet supplementation, dry fruit and leaf extracts are typically administered at a dose of 500–2000 mg daily, while the oil is administered at doses of 2000 – 5000 mg (Sea Buckthorn, available online, accessed on 11 October 2017). The oils are typically incorporated in vegetable-based capsules, gelatin and liquids for oral administration (Yang and Kallio, 2002) and in commercially-available cosmetics, such as cream and shampoo (Bal et al., 2011). Fortunately, toxicity studies indicate no adverse effects in subjects administered with sea buckthorn seed oil (Upadhyay et al., 2009). The aim of this paper is to briefly review the composition and nutritional aspects of sea buckthorn seed and pulp oil, and their beneficial effects on human health.

2. History and traditional uses of sea buckthorn

Sea buckthorn has been used for many years in traditional medicine (Suryakumar and Gupta, 2011) in both Asia and Europe. Its health benefits have been detailed in various sources including the Siu Yidian and the Jing Zhu Ben Cao, dating back to the Tang (618–907 CE) and Qing Dynasties, respectively. Sea buckthorn was being used as a medicinal remedy in Tibet in 900 CE and “the RGyud Bzi” (The Four Books of Pharmacopoeia) of the Tang Dynasty describes the medicinal use of sea buckthorn, as do other ancient Tibetan medicinal texts. Sea buckthorn has been used in traditional Mongolian medicine since the 13th Century, when the RGyud Bzi was disseminated throughout Mongolia. Sea buckthorn berries have been used as a source of herbal medicines and as a health food in Central Asia and Europe (Suryakumar and Gupta, 2011; Li and Hu, 2015). Local people also used the berries for treatment of skin diseases, hypertension and problems with the digestive system in Central Asia, and for the treatment of skin diseases, gastrointestinal diseases, asthma and rheumatism in the Indian Himalayas and Russia (Suryakumar and Gupta, 2011; Malinowska and Olas, 2016; Olas, 2016b).

The first clinical studies on their medicinal use were initiated in Russia during the 1950s (Gurevich, 1956). However, China was the first country to recognize sea buckthorn as a drug, being formally included in the Chinese pharmacopoeia in 1977 (The State of Pharmacopoeia Commission of P.R. China, 1977). In addition, various drugs have been developed from sea buckthorn in these countries and have been incorporated in various formulations such as powders, liquids, pastes and even aerosols (Li and Schroeder, 1996). Chinese medicinal literature has described the use of the fruits for treating a range of conditions including circulatory diseases, hepatic disorders, fever, cold, toxicity, inflammation, metabolic disorders, cough and gynecological diseases (Ballabh and Chausais, 2007; Kumar et al., 2011). The flowers are also used as a skin softener in Tajikistan (Kumar et al., 2011).

Sea buckthorn oil is approved for clinical use in hospitals in Russia and in China. ClinicalTrials.gov (2017) describes sea buckthorn oils as dietary supplements which play an important role in modulating various conditions, including skin aging, dry eye syndromes, mucous membrane disorders, and the risk factors for age-related macular degeneration. More details about its history and traditional use are given by Suryakumar and Gupta (2011) and Olas (2016b); however, the plant has also been recorded as a source of firewood and decorative elements (Suryakumar and Gupta, 2011; Malinowska and Olas, 2016; Olas, 2016b), and has been used to rehabilitate degraded ecological regions in Germany (Xing et al., 2002; Olas, 2016b).

3. Botanical characteristics of sea buckthorn

The plant names have been checked and updated with The Plant List version 1.1 (www.theplantlist.org) (2017) of the Royal Botanic Gardens, Kew and the Missouri Botanical Garden (accessed November 2017). *Elaeagnus rhamnoides* (L.) A.Nelson is an accepted name in the genus *Elaeagnus* (family *Elaeagnaceae*). Other plants (*Hippophae salicifolia* D.Don, *Hippophae goniocarpa* Y.S. Lian & et al. ex Swenson & Bartish, *Hippophae gyantsensis* (Rousi) Y.S. Lian, *Hippophae litangensis* Y.S. Lian & X.L. Chen ex Swenson & Bartish, *Hippophae neurocarpa* S.W. Liu & T.N. He and *Hippophae tibetana* Schltdl) are in the genus *Hippophae* (family *Elaeagnaceae*).

The natural distribution of sea buckthorn ranges Great Britain and France in the west to Mongolia in the east, including parts of Europe, Scandinavia and central Asia. It typically grows as a shrub, but sometimes also as a small tree growing to 5–8 m tall; however, specimens as tall as 10 m have been found (Niesteruk et al., 2013). The leaves are hydrolapathum-shaped, the top is grey-green, smooth and shiny, while the bottom is hirsute, reflective white or with a light brown shade. The young shoots have silver hairs. The buds on the shoots are golden-copper in colour, and are larger and more numerous in male than female individuals (Hu, 2005; Banas, 2013).

Sea buckthorn is a diclinous plant. It has both male and female reproductive organs. The female flowers are yellow, while the male flowers have a greenish colour and are collected in spherical inflorescences. Pollen is spread by the wind. Blooming occurs at the end of April and is observed before the leaves develop (Niesteruk et al., 2013). The fruits are orange berries measuring 6–9 mm in diameter, and are soft, juicy and rich in oils (Suryakumar and Gupta, 2011). The plant has the ability to symbiose with *Actinomycetes frankia*, which has allowed the plant to grow on poor and sandy soils (Banas, 2013; Niesteruk et al., 2013).

4. Hydrophilic compounds in sea buckthorn fruits (berries)

Sea buckthorn berries are characterized by high concentrations of phenolics, especially flavonols. Teleszko et al. (2015) identified a total of 11 flavonols in the fruits of eight chosen cultivars of *Hippophae mongolica* (Rousi) Tzvelev: six compounds derived from isorhamnetin, four from quercetin and one from kaempferol. The examined cultivars were ‘Aromatnaja’, ‘Avgustinka’, ‘Botaniczeskaja’, ‘Botaniczeskaja Ljubitelskaja’, ‘Moskwiczanka’, ‘Luczistaja’, ‘Podarok Sadu’ and ‘Porożrachnaja’.

In vitro and in vivo studies indicate that the phenolic compounds demonstrate various biological activities and antioxidant properties (Chauhan et al., 2007; Michel et al., 2012; Olas et al., 2016). However,

Download English Version:

https://daneshyari.com/en/article/8532550

Download Persian Version:

https://daneshyari.com/article/8532550

Daneshyari.com