Foreword

Seabuckthorn (*Hippophae rhamnoides* L.), which grows very widely in Indian Himalayas, China, Russia, Europe and many other countries, has recently attracted the attention of scientific community and policy makers in India. The fruit and leaves of this plant are quite rich in anti-oxidants like vitamin C, E, carotenoids and flavonoids etc., which have found application in the preparation of health protection food, drug and cosmetic products globally. In view of the high potential of seabuckthorn in the herbal drug industries and increasing world trade in the plant, India has also decided to scientifically exploit the potential of seabuckthorn plant for the preparation of a number of health products. Already studies carried out in India on various aspects like anti-oxidant properties, effects of seabuckthorn on the radiation damages, wound healing, burn, ulcer and cold stress etc., have shown promising results of the plant. Seabuckthorn has also been reported to have the efficacy of curing some cardiovascular diseases and tumors.

I appreciate the efforts of Dr. Virendra Singh, a Seabuckthorn Scientist in CSK Himachal Pradesh Agricultural University, Palampur, who in collaboration with international seabuckthorn experts, produced this very valuable book, which will make it easier for the those, who are interested to explore seabuckthorn further. The book entitled “Seabuckthorn (*Hippophae rhamnoides* L.) - A Multipurpose Wonder Plant - Vol. II. Biochemistry and Pharmacology” has covered biochemical and medicinal aspects of the seabuckthorn plant, which also make it a good source of information on the subject to researchers, entrepreneurs, policy makers etc. I congratulate Dr. Singh and his co-editors in producing a useful and quality book on seabuckthorn.

June 6, 2005

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Preface

Epidemiological studies have found strong association between prevention of diseases like cancer and cardiovascular disorders and intake of fruits and vegetables, rich in anti-oxidants like vitamin C, E and carotenoids etc. Oxidative stress is one of major causes of aging and diseases like cancer, cardiovascular, Parkinson diseases, Alzheimer type dementia and atherosclerosis, which can be curtailed by anti-oxidants like vitamin C, E, carotenoids, flavonoids etc. Seabuckthorn (Hippophae L.) is one of the plant species found in cold regions of Asia and Europe, fruit of which is very rich in these anti-oxidants, therefore, it has very high potential in health protection industries.

Medicinal properties of seabuckthorn are known since ancient times, as described by the name ‘Amlavetas’ in Ayurveda, written during 5000-500 BC. The science of medical application of this plant was evolved by the Tibetan doctors, as extensively described in the Tibetan Medical Classic “rGud bzi” written during Tang Dynasty (618-907), from where the knowledge spread to adjacent countries, Russia and Europe. The credit also goes to the Russians for the discovery of vitamin C in the fruits during 1940s, development of seabuckthorn science and its commercial utilization. In the present time, hard work done by the Chinese in large-scale exploitation of this plant for ecological and economic purposes was followed in recent years by other countries like Germany, Finland, Canada and India etc. Even some countries in North and South America have also started research and development work on seabuckthorn.

Fruit of seabuckthorn, is a storehouse of anti-oxidants and other bioactive substances with medicinal properties. Vitamin C value in seabuckthorn fruit varies from 300 to 2750 mg/100g, which is 4-100 times higher than many fruits and vegetables. Vitamin C is considered a very strong anti-oxidant and protects us from many diseases. Organic acid content is 2-4% in the fruit juice, higher than many horticultural crops. Fruit is also rich in protein and amino acids. High contents of these bioactive substances make seabuckthorn juice a health protection drink for weak children, daily workers, pregnant ladies and aged persons. Oils of seabuckthorn fruit pulp and seeds, are very precious and of high quality due to presence of fat soluble anti-oxidants like vitamin E, K, carotenoids and other compounds like sterols etc., therefore possess strong anti-oxidant properties and have been
found useful in wound healing, treatment of ulcer, skin diseases, some forms of cancer and cardiovascular diseases.

Vitamin E is an important dietary antioxidant, present in higher content in seabuckthorn fruit oil. Its most important antioxidant function appears to be the inhibition of lipid peroxidation and scavenging lipid peroxyl radicals. Vitamin K plays an essential role in normal blood clotting and helps promote bone health. Carotenoids function as powerful antioxidants and immuno-potentiaters. Diets rich in carotenoids are linked with a decreased risk of heart disease, cancer, and degenerative eye diseases like macular degeneration and cataracts. There are many carotenoids in seabuckthorn fruit, among them beta-carotene is the most dominant and important and also a precursor of vitamin A.

The biological, pharmacological and medicinal properties of the flavonoids have been extensively studied. The wide range of effects elicited by flavonoids is an expression of their functional group chemistry, underlying their antioxidant and prooxidant properties, mutagenic, anticarcinogenic and biocidal effects, interaction with signal transduction processes and beneficial effects in inflammatory and immunomodulatory systems.

A strong anti-oxidant compound found in seabuckthorn is metallothionein, which is a free radical scavenger for most toxic radical hydroxyl radical (HO•). Metallothionein inhibits the erythrocyte hemolysis, stress induced ulcer and diabetes. Superoxide dismutase (SOD) found in seabuckthorn is the first enzyme involved in the anti-oxidant defence. SOD has been found to have therapeutic effect on the cancer bone marrow injuries, radiation damage, pneumonia and loss of immunity.

The amount of sterols, in the fruit pulp of studied forms ranged between 0.16 and 0.76% and in the seeds, it ranged from 0.19 to 0.96%. In addition to their cholesterol lowering property, sterols possess anti-cancer, anti-atherosclerosis, anti-inflammation and anti-oxidation activities. Besides α-cytosterol, the considerable amount of stigmasterol was also found in sterol fraction of seabuckthorn oil. 5 HT or serotonin is a very important compound also found in seabuckthorn. The functions of serotonin are numerous and appear to involve the control of appetite, sleep, memory and learning, temperature regulation, mood, behavior (including sexual and hallucinogenic behavior), cardiovascular function, muscle contraction, endocrine regulation, and depression.

The human body absolutely requires the polyunsaturated EFAs α-linoleic acid (omega-6 fats) and alpha-linolenic acid (omega-3 fats). The high content of palmitoleic acid, which is uncommon in the plant kingdom, distinguishes the seabuckthorn oil from other oils. This fatty acid has attracted an increasing interest due to its possible effects on many physiological processes, including cholesterol and triglyceride lowering and stroke reducing effects. Palmitoleic acid is a principal constituent of skin fat and the extract is also recommended for skin softening and anti-wrinkle products. By application of seabuckthorn seed oil, the increase in the level of α-linolenic acid in plasma lipids leaded to improvement of atopic dermatitis symptoms.

Therefore, it can be understood, that seabuckthorn has a vide efficacy for application in several diseases like cardiovascular, cancer, skin disorders, wounds, ulcer etc. due to the presence of a variety of anti-oxidants and other bioactive substances in its fruit, leaves and even bark.

Recently, many peoples across the world became interested in seabuckthorn, however, most of the literature on seabuckthorn is in Russian and Chinese languages, and therefore a need was felt to compile the whole publications on seabuckthorn in English language for the global spread of seabuckthorn science and its fullest economic and ecological utilization for the benefit of humanity and nature. The first volume of our book on “Seabuckthorn (Hippophae L.)-A Multipurpose Wonder Plant. Vol. I. “Botany, Harvesting and Processing Technologies” was released during the First International
Congress on Seabuckthorn, held on 14-18th September 2003 in Berlin. This second volume contain papers on “Biochemistry and Pharmacology”. There are 42 papers, which covers the scientific studies carried on the identifications of active compounds present in the seabuckthorn fruit, pulp, seeds, oils and leaves and efficacy of seabuckthorn preparations on various diseases in the animals and human beings. There are also papers on ethnobotany, processing methodologies of various products and oil extraction of seabuckthorn. We think that we have been able to fulfill the requirement of a quality book on the subject to a great extent and it will be used by researchers, policy makers and industries etc. across the world.

Editors
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