

Nutritional and Health Attributes of Herbs

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Abstract

India is undergoing nutrition transition and is facing the dual burden of malnutrition. Over the last two decades, over nutrition and obesity have emerged as public health problems; there has been increase in the prevalence of non-communicable diseases like diabetes and cardiovascular disease (CVD). Many herbs have been served as food as well as for medicinal purposes for centuries. Due to powerful antioxidant composition of some herbs, it may offer antitumor or antiviral activity, provide protection against low density lipoprotein cholesterol from oxidation and various chronic diseases, inhibit lipoxygenase and cyclooxygenase enzymes and lipid peroxidation. With the presence of antifungal and antimicrobial properties, these herbs increase the shelf life and improve taste and flavour of foods. In spite of being easily available their use in culinary is limited only as a flavour enhancer in freshly cooked foods. "A little and often" is best suitable idea to get maximum health benefits from herbs. Instead of treating, it helped to provide protection against many health problems. In this paper, the nutritional and health benefits of herbs namely Basil, Mint, Curry leaves, Drumstick leaves, Celery leaves and lemon grass will be discussed. Herbs are still the alternative medicine and primary source of health care for 80% of the world.

Beneficial effects of herbs on human health have already been well demonstrated due to presence of significant amount of nutritional and non-nutritional components like micronutrients, vitamins, antioxidants, phytochemicals and fibre hence, promoted as 'functional foods'. Main concern is that these are low cost easily available and does not have any side effects when mixed in any food items.

Keywords: Nutrition, herbs, health, antioxidants, micronutrients

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Introduction

Any plant that was either a shrub or a tree was considered to be a herb in ancient times. Botanists however defined it in the other way "any perennial plant dying down to the ground after its growing season and sprouts again is an herb." For others herb is a small and easy to cultivate plant, offering other useful properties of fragrance, culinary applications, medicinal remedy, historical association with myths, folk-lore etc. According to the dictionary of Oxford, the word herb is defined as plants with seeds, leaves and flowers which are used as perfume, medicine and to flavour the food. Usually herbs involve leaves of the plant but other materials (seeds, roots and bark) are mainly classified as a spice.

Although, allopath based treatment is effective in diseases cure and alters the various metabolic and molecular pathways. For centuries, herbs based products have been used for medicinal purposes. Presently, eighty per cent population of the world have faith in botanical preparations as remedies to come across their well-being. Spices and herbs are commonly effective and safe for treatment of certain ailments and also widely used among many African, Asian and other countries. From the recent studies, the practice of using herbs has been progressively growing among developed countries, considering their positive effects. Herbs and spices are generally used in phytotherapy, which is using chemical constituents of plants to reduce some health related problems. It is common form of treatment especially used in Europe. Among Europe, Germany holds 49 % share, while, France holds 10%, Italy and UK hold 10% each and Belgium, Netherlands and Spain hold 2% each. Remaining share (15%) hold by rest of Europe [1].

With the presence of antifungal and antimicrobial properties, these herbs increase the shelf life and improve taste and flavour of foods. Some studies reported that herbs constitute significant amount of antioxidants, fibre, micronutrients, phytochemicals and vitamins. It is useful to fight against micronutrient malnutrition, provide protection from degenerative diseases [2]. Many valuable medicines and herbs are easily available, however their use in culinary is limited only as a flavour enhancer in freshly cooked foods. About 80% of the world population still dependent on herbs to use as an alternative medicine which is principal source of healthiness. Available information related to the nutritional value of herbs is negligible [3].

Properties of Herbs

Herbs are the best and noblest endowment of nature to the mankind and the living beings for the perpetuation and beautiful living. Herbs contain all the virtues of their being used in enhancing the organoleptic tastes, making of good appetizers with their fragrance and aroma, catching eye appeal from the pleasing colours and presentations from green colour of the leaves to yellow/orange/red/pink from the flower petals, preserving fragrant qualities in drinks, beverages, liquors, vinegars and last but not the least as medicines are a few factors, which have led to a broad sub categorization of these herbs, which are: Culinary, medicinal and aromatic

Composition

Herbs generally used in Indian cooking can come from different families of various plants. These may vary significantly in aroma, chemical constituents and taste. The important and common property of herbs is that their leaves have strong aromas and flavours. Most of the common herbs belong to two chief families i.e. the Apiaceae (carrot family) and the Lamiaceae (mint family). Different families of herbs might have common compounds and showed similar bioactivity along with aroma and flavour. Essential oil components and phenolic are the most studied compounds in herbs. It may vary greatly in herbs like other plants. Moreover, it is having antioxidant activity, anti-allergic, anti-cancer, anti-inflammatory and anti-microbial properties. Even though there is not complete consent between results but some results showed that marjoram or oregano species predominantly contain the highest amount of phenolic compounds, also revealed in their highest antioxidant activity. Some phenolics present in herbs such as carnosic acid and its derivative, carnosol, phenoiditerpenes, phenolic acid, and rosmarinic acid and common flavonoids such as apigenin, hispidulin, kaempferol, luteolin and quercetin [4].

Health and nutritional attributes of some useful herbs

Herbs are well-known as an important source of natural antioxidants. Therefore, it play significant role in the chemo prevention of diseases arising from lipid peroxidation. Several researches have shown known and new more than hundred compounds which is also having antioxidant activity [5]. Various industries such as food, cosmetics, biotechnology and pharmaceutical have a keen interest in herbs. These herbs have been used for several purposes such as beverages, cosmetics, dyeing, flavouring, fragrances, medicinal, smoking and other industrial uses. Herbs are an exceptional source of phytochemicals having powerful antioxidant effects [6]. Researchers have identified a host of cancer chemoprotective phytochemicals in these herbs. The antioxidants properties in herbs help to, inhibit hormonal actions, formation of DNA adducts with carcinogens, metabolic pathways associated with the development of cancer and nitrosation, induce phase I or II detoxification enzymes and stimulate the immune system. As evident from the above discussion, herbs have been used as an alternative medicine for prevention and cure of many health problems. Following is som health and nutritional attributes of commonly use herbs.

Lemon grass

The research highlighted the functional properties of Lemon grass (*Cymbopogon citratus*), consumed in various forms such in Thai, Vietnamese and South East Asian cuisines have been highlighted by many research studies. It is highly ranked traditional medicine of Brazil and has been helpful in treatment of some health problems such as constipation, coughs, diarrhoea, elephantiasis flu, headache, gingivitis, malaria, leprosy, pneumonia, ophthalmia, stomach ache and vascular disorders [7]. A comparative study among spices, herbs and vegetables was conducted with respect to its total phenolic content and antioxidant activity and results showed better antioxidant activity in lemon grass when compared to coriander (leave and stem), garlic, ginger and tomato whereas less total antioxidant activity among lemon grass was found than cumin, turmeric and dried curry powder. Among herbs, highest total antioxidant activity was observed in Turmeric (1126.12 ± 94.2 mg VCE/100 g) followed by cumin (302.26 ± 0.9 mg VCE/100 g), dried curry powder (236.55 ± 7.9 mg VCE/100 g), lemon grass (120.57 ± 5.46 mg VCE/100 g), coriander (92.18 ± 62.9 mg VCE/100 g), ginger (62.24 ± 0.19 mg VCE/100 g), tomato (22.97 ± 4.8 mg VCE/100 g), garlic (8.77 ± 1.93 mg VCE/100 g.) [8].

Ray supplemented 250 millilitres of lemon grass decoction (decoction was prepared by boiling 20 leaves about 1 foot in length including its roots in 1 litre for 20 minutes) to 31 hypertensive individuals for a period of 16 weeks [9]. Average arterial pressure was improved with the consumption of decoction of lemon grass two times a day, while no improvement was found in heart rate and clinical symptoms related to hypertension. When amount of 140 mg/d of lemongrass oil (rich in citral and geraniol) was consumed by hypercholesterolemic subjects for 3 months, showed fall in concentrations of cholesterol level among subjects. Concentration of cholesterol level was also suppressed with the

intake of other isoprenoids which are available in some herbs [10].

Mint

Mentha belongs to lamiaceae family and comprises about total of 25 species. It is an herb that has been used for hundreds of years for its remarkable medicinal properties. Stem, flowers and leaves of *Mentha* spp. are usually used as additives in foods and as herbal tea to provide flavour and aroma. These also help to provide protection against some food pathogen bacteria [11]. In Cyprus, *mentha viridis* is generally consumed in herbal tea as a dried product. Dried *mentha viridis* was also used in traditional cheese of Cypriot called halloumi as an additive. Drying is taken as a critical feature for the merchantability and postharvest management of herbs. Water content was vary from 75 to 80 % in fresh lamiaceae herbs which is used as spearmint. But for the successful preservation of mint herb, the amount of water should be dropped to less than 15% [12].

Popular herb, mint has several health benefits such as relief from depression, headache, fatigue and nausea, proper digestion and weight loss, treatment of skin problems, asthma and memory loss. Rosmarinic acid (antioxidant and anti-inflammatory agent) present in mint plants provide relief from seasonal symptoms of allergy and enlightening a favourable natural treatment. It also helps to nourish the lungs and increase the body's resistance against the diseases. It also help to protect against harmful effects of anti tubercular drugs. The phenols in the mint have been found to be beneficial in treating respiratory infections. Mint has antiseptic qualities which help to keep the mouth fresh by killing germs causing harmful odour. It also helps to prevent tooth decay, pyorrhea and pre mature falling of teeth by providing required nutrients.

Basil

Another name of basil is *Ocimum sanctum*, *Ocimumtenuiflorum*, tulasi and tulsii. It belongs to Lamiaceae family and an aromatic plant. The herb basil is native to the Indian subcontinent and commonly grown in all over the Southeast Asian tropics. Mainly in Hindu religion, various households worshipped the Tulsi plant for a deep-rooted purpose. This low-cost and humble herb is available to Gods and overloaded with lots of health benefits.

Several experimental studies reported that tulsii plant has the ability to provide protection against the harmful effects of many toxicants. Some studies proved that tulsii plant prevent brain from injury, kidney and liver by provide protection against the damage to cells, genetic and immune response which is generally caused by industrial chemicals, pharmaceuticals and pesticides. Thus, it revealed that harmful and toxic effects of industry chemicals and common pesticides may be reduced by using tulsii in daily diet [13]. Basil plant also have the ability to protect our body against some pharmaceutical drugs such as acetaminophen, anti-tubercular drugs, haloperidol, meloxicam and paracetamol, The leaf juice of *O. sanctum* L. along with triphala is used in Ayurvedic drop preparation. It is used for glaucoma, cataract, chronic conjunctivitis [14]. Juice of tulsii leaves along with honey, if taken regularly for six months helps to expel the renal stone through urinary tract [15]. Pand and Kar reported that about 0.5 g/kg body weight dose of leaf extract of *O. sanctum* L. for a period of 15 days expressively reduced serum T4 concentration [16]. Comparative evaluation of aqueous and ethanolic extract of leaf (orally) and fresh leaf paste (topically) to assess their chemo preventive activity carcinogenesis. When leaf paste is topically applied and extract is given orally to animals, it increased the life span by reducing the frequency of occurrence of cell cancer. Orally administered aqueous extract established the thoughtful effect on the mucosa when compared to the other [17].

Ocimum gratissimum leaves were collected from three dissimilar localities in Misurata region (Daphnia, Tamena and Zaroge) in Libya. These were analyzed for its proximate analysis and mineral content. Results revealed that moisture, crude protein, ash, lipids and carbohydrate content of leaves were 10.60, 9.10, 50.35, 41.3 and 10.08 % in Zaroge region, 10.40, 9.80, 14.5, 11.0 and 52.45% in Tamena region and 10.60, 9.22, 13.19, 22.55 and 11.16% in Daphnia region on dry weight basis. Among the minerals in all the regions, iron content ranged from 0.98 to 4.35 mg/100g, zinc from 10.44 to 17.72 mg/100g, copper from 0.45 to 3.75 mg/100g, Lead from 0.061 to 0.12 mg/100g and cadmium from 0.011 to 0.018 mg/100g respectively. The results based on analysis had given the importance to basil leaves as food and medicinal purpose [18].

Curry leaves

Murraya koenigii (Curry leaves) a tropical to subtropical tree native to India, is medicinal plant having hypoglycemic property. In Indian cooking, curry leaves are extremely important and has given value as an important part of the diet. Popularly known as kari-pattha [19]. As part of folk and traditional medicines, many parts of plant have been used in the treatment of rheumatism injury, snake bite and traumatic injury. Further, it is reported that it is an antioxidant and having anti-diabetic, anti-dysenteric, antihypercholesterolemic, anti-inflammatory, antimicrobial, and

hepatoprotective activities. Nutrients value of fresh curry leaves (100g) and dehydrated curry leaves (100g) is protein 6g and 12g, fat 1g and 5.4g, carbohydrate 18.7g and 64.31g, calcium 830 mg and 2040 mg, iron 0.93 mg and 12 mg and β -carotene 7560 μ g and 5292 μ g, respectively [20].

Murraya koenigii (Curry leaves) is medicinal plant having hypoglycemic property. A study was undertaken to investigate the hypoglycemic impact of curry leaf powder among patients of Type 2 diabetes. Twenty two male patients with Type 2 Diabetes in the age group of 51-62 years formed the samples for the study. Fifteen g of curry leaf powder was supplemented for a period of 30 days for the Diabetic Experimental Group (DEG) (n=10). The glucose level was noted down on days 0, 1, 10, 20 and 30 of the supplementation period before lunch and 2 hrs after lunch for both control and experimental before supplementation. After supplementation, fasting and post prandial levels of glucose were improved in the DEG and significant reduction was also found among both the pre and post lunch levels of glucose. Further, a significant change between the DCG and the DEG was also observed with respect to the post prandial levels of blood glucose [21]. Results showed that curry leaf powder had the property to decrease the blood glucose load and are the dietary adjunct in the management of Type 2 Diabetes.

Celery leaves

Celery (Apium graveolens), belongs to family Apiaceae and considered as a vegetable. Celery is a good source of vitamins such as folate, vitamin B6, C and K and minerals such as potassium. It is an excellent source of antioxidants and favourable enzymes. In addition, it is also recognized for some other vitamins and minerals such as vitamin A, B1 and E, calcium, iron, magnesium, manganese, phosphorus and zinc [22]. Celery helps to improve cholesterol and blood pressure and prevent from heart diseases as it is having both anti-inflammatory and antioxidant properties. In addition to well-known antioxidants like vitamin C and flavonoids, new antioxidant activity has been found in celery, which is mainly due to the presence of phenolic content and provides protection against the oxidative damage to blood vessels, cells and organ systems. Celery also provides good amount of dietary fibre. Due to its high amount of water and electrolytes, it helps to prevent from dehydration. Celery perfume as a diuretic and help to reduce bloating due to the presence of some superior compounds. Celery contains high calcium which is helpful in maintaining nerve health and muscle function.

The extract of plant roots and leaves holds property of some operational biochemical parameters including reduced catalase, glutathione content, glutathione peroxidase, oxidase, peroxidase and xanthine activities which disturb the strength of lipid peroxidation in homogenized blood and liver. When the combination of extract and doxorubicin is used, it is induced some protective effect against it [23]. Another author revealed that extract of celery provides a significant decrease in serum levels of low density lipoprotein (LDL) and total cholesterol and increase the hepatic triglyceride with the reduction of action of hepatic triacylglycerol lipase enzyme among subjects [24]. Nehal reported that barley grains, celery and chicory leaves are the valuable ingredients in diets of weight loss [25]. They might help to normalise lipid metabolism and decrease risk of becoming fatty liver. Results recommended that inclusion of mixture of barley grains, celery and chicory leaves (5% each) in the diet, help to patients who are suffering from liver diseases and hypercholesterolemia.

Drumstick leaves

Drumstick leaves have the highest known contents of total beta carotene (40139 μ g/100g) and beta carotene (19210 μ g/100g) [26]. These are excellent source of nutrients like Calcium (440mg), phosphorous (259mg) vitamin C (220mg) and protein (6.7g) per 100g of fresh leaves. Kowsalya and Vidhya analyzed the nutrient content of sundried drumstick leaves and reported iron as 25.5 mg and calcium as 1500 mg/100g of these drumstick leaves. They also showed these leaves contain 24.0, 2.9, 8.5g/100g of protein, fibre and ash respectively and 41.7 mg/100g beta-carotene. They also reported 196g/100g of vitamin C in fresh drumstick leaves [27].

Type 2 diabetic patients (30–60 years of age) were selected for the study and divided into two groups viz. experimental (46 subjects) and control (9 subjects). They were supplemented with drumstick leaves for over a period of 40 days and observed the hypoglycemic effect among subjects. They have not taken anti-hyperglycemic drug during the study period. The subjects of experimental group were provided 8 g of leaf powder daily. When compared to the control group, significant reduction was found in experimental group [28].

Drumstick leaves (*Moringa Oleifera*) had higher levels of crude protein, crude fibres, crude fat, iron, calcium and beta-carotene. Cream crackers were developed from cassava and sweet potato flour incorporated with these leaves using wheat flour as controls. Sensory evaluation of the cream crackers developed showed that they had good sensory properties and since the cassava and sweet potato flour crackers do not contain gluten, they can be consumed by gluten intolerant patients [29]. These leaves comprise phytosterols mainly β -sitosterol (Jain *et al* 2010) and it can decrease the intestinal intake of dietary cholesterol [30].

Table 1 Nutritive value of some useful herbs (per 100g basis)

S. No	Herb	Moisture (g)	Energy (kcal)	Protein (g)	Fat (g)	Fiber (g)	Calcium (mg)	Iron (mg)	Vitamin C (mg)
1	Basil	92.1	22.0	3.1	0.6	3.9	177.0	3.2	18
2	Mint	85.5	70.0	3.8	0.9	8.0	199.0	11.9	13.3
3	Drumstick Leaves	78.7	64.0	9.4	1.4	2.0	185.0	4.0	51.7
4	Curry leaves	63.8	108.0	6.1	1	6.4	830.0	1.0	4.0
5	Celery leaves	95.0	12.0	0.7	0.2	1.8	40.0	0.2	3.1
6	Lemon grass	70.5	99.0	1.8	0.5	-	65.0	8.1	2.6

Conclusion

Culinary herbs provide such components which are not even supplied by fruits and vegetables in the diet. Though herbs are excellent source of various phytochemicals and some essential nutrients but individual can consume herbs in small amount. That's why its dietary contribution is relatively show insufficient medicinal effects. Herbs might provide valuable bioactive compounds such as both less common phytochemicals and ubiquitous, if eaten regularly in diet. From thousands years, herbs are mainly used as a medicine and an important part of Indian cuisine. Many of researchers generally focused on its antioxidant property, though it is also having antimicrobial activity. Besides being examined for their health characteristics, herbs are being gradually explored as natural food preservatives. In this perspective, antioxidant action is predominantly essential in postponing rancidity in fatty or oily foods and its antimicrobial activity protect the foodstuff from possible pathogens. While when used as traditional remedies and medicine ingredients, the bioactive compounds in herbs will be present in higher amount than when consumed as cuisine flavourings in the plant form. It can be concluded that daily consumption of herbs even in small amount can provide a improvement in dietary phytochemicals including those with antioxidant activity. "A little and often" is best suitable idea to get maximum health benefits from herbs. Instead of treating, it helped to provide protection against many health problems.

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