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Nutritional and Pharmacological Potential of Fiddleheads from Asian Region

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ABSTRACT:
Indian forests are furnished with a variety of medicinally useful flora. In Indian traditional food system various types of herbal plants were mostly included in the diet out of which ferns have very high nutritional composition. These ferns are the part of the diet in past traditional food culture but their value has been forgotten in some part of India. These ferns could add in the daily diet as it provides sufficient daily requirements of various type of biologically active compounds. Ferns have been found to contain a high number of phenolic compounds, glycosides, flavonoids, terpenoids, carotenoids, alkaloids, and fatty acids. When compared to other green vegetables, ferns are especially rich sources of antioxidants, essential omega-3 and omega-6 fatty acids. Ferns extracts exhibit potent antioxidant, antimicrobials, antibacterial, antiviral, and anti-inflammatory activities. It is found in tribal tribes around the world, including the Himalayan regions of Pakistan, India, China, Tibet, Nepal and other country. As very less research has been conducted on ferns so their actual value is not yet well known. This review focus on the nutritional composition and importance of the ferns.

KEYWORDS: Nutritional source, Ferns, Antioxidant, Antimicrobial, Antibacterial, Antiviral, Anti-inflammatory.

I. INTRODUCTION

Among the various systems of medicines, the homeopathy is one which is mostly based on the use of plants and mineral components as drug. In India this system of medicine is in practice from past several years as Indian forests contain a wide assortment of plants with medicinal potential. The Indian food culture is furnished with the use of various herbal plants along with some wild varieties of plants. In addition to the nutritional aspects many wild plants have medicinal use due to the presence of bioactive compounds.

[1]. Ferns have been recognized as edible medicinal plants for centuries, especially in China, India, and other countries**.** In India there are various species of ferns which are being used as the vegetables. Ferns are represented by about 12000 species. The habit of eating ferns goes back thousands of years when wild plant gathering was a primary food source. [2]. The use of fern extracts has already been known in ancient medicinal system of India (Ayurveda) and China.

[3].The ferns leaves, young fronds, stems and rhizomes parts are consumed as the food. Around 144 fern species are used as source of food and flavoring agent in the world. Despite this, they are the one of least studied terrestrial plants in terms of nutraceuticals. [4,5]. Ferns have been found to contain a high number of phenolic compounds, glycosides, flavonoids, terpenoids, carotenoids, alkaloids, and fatty acids. [6,7]. As compared to green vegetables, ferns are rich sources of antioxidants, omega-3 fatty acid and omega-6 fatty acids. This composition of the ferns makes them valuable for their addition in the diet not only from the medicinal point of view, but also from a nutritional perspective.

NUTRITIONAL COMPOSITION

Fiddlehead ferns are one of the most popular edibles of ferns, and are eaten as seasonal leafy vegetable in several mountain tribes around the world, including the Himalayan regions of Pakistan, India, China, Tibet, Nepal and other country. Fiddlehead ferns have a soft edible component which being eaten by humans.
[8,9]. Although little published data exist on the nutrition related composition of fiddleheads. Based on a 100 g fresh wet sample, they provide 71, 46, 25, 13, and 2% of the recommended dietary allowance (RDA) for vitamin A, vitamin C, niacin, riboflavin and thiamine, respectively. A 100 g wet sample also supplies 13, 13, 10, 5.5 and 4% of the RDA for phosphorus, iron, magnesium, zinc and calcium, respectively. Fiddleheads are low in salt and high in fibre content.
Ferns contain a wide range of nutritionally important chemicals compounds, including flavonoids, polyphenols, fatty acids, carotenoids,

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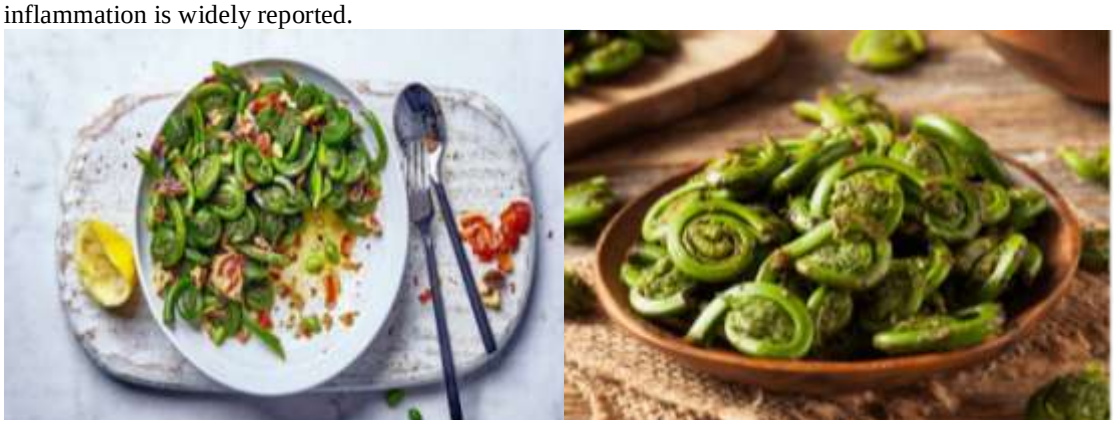
terpenoids and steroids. Apart from their nutritional importance such compounds are also efficient free radicals' scavengers, demonstrating significant antioxidant activity, that is the reason for the lower occurrence rate of age-related diseases.

1. [10]. Fiddlehead ferns are a great source of 'carotenoids' which belongs to antioxidants, and their high consumption, especially of lutein and zeaxanthin, has been reported to be beneficial to retinal tissue, as high concentrations of these pigments are present in the macular region of the human eye. β-Carotene which is a source of vitamin A, protects the skin from excessive light radiation. In addition, β-carotene is necessary for the biosynthesis and for the activation of rhodopsin which serve as a sensitizing chromophore for UV light. The use of plant extracts as anti-inflammatory therapeutics or as nutraceuticals to decrease the level of inflammation is widely reported.
2. [11]. Ferns are also known to be a valuable source of essential fatty acids. The consumption of foods which have high antioxidant capacity like fruits and herbs may reduce the risk of various age-related problems associated with high levels of oxidative stress.[12]. In 1975 first studies on fatty acid composition in ferns were reported. In this study, the quantification of the total and individual content of fatty acids in fern fiddleheads was carried out. [13]. In fern fiddlehead extracts, about 30 different fatty acids were detected. The fatty acids present in the highest amount were linoleic acid, arachidonic acid, oleic acid, α-linolenic acid, palmitic acid, and γ-linolenic acid. Dietary intake of essential fatty acids protects against mental and cardiovascular disorders, cancer, osteoporosis or diabetes.



Fiddlehead Ferns

List Of Chemical Constituents Of Fiddlehead Ferns And Its Pharmacological Action

MAIN CHEMICAL CONSTITUENTS	OTHER CHEMICAL CONSTITUENTS	PHARMACOLOGICAL ACTIONS
Carotenoids	lutein, neoxanthin, antheraxanthin, violaxanthin, β-Carotene	Antioxidants, Induction of apoptosis, enhance immune system functioning, eye nourishment
Fatty Acids	Caproic A, α-linolenic acid, γ-Linolenic acid, Linoleic A, Arachidonic A, palmitic acid, dihomo-γ-linolenic acids (DGLA)	Anti-inflammatory (inhibition of COX), hormones production, antiarrhythmic activity, antihypertensive, antidiabetic
Minerals	phosphorus, iron, magnesium, zinc and calcium	Healthy body functioning
Flavonoids	Rutin, quercetin	Anti-cancer, anti-microbial, anti-oxidant, free radical scavenging property
Ascorbate	Vitamin C	Enzyme cofactor, antioxidant, healing process(collagen synthesis)

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Niacin	Vitamin B3	Decreases VLDL(very low density lipoproteins), increases HDL(high density lipoproteins)
Riboflavin	Vitamin B2	To maintain healthy skin, eyes, nerves and blood cells

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[8]. Although some fern species can be toxic or carcinogenic. The consumption of raw or improperly cooked fiddlehead ferns can be very risky as due to the presence of various toxins in them. In every case, the use of inadequate preparation techniques has been the main cause of the toxicity**.** Fiddlehead ferns need to be boiled for 10-15 minutes in order to kill any illness-promoting pathogens resident within the tightly curled fronds.

VARIOUS FERNS SPECIES IN INDIA

[14]. Fiddleheads are very popular in the northern regions of the Indian subcontinent. The fiddleheads are termed as 'Lingad' in Mandi, 'Lingri' in Kullu Valley and 'Lungdu' in Kangra Velly in the state of Himachal Pradesh. In Darjeeling and Sikkim, it is locally known by the name 'ningro' and in Assam called as 'Dhekia xaak'.

FIDDLEHEAD FERNS SPECIES	MEDICINAL PROPERTIES	GEOGRAPHICAL SOURCE
Asplenium trichomanes Aspleniaceae	[15,16]. Commonly Used as Expectorant, activity is also seen in promoting menstruation	Jammu &Kashmir
Ampelopteris prolifera Thelypteridaceae	[17]. Provide relief from constipation	North East
Alsophila gigantea Cyatheaceae	[18]. Used for treating inflammation, leucorrhea and also used against snake bite	North East
Diplazium dilatatum Athyriaceae	[18]. Used as a diuretic agent	North East
Huperzia phlegmaria Lycopodiaceae	[19]. Used in treatments of Alzheimer and Parkinson diseases	North East
Sphenomeris chinensis Lindsaeaceae	[20]. Treatment of inflammation and sprains	North East, Uttarakhand
Pteris wallichiana Pteridaceae	[21]. Roasted leaves along with sesame oil is used to remove skin infections of infants	North East
Microsorum punctatum Polypodiaceae	[22]. Used in the urinary problems, snakebite, dysentery, diuretic, purgative and also for healing wound	North East

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Marsilea quadrifolia Marsileaceae	[23]. Improve fertility	North East, West Bengal
Nephrolepis cordifolia Nephrolepidaceae	[24]. Frond's paste is applied on wound to prevent bleeding and for the treatment of jaundice and decoction of fresh fronds consumed orally for cough	North East
Marsilea minuta Marsileaceae	[25]. Plant used in cough, spastic conditions of leg muscles, in sedation and insomnia	North East, Jharkhand
Nephrolepis biserrata Nephrolepidaceae	[26]. It possesses an antimicrobial activity and also used in boils, abscesses and blisters also used to avoid miscarriage, foetus development and various microbial infections	North East
Ophioglossum vulgatum Ophioglossaceae	[27]. It has an antiseptic property and applied on wound to prevent bleeding	North East
Pteridium aquilinum Dennstaedtiaceae	[28]. Rhizomes and leaves extract is given for chronic disorders of large internal organs(Heart, Lungs and Stomach) and spleen. Rhizome powder mixed with milk is used to treat diabetes	Uttarakhand, North East

PHARMACOLOGICAL ACTIVITY OF FIDDLEHEAD FERNS

1. Prevention of cancer

[29]. The antioxidants present in fiddlehead fern has the ability to prevent cancers. Antioxidants like beta-carotene, vitamin A and vitamin C helps in protecting the cells from cancer-causing free radicals and stabilize the free radicals, which results in lowering the risk of cancer.

2. Promotes eye health

[30]. Fiddlehead fern is a rich source of vitamin A which is useful in improvement of eyesight and treatment of night blindness. It is also used for lowering the risk of macular degeneration, glaucoma, poor night vision, dry eyes and cataracts.

3. Strengthens the immunity

[31]. Fiddlehead ferns contain vitamin c. it is a water-soluble antioxidant that strengthens the immune system by fighting your body against infections. Vitamin C helps the body to develop resistance against infections like virus, bacteria and protozoa. It also prevent them from attacking the body.

4. Treatment of migraine

[32]. Fiddlehead fern is rich source of riboflavin which is also known as vitamin B2. It is

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very effective in the treatment of migraine headaches. It plays a major role in the functioning of the mitochondria which is powerhouse of the cell. Migraines can occur due to the dysfunction of mitochondria in some individuals that's why fiddleheads are very effective in the treatment of migraine.

5. Promotes heart health

[33,34]. Fiddlehead fern is rich source of potassium and niacin(vitamin B3). Potassium helps in maintaing blood pressure. Niacin (vitamin B3) boosts good cholesterol and lowers triglyceride levels.

II. CONCLUSION

As these fiddlehead ferns are a great source of nutrition. Our main focus during this work is on introducing the medicinal and nutritional properties of the fiddlehead ferns in front of the population. So that it helps in maintaining the diet routine and diet plan because it provides efficient daily requirement of various vitamins, fatty acids, minerals and other biologically active substances**.** However, our objective is to cumulate fiddlehead ferns species data, its medicinal properties and pharmacological actions. Recently it is very rarely used as nutraceutical but it can be useful in the treatment of various disease for future perspective.

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