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Sea Buckthorn, A Great Privilege for Immune System: A Review

Mrs.Keya Adak[1], Dr. Shilpi Shrivastava[2]

[1]Research Scholar, Department of Chemistry, Kalinga University, Naya Raipur, Chhattisgarh, India
[2]Associate Professor, Department of Chemistry, Kalinga University, Naya Raipur, Chhattisgarh, India

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Abstract: At the present time the food industry, researchers, consumers are showing interest in some primitive plants and foods which can succor to sustain animal and human well-being with their conventional nutritious moral. Due to habituation to the nature, the flora inhabitants in many areas manifest hereditary diversification that may impact the bioactive chemical constituents and biological anatomy of the plants. The wild Sea buckthorn is one of the spiny nitrogen (N2) fixing shrubs with high pharmaceutical and curative effects among primitive medicinal plants. It could be used in animal as well as human and nutrition and also plays a significant role in nutraceutical market. Due to its therapeutic and nutritional value sea buckthorn shows its past as well as modern virtue.

Keywords: Flavonoid, Vitamin C, Phenolic compounds, Carotenoids, Phytochemical

1. Introduction

Sea buckthorn is a deciduous shrub in family Elaeagnaceae and belongs to genus, Hippophae. It belongs to Europe and Asia, North America as native. It is distributed the basin of rivers and lakes and also distributed between high mountains in western and northern parts of the country. Its thorny shrubbery long and narrow leaves, orangish yellow berries[due to presence of yellowish hexuronic acid(C6H8O6)], and seeds are rich sources of natural dietary supplements such as hydroxylated aromatic compounds (20.8 to 34.6 mg/g), tannins (2.0 to 5.8 mg/g),vitamin C(1.5 to 9.0 mg/g),vitamin E, tetraterpenoids[(0.80 to 1.2 mg/g)as lutein, zeaxanthin], flavonoids(Figure 1) [(0.98 to 2.80 mg/g) polyphenolic structure with benzo-γ-pyrone],proteins(37.79%), soluble minerals [(11.85 to 31.50%) lipids (mainly unsaturated fatty acids), organic acids(α-linolenic acids, pulp oil that rich with high levels of monounsaturated palmitoleic acid) and phytosterols (plant sterols),sugar(38.14 to 110.70 mg/g) in form of carbohydrate.

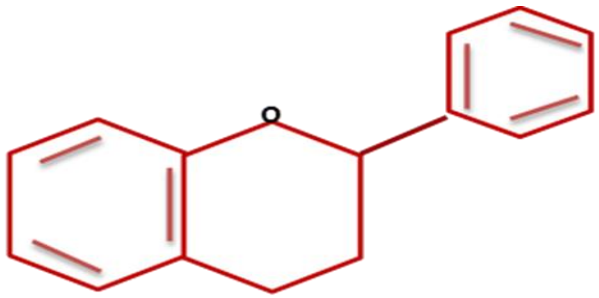
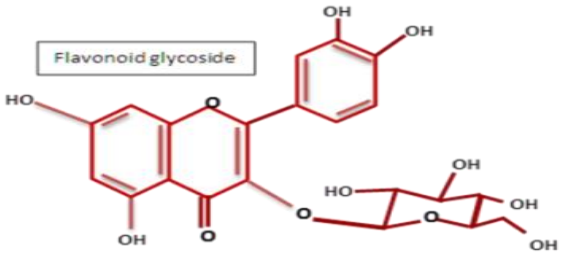


Figure (1):Basic Flavonoid

2. Beneficial effects of Sea Buckthorn

2.1Contribution of leaves

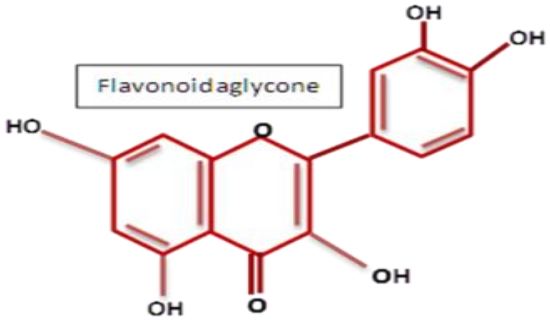
The fruit contains 60-80% juice rich in sugar, organic acids, amino acids and vitamins. Vitamins C contents is 0 to 1 500 mg 100 g-1 which is five to 100 times higher than any other fruit or vegetable known (Ahmad and Kamal, The Sea buckthorn leaves extract (SLE) rich with flavonoid glycosides



Figure(2):Structure of Flavonoid Glycoside

(Figure 2) containing isorhamnetin 3-glocoside and quercetin 3-glocoside which can prevent dyslipidemia and adiposity. The extract of flavonoid glycosides effect on diet induced obesity with its metabolic complication, insulin resistance, lipid metabolism of adipose tissue and hepatic steatosis(inflammation),non-alcoholic fatty liver disease in respect to high diet. The leaves are extracted with 80% aqueous ethanol under an ultrasonic cleaner.The SLE supplement can treat dyslipidemia by reducing the total level of plasma cholesterol,triglyceride, non-HDL-cholesterol which led to decrease weight of all white adipose tissue(epididymal, perirenal, mesenteric, subcutaneous ,interscapular). The hepatic steatosis associated with the normalization of the plasma glucose are improved remarkably and level of insulin shows its reflection on the betterment of hepatic insulin sensitivity.

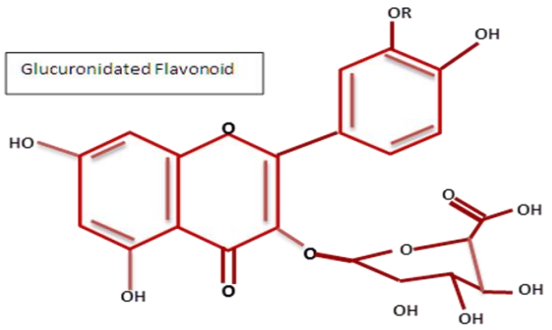
After chewing the food (containing physicochemical properties) the liberated dietary flavonoids started absorbing. At last after absorbing from the small intestine it is moved to the end part of large intestine. Its absorption depend upon flavonoid structure, either it may glycoside structure nor aglycone structure. Flavonoid aglycone



Figure(3): Structure of FlavonoidAglycone

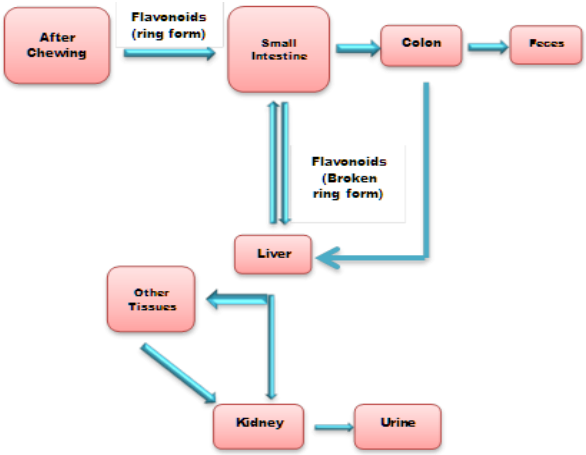
(Figure 3) can easily be easily assimilated by the enzymes of small intestine, but before assimilation glycosides structure converted into the form of aglycone. Flavonoid glucosides are undergone hydrolysis process by lactase

phloridzin hydrolase (LPH) and after this hydrolysis, the hydrolyzed flavonoid aglycone can be absorbed along the wall (villi) of small intestine. The remaining part of flavonoid glycosides which are not treated by intestinal enzymes are followed towards the large intestine where useful microbes has the capability to hydrolyze flavonoid glycosides. After absorption, the total flavonoids are conjugated in the liver by glucuronidation(a conjugation reaction by glucuronic acid is covalently linked to a substrate containing nucleophilic functional group)



Figure(4):Structure of Glucuronidated Flavonoi

(Figure 4), which leads to metabolize it into smaller phenolic compounds. After conjugation with bile the part of flavonoids which cannot be absorbed by the wall of the small intestine, are degraded in the colon (large intestine) by microbes of intestine which also catabolized the flavonoid ring structure (Figure 5). After conjugation reactions, no free flavonoid aglycones are found in plasma.



Figure(5):Flowchart of Flavonoid Metabolism

2.2 Contribution of fruits and seeds

The sea buckthorn fruits contain phenolic compounds including flavonoids (iso-rhamnetin and quercetin), flavones, phenolic acids, and tannins [1,3] which are effective for healing wound including bedsores, burns, cuts, acne, for treating radiation damage from x-rays and also cardio-protective, cyto-protective [4]. The sea buckthorn fruit juice shows the most important medicinal role containing vitamin C (ascorbic acid) as content [5] which endures cell membrane coherence [6]. The fruit pulp is rich with huge amount of numerous vital components such

as carotenoids, lycopene and β-carotenes [6,7] which act as antioxidant to conglomerate of collagen(protein found s;pecially in the joints of human being and and animals) and epithelialization (therapy of chronic wound)[8]. The iso-rhamnetin and quercetin have diversity of curative effects on the critical cardiac diseases [9]. There are two sources of oil in sea buckthorn fruits, oil from fruit pulp and seed oil (4.51 to 7.91%). The seed oil enrich with two vital unsaturated fatty acids such as linoleic acid (28.73 to 37.42%) and linolenic acid (21.51 to 28.3%)] which has important therapeutic roles to prevent arthritis, chronic heart disease, modulation of the immune system(immunomodulatory), neuroprotective and antitumor effects [2]. In fact, as sea buckthorn fruits contain variety of vitamins, organic chemicals and other bio-active supplements which have been used as an organic medicine to cure and remedy of various diseases as well as limiting the toxicity of chemical cancer treatment (chemotherapy), angina (chest pain) and also balancing the immune system.

3. Methods to determine dietary supplements:

Phytonutrients analysis of fruit pulp and seed oil traits was executed by using various methods of chromatography as for example HPLC(High Performance Liquid Chromatography) , spectrophotometry, and GC(Gas Chromatography). Vitamin E(anioxidant tocopherols, phytosterol) determined by Liebarman Burchard method . Soluble minerals (Cu,Cr,Fe,Ca,Zn) are determined by atomic absorption spectroscopy(AAS).The lipids (mainly unsaturated fatty acids. Sugar [glucose(125.6 mg/g), fructose(132.1 mg/g), arabinose (123.62 mg/g), xylose(76.13 mg/g)] are determined by UV spectrophotometry method. To quantify the total carotenoid the absorbance of the hexane extract was notified using UV/VIS spectro-photometer[12].Total phenolic elements of dry fruits was determined using Folin-Ciocalteu reagent. The presence of tannin contents in sea buckthron are identified by using insoluble polyvinyl-polypirrolidone (PVP)[11]. The amount of tannin content is measured after calculating the difference between total quantity of bioactive supplements and non-tannin phenolic content.

4. Conclusion:

The vitamin C is the main valuable chemical constituents of sea buckthorn which play a as valuable multipurpose role as effective dietary supplements. Flavonoids have diverse biological activities which are one of the important bioactive supplements of sea buckthorn leaves and fruits. The quality of sea buckthorn fruit juice is often based on its soluble Chemical substances of rich organic acids and sugars of its berry [9]. Enrich amount of ascorbic acid of its fruit juice offers the antioxidant activity as a scrounger of free radicals and suppresses the formation of potentially carcinogenic substances [9].

5. References:

[1] Rosch D, Krumbein A, Mugge C, Kroh LW. Food Chem. 2004; 52(13): 4039-4046.

[2] Yang B, Kallio H. Composition and physiological effects of sea buckthorn (Hippophae) lipids. Trends Food Sci Technol. 2002; 13(5): 160-167.

[3] Arimboor R, Kumar SK, Arumughan C. Simultaneous estimation of phenolic acids in sea buckthorn (Hippophae rhamnoides) berries and leaves. J Pharm Biomed Anal. 2008; 47(1): 31-38.

[4] Upadhyay NK, Kumar MSY, Gupta A. Food Chem Toxicol. 2010; 48(12): 3443-3448.

[5] Morsel JT, Zubarev Y, Eagle D. Sea buckthorn. Research for a promising crop: A look at recent developments in cultivations, breeding, technology, health and environment. 3rd ed. Norderstedt: Books & Demand, 2014.

[6] Kallio H, Yang B, Peippo P. Effects of different origins and harvesting time on vitamin C, tocopherols and tocotrienols in sea buckthorn (Hippophae rhamnoides) berries. J Agric Food Chem. 2002; 50(21): 6136-6142.

[7] Pop R, Weesepoel Y, Socaciu C, Pintea A, Vincken JP. Carotenoid composition of berries and leaves from six Romanian sea buckthorn (Hippophae rhamnoides) varieties. Food Chem. 2014; 147(1): 1-9.

[8]Andersson S, Olsson ME, Johansson E, Rumpunen K. Carotenoids in sea buckthorn (Hippophae rhamnoides L.) berries during ripening and use of pheophytin a as marker of maturity. J Agric Food Chem. 2009; 57(1): 250-258.

[9] Suryakumar G, Gupta A. Medicinal and therapeutic potential of sea buckthorn (Hippophae rhamnoides L). J Ethnopharmacol. 2011; 138(2): 268-278.

[10] Beveridge T, Li TS, Oomah BD, Smith A. Sea buckthorn products: manufacture and composition. J Agric Food Chem. 1999; 47(9): 3480-3488.

[11] Makkar HPS. Quantification of tannins in tree foliage. rd ed. Vienna: FAO/IAEA Working Document, 2000.

[12]Lee HS. Characterization of carotenoids in juice of red navel orange (Cara cara). J Agric Food Chem. 2001; 49(5): 2563-2568.