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Wonders of Leafy Spices: Medicinal Properties Ensuring Human Health

A.B. Sharangi and S. Guha

Department of Spices and Plantation Crops, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, 741252, Mohanpur, Nadia, West Bengal, India

ABSTRACT

Background: Leafy spices include coriander, fenugreek, curryleaf, bayleaf, basil, mint, rosemary, marjoram, thyme, etc. As fresh and/or with value addition, they not only impart diverse flavors, colors and tastes to foods, but also offer a host of powerful phytonutrients which enhance health and well-being. Though many researchers found wonderful medicinal properties of leafy spices contributing towards human health, literature is almost scanty on a comprehensive review attributing the spicy wonders. This review will highlight such spicy wonders, in detail. **Results:** Coriander contains carbohydrate, fat, protein, vitamin A and C including energy. It aids in digestion, reduces flatulence, improves appetite, helps relieving spasms. Fenugreek leaves are enriched with Calcium, Iron, vitamin C and K, energy and protein. Curry leaves, also rich in minerals and vitamins, used as herbal tonic, prevents hair loss, aids in eye disorders and prevents diabetes, skin problems. Bay leaf, containing polyphenols and antioxidants, can prevent infections, diabetes and skin diseases. Mint is rich in vitamins and minerals and having anti-inflammatory, antiseptic effects. The essential oil of thyme consists of 20-54% antiseptic thymol, which is the main ingredient of mouthwashes and medicated bandages. Marjoram is used to relief from indigestion, asthma, stomach pain, headache, dizziness, colds, coughs and nervous disorders. Rosemary, extremely high in iron, calcium and vitamin B_6 is believed to improve memory. **Conclusion:** It may be concluded that herbs and medicinal plants are rich sources of beneficial compounds including antioxidants and functional foods. Comprehensive research is necessary to process plant materials into medicine.

Key words: Leafy spices, medicinal value, value addition, human health

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INTRODUCTION

The culinary world would be lifeless without spices. Spices, like their botanical leafy counterparts-herbs, impart diverse flavor, color and taste to various foods around the world. They also offer a host of powerful phytonutrients that can enhance human health and well-being. While culinary spices are having been used for thousands of years for their numerous health benefits[1], extensive research in the last two decades has been able to explore and explain the vistas of hidden magical wonders within them. In fact, they may prevent chronic illnesses, such as cancer, diabetes, cardiovascular disease and other serious pulmonary, neurological and autoimmune conditions[2]. Spices are popularly known for their flavor in the domestic and international markets all over the world. With the growing awareness of ill effects of synthetic chemicals, drugs and medicines, people are now switching towards traditional system of medicines where spices are also an inseparable component. Among wide ranges of spices known so far, leafy spices like coriander, basil, fenugreek, curry leaf, bay leaf, rosemary, marjoram, thyme, etc are important for their wide acceptance by the consumers around the world both in terms of imparting taste, flavor and aroma to the food as well as taking care of the human health since time immemorial.

The World Health Organization[3] reported that chronic under nutrition affects over 200 million people or 42% of the population in Sub-Sahara Africa. The long-term malnutrition problem of the poor nations cannot be solved by food aid or food trade with the affluent countries but rather by the adequate utilization of indigenous plant foods[4]. Many researchers[5,6] identified and documented the traditional leafy vegetables and spices of Ebonyi State, Nigeria and assessed their nutritional values with a view of enhancing their selection as components of cooked food. Results identified twenty-seven traditional leafy vegetables and

Corresponding Author: A.B. Sharangi, Department of Spices and Plantation Crops, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, 741252, Mohanpur, Nadia, West Bengal, India Tel: +91-943473 222659

five spices from 23 plant families. The 33.3% of the leafy vegetables were tree species, 30% were herbaceous plants and 23% were climbers, while 13.3% were shrubs. The 60% of species were propagated by seed, while 36.7% were propagated by vegetative means. Three of the vegetables analyzed were good sources of micro-nutrients. Their calcium content ranged between 54.06-90.10 mg 100 g^{-1}, while zinc and lead which are antioxidants were absent. The ash content of the three plants ranged from 8.10-6.30%, while protein ranged from 5-10% of fresh weight or 13-30% for dry weight. Their fiber (roughage) content was high and will promote digestion and prevent constipation when consumed. In spite of several researches in this direction in different areas of the world, information for a comprehensive knowledge base is still very insufficient to grow general awareness and interest for the leafy spices. With this in view the following study has been conceptualized envisaging the numerous heath benefits as well as value addition of leafy spices.

Coriander: In the United States, leaves of the coriander (*Coriandrum sativum*, Apiaceae) are known as *'cilantro'*. Coriander leaves provides only 39 cal 100 g^{-1}, but their phyto-nutrients profile[7] is no less than any high calorie food source; be it nuts, pulses or cereals or meat group. Green leaves basically contain protein 3.3%, fat 0.6%, calcium 0.14%, phosphorus 0.06%, iron 0.01%. Leaves are the rich source of vitamin A and C. Research has shown that coriander leaves can also aid in digestion[8]. Coriander leaves have long been used to treat anxiety.

Coriander herb contains no cholesterol but is rich in anti-oxidants and dietary fiber which help reduce Low Density Lipoprotein (LDL) while increasing the more acceptable High Density Lipoprotein (HDL) levels. The leaves and seeds contain many essential volatile oils such as borneol, linalool, cineole, cymene, terpineol, dipentene, phellandrene, pinene and terpinolene. The leaves and stem tips are also rich in numerous anti-oxidant polyphenolic flavonoids such as quercetin, kaempferol, rhamnetin and epigenin. The herb is a good source of minerals like potassium, calcium, manganese, iron and magnesium. Potassium is an important component of cell and body fluids that helps control heart rate and blood pressure. Iron is essential for red blood cell production. Manganese is used by the body as a co-factor for the antioxidant enzyme superoxide dismutase. Coriander is one of the richest herbal sources for vitamin K. Vitamin-K has potential role in bone mass building by promoting osteotrophic activity in the bones. It also has established role in the treatment of Alzheimer's disease patients by limiting neuronal damage in their brain. The coriander seeds oil have found application in many traditional medicines as analgesic, aphrodisiac, anti-spasmodic, deodorant, digestive, carminative, fungicidal, lipolytic (weight loss), stimulant and stomachic.

Basil: Basil (*Ocimum sanctum,* Lamiaceae) contains many different and powerful flavonoids, which protect against cell damage and have strong antioxidant as well as antibacterial properties[9]. Studies have confirmed that basil contributes to heart health by improving circulation and reducing heart disease. It also acts as an antibacterial agent to even the more antibiotic-resistant types of bacteria, particularly those found in produce[10]. Small-scale herb growers may also market value-added products such as pesto, basil vinegar and fancy-packed dried basil for sale in specialty shops. Greenhouse herb plants can also be sold as herb bedding plants for transplanting to gardens.

Curry leaves: An analysis of curry leaves (*Murraya koenigi*, Rutaceae) shows them to consist of moisture 66.3%, protein 6.1%, fat (ether extract) 1.0%, carbohydrates 16.0%, fiber 6.4% and mineral matter 4.2% 100 g^{-1}. Their mineral and vitamin contents are calcium, phosphorous, iron, nicotinic acid vitamin C. Fresh leaves on steam distillation under pressure yield a volatile oil. Besides the oil, the leaves contain a residual glucoside named as koenigin. Curry leaves posses the qualities of herbal tonic. They strengthen the functions of stomach and promote its action. They are also used as a mild laxative. The leaves may be taken mixed with other mild tasting herbs. Curry leaves health benefits also include relief from kidney pain, arresting the premature graying of hair, treatment of minor superficial skin injuries and managing diabetes. A liberal consumption of curry leaves is believed to be beneficial in nourishing the roots of the hair thus preventing further hair loss. Some communities in the Indian subcontinent steep fresh curry leaves in hot coconut oil and use it as a medium for nourishing the hair roots. It is believed that by doing so, premature graying of hair can be stopped. As a treatment for diarrhea and dysentery, tender green curry leaves to work effectively when with honey. As an external application curry leaves can be used as a poultice to treat skin eruptions and minor skin infections. The fresh juice of curry leaves are also used as an eye treatment for certain eye disorders, especially in arresting the development of cataract. Tender curry leaves are valuable remedy for treating diarrhea, dysentery and piles. They should be taken, mixed with honey. Eating ten fresh fully grown curry leaves every morning for three months will help to prevent diabetes due to heredity factors. It also cures diabetes due to obesity, as the leaves have weight reducing properties. As the weight drops, the diabetic

patients stop passing sugar in urine. Curry leaves can be used with gratifying results to treat burns, bruises and skin eruptions. They should be applied as a poultice over the affected areas. Fresh juice of curry leaves suffused in the eyes makes then look bright. It also prevents the early development of cataract. The value added product of curry leaves are volatile oil and dehydrated curry leaves.

Fenugreek: Fenugreek (*Trigonella foenum-graecum* L.) is an erect annual herb belongs to the family Leguminosae. Fenugreek leaves are enriched with minerals like potassium, calcium and iron. One hundred grams of fenugreek leaves comprise only 49 calories. The leaves have good dietary fiber and are enriched with vitamin C. The vitamin K from fenugreek leaves is comparable to spinach. Fenugreek leaves are bitter in taste. People have also recognized the leaves of the plant as a powerful herb. Fenugreek has slender stems and the tripartite, serrated leaves appear in light green color. The leaves are refrigerant and aperients are given internally for vitiated conditions of pitta. Fenugreek leaves add flavor and zest to cooking and can be added to any kind of cooking that involves dal, vegetable, rice, or atta (chapathi flour). Anemic patients can consume fenugreek leaves regularly as they are a rich source of iron. Fenugreek leaves paste applied on palms and soles alleviates burning sensation. A cup of fenugreek leaves decoction added to honey and a teaspoon of ginger powder clears the phlegm and cures cough. Fenugreek leaves paste applied on swellings, sprains and burns heals them effectively. Fenugreek leaves consumed regularly tones your respiratory system, nervous system, reproductive system and neuromuscular system. Fenugreek leaf powder significantly increases the antioxidant system in diabetics.

Fresh fenugreek leaves paste and coconut milk applied over the scalp is believed to prevent hair-loss, promote hair growth, preserve its natural color, delay graying of hair and make it silky soft. A pimple and blackhead prone skin when treated with the paste of fenugreek leaves and turmeric, improves the skin tone. Fenugreek leaves also has anti ageing properties. Make a paste of fenugreek leaves and add boiled milk to it. Applying this to your face delays the appearance of fine lines and face wrinkles. It not only improves the complexion but also makes one look years younger. Fenugreek leaves paste when applied on acne affected area every night and washed away the following morning with warm water prevents fresh breakouts of acne. The value added products are fixed oil, volatile oil and oleoresin. The fixed oil consists of fatty acids like linoleic, oleic and linolenic acid which has marked drying properties.

Bay leaf: Bay leaf, with its scientific name of (*Laurus nobilis*, Lamiaceae) is a popular leafy spice used in seasoning food. Commonly found in many kitchens, bay leaves are used in stews, soups and other savory dishes. According to the USDA's Nutritional Database, a one pinch of crumbled bay leaves weighs just 0.6 g. Within that amount, bay leaves have 0.45 g carbohydrates, 0.05 g proteins and 0.2 g dietary fiber. The remaining portion is made of other nutrients and water.

Bay leaf has medicinal property that helps in curing outside infections and skin diseases. They have strong and distinctive fragrance repelling unwanted bugs away from the room. Application of bay leaf paste is the best medicine for curing minor cuts and insect bite. In case of muscle soreness, bay leaf oil relives from soreness plus enhances the blood circulation too. It also has antibacterial and antifungal properties that can cure dandruff effectively. A regular intake of bay leaf in diet cures cold and urinary infections. It has been believed that bay leaf offers health benefits to our body. Indian researchers from Annamalai University[11] estimated the total polyphenolic content of Indian bay leaf and it was 6.7 mg gallic acid equivalent 100 g^{-1}. Bay leaf extract displayed scavenging activity against superoxide and hydroxyl radicals in a concentration-dependent manner. Spanish researchers determined the active aroma of bay leaf to be eugenol, elemicin, spathulenol and beta-eudesmol[12]. Researchers from Kyoto Pharmaceutical University, Japan, found the methanolic extract from the leaves of *Laurus nobilis* (bay leaf, laurel) could inhibit nitric oxide production in lipopolysaccharide (LPS)-activated mouse peritoneal macrophages. Seven sesquiterpene lactones (costunolide, dehydrocostus lactone, eremanthine, zaluzanin C, magnolialide, santamarine and spirafolide) potently inhibited LPS-induced NO[13]. In addition to its high content of antioxidants, it may have potential health benefits on diabetic people. Researchers from Agricultural Research Service[14] found that bay leaf has insulin-like biological activities.

Mint: Mint (*Mentha arvensis,* Lamiaceae) is closely related to other aromatic herbs such as basil, rosemary and sage. It is rich in vitamins A and C and has a small amount of minerals such as manganese and copper as well. Mint has an anti-inflammatory, antiseptic effect on the body. It is a powerful antioxidant and helps against the formation of cancerous cells. Additionally, it also helps improve the functioning of our immune system. Mint can help relieve symptoms of heartburn and irritable bowel syndrome by relaxing the muscles in and around the intestine. It can be consumed in the form of capsules or drops. Its digestive properties are beneficial for the liver and it helps dissolve

gravel in the kidneys and the bladder. When chewed on a daily basis it works as effective antiseptic toothpaste and the chlorophyll in the leaves combined with its antiseptic properties kills odor causing bacteria. The nutrients present in it prevent tooth decay, premature falling of the teeth and pyorrhea. A decoction of mint and salt when gargled is known to cure hoarseness that comes from shouting or singing in varying pitches. Mint that is brewed in tea or mixed in milk and warmed is sometimes used to relieve abdominal cramps and pains. Mint is a spice used extensively in cooking and the plant has delicate, dark green leaves which are fragrant and have underground modified stems. The leaves are rich in a variety of vitamins and minerals, particularly vitamin C, D, E, iron, phosphorous, calcium and trace amounts of vitamin B complex. Mint is popularly known as a carminative that is used to provide relief from gastric discomforts, while also working as an antispasmodic, a stimulant and a stomachic that aids in providing a better appetite. Mint oil is extracted from the leaves and flowering tops of this plant. Menthol, a key component of mint oil, has been used to relieve nasal congestion and ease breathing during cold and coughs. Mint oil is believed to help against headaches and body aches. Gargling with mint oil and warm water is effective against toothache and gum problems. Mint leaves are diuretic, thus increasing the rate of excretion from your body and cleansing your body. Mint leaves are also used as mouth fresheners to cure bad breath. Mint creams have bee proven to have a relaxing and soothing effect on the body. Applying fresh mint juice can help cure acne, pimples and even insect stings and eczema. Mint oil is often applied on the body during outdoor activities to repel insects due to the strong and pungent smell of this herb. An excellent appetizer, the juice extracted from freshly plucked mint leaves combined with a teaspoon of honey and fresh lime juice is known to aid in digestion and treat colic, morning sickness, summer diarrhoea, biliousness, flatulence and thread worms. The anti-pruritic or anti-itch properties of mint helps cure the irritation and rash caused by insect bites and stings, when mixed with a little camphor. Since mint is a strong diuretic, it helps to eliminate toxins from the body while also relieving congestion especially related to common cold or sinus problems. It controls the growth of harmful bacteria and fungus in the body and helps cure asthma and other allergic conditions to some extent. For older children suffering from abdominal pain, a quarter teaspoon of seeds can be given to be chewed and then swallowed with water. The juice extracted from mint leaves can be applied onto the face and left overnight to cure pimples and keep the skin sufficiently moist. Eczema, contact dermatitis and scabies are conditions which can be cured by the application of mint juice. It is nevertheless important to remember that mint is not a remedy for any advanced case of illness and will require a doctor's consultation. It can however be consumed as a supplemental treatment to speed recovery[15].

Rosemary: Rosemary (*Rosmarinus officinalis* L., Labiatae), with distinct flavor and scent, typically grows by the sea. Hence the name has been derived from the Latin *rosmarinus,* meaning 'dew of the sea'. The fragrant leaves of this plant look like tiny evergreen needles.

Rosemary leaf contains important phenolic components such as rosmarinic, chlorogenic and caffeic acids and a host of health-promoting flavonoids that possess strong antioxidant properties. The terpenoids in rosemary, such as rosmarinic acid, rosmanol, carnosol and ursolic acid provide effective anti-inflammatory benefits, while ursolic acid conveys anti-tumor properties. The volatile oil of rosemary has some antiseptic properties. It contains a high percentage of 1, 8-cineole (providing the fresh eucalyptus-like fragrance) and other major terpenoid components including-pinene, -terpineol and camphor.

The fresh or dried leaves of rosemary are used for a variety of medicinal benefits. In traditional European medicine, rosemary has been used internally as a tonic, stimulant and as a carminative to treat flatulence. It is also used to treat dyspepsia, mild gastrointestinal upsets, colds, headaches and nervous tension. In India and China, rosemary leaves are used to treat headaches. Rosemary is extremely high in iron, calcium and vitamin B_6. It also contains a large number of polyphenolic compounds[9] that can inhibit oxidation and bacterial growth. In cancer prevention studies, rosemary has been found to protect the blood against radiation exposure[16]. It may even help with memory loss; a recent study found that when the scent of rosemary was pumped into workplace cubicles, people exhibited improved memory[17,18].

Rosemary oil is known to have anti microbial property. The oil is the only value added product of rosemary. Rosemary oil can be distilled from the leaves of the plant, mixed with a vegetable oil and used for massage. Applied externally this oil is used for relief from muscular and arthritic pain. In Europe, rosemary oil is used to treat rheumatic conditions, bruises and circulatory problems. When applied externally the oil appears to stimulate an increased blood supply. In addition, rosemary oil or some freshly cut sprigs can be added to bath water to soothe aching muscles and joints. These leaves are most frequently used as kitchen spices, but many believe that brewing them into a tea can have a beneficial effect on the body and brain. Rosemary leaf tea, with its pine-like flavor, is said to bear a number of useful nutrients, including vitamin A, beta carotene and antioxidants.

Marjoram: Marjoram (*Majorana hortensis* Monech, Lamiaceae) is an aromatic, perennial herb which contains water, protein, volatile oil, minerals like K, Ca, Na, P, Fe, Si, Mg, Mn etc. It is very much useful as an external application for sprains, bruises, stiff and paralytic limb, tooth ache and in cases of acute diarrhea. Sweet marjoram is one of very popular herb especially in Mediterranean countries. Marjoram is considered to be a carminative, expectorant and tonic. It is reported to be useful in treating asthma, hysteria and paralysis. The oil obtained from the leaves has antimicrobial property.

The herb contains many notable phyto-nutrients, minerals and vitamins that are essential for optimum health and wellness. The herb parts contain certain chemical constituents like eugenol sabinene, α-terpinene, cymene, terpinolene, linalool, cis-sabinene hydrate, linalyl acetate, terpinen-4-ol and terpineol. These compounds are known to have anti-inflammatory and anti-bacterial properties. Fresh herb has high levels of vitamin C (ascorbic acid); provide 51.4 μg or 86% of RDA per 100 g. Vitamin C is one of the powerful natural anti-oxidant help remove harmful free radicals from the body. Ascorbic acid also has immune booster, wound healing and anti-viral effects. Marjoram herb contains exceptionally high levels of beta-carotene, vitamin A, cryptoxanthin, lutein and zea-xanthin. Carotenes, xanthins and lutein are powerful flavonoid anti-oxidants. Together, these compounds help act as protective scavengers against oxygen-derived free radicals and Reactive Oxygen Species (ROS) that play a role in aging and various disease process. Vitamin A is known to have antioxidant properties and is essential for vision. It is also required for maintaining healthy mucus membranes and skin. Consumption of natural foods rich in vitamin A and carotenes are known to help body protect from lung and oral cavity cancers. Zeaxanthin, an important dietary carotenoid, selectively absorbed into the retinal macula lutea in the eyes where it is thought to provide antioxidant and protective light-filtering functions. It has proven beneficial action against Age Related Macular Disease (ARMD) especially in the elderly. Sweet marjoram is one of the richest herbal sources for vitamin K; provides about 518% of recommended daily intake. Vitamin-K has potential role in bone mass building by promoting osteotrophic activity in the bones. It also has established role in the treatment of Alzheimer's disease by limiting neuronal damage in the brain. Marjoram herb has good amount of minerals like iron, calcium, potassium, manganese, copper, zinc and magnesium. Potassium is an important component of cell and body fluids which helps control heart rate and blood pressure. Manganese is used by the body as a co-factor for the antioxidant enzyme superoxide dismutase. Its leaves are an excellent source of iron, contains 82.71 mg 100 g^{-1} (about 1034% of RDA). Iron is an important co-factor for cytochrome oxidase enzyme in the cellular metabolism. In addition, being a component of hemoglobin inside the red blood cells, it determines the oxygen carrying capacity of the blood. The essential oil is the main value added product. Marjoram oil is extracted from the fresh and dried leaves and flowering tops of the plant by steam distillation and yields 0.5-3%. The main chemical constituents are sabinene, α-terpinene, γ-terpinene, p-cymene, terpinolene, linalool, cis-sabinene hydrate, linalyl acetate, terpinen-4-ol and γ-terpineol[19].

Thyme: The herb *Thymus vulgare* Linn, Labiatae is pungent in taste and contains moisture, protein, fat, crude fibre, Ca, K, Na, Fe, P, vitamin A, B_1, B_2 and vitamin C etc. The main constituent of the oil extracted from thyme is thymol. The herb is also a rich source of many important vitamins such as B-complex vitamins, beta carotene, vitamin A, K, E, C and folic acid. Thyme provides 0.35 mg of vitamin B-6 or pyridoxine; furnishing about 27% of daily recommended intake. Pyridoxine keeps up GABA (beneficial neurotransmitter in the brain) levels in the brain, which has stress buster function. Vitamin C helps body develop resistance against infectious agents and scavenge harmful, pro-inflammatory free radicals. Vitamin A is a fat soluble vitamin and antioxidant that is required maintaining healthy mucus membranes and skin and is also essential for vision. Consumption of natural foods rich in flavonoids like vitamin A and beta-carotene helps protect from lung and oral cavity cancers.

Thymus oil has antiseptic, antispasmodic and carminative properties. It is used in mouth washes and gargles. It is also used in veterinary medicine. The leaves are said to possess laxative, stomachic and tonic properties. It has an insect repellent property. The herb is good for kidneys and eye and is blood purifiers. Thyme contains many active principles that are found to have disease preventing and health promoting properties. Thyme herb contains thymol, one of the important essential oils, which scientifically have been found to have antiseptic, anti-fungal characteristics. The other volatile oils in thyme include carvacol, borneol and geraniol. Thyme contains many flavonoids, phenolic antioxidants like zeaxanthin, lutein, pigenin, naringenin, luteolin and thymonin. Fresh thyme herb has one of the highest antioxidant levels among herbs, a total ORAC (Oxygen Radical Absorbance Capacity) value of 27426 μmol TE 100 g^{-1}. Thyme is packed with minerals and vitamins that are essential for optimum health. Its leaves are one of the richest sources of potassium, iron, calcium, manganese, magnesium and selenium. Potassium is an important component of cell and body fluids that helps controlling heart rate and blood pressure. Manganese is used by the body as a co-factor for the antioxidant enzyme, superoxide dismutase. Iron is required for red blood cell formation. Volatile oil, oleoresin and thymol are the value added products of thyme herb. Thymol (also known as 2-isopropyl-5-methylphenol, IPMP) is a

natural monoterpene phenol derivative of cymene, $C_{10}H_{14}O$, isomeric with carvacrol, found in oil of thyme and extracted from *Thymus vulgaris* as a white crystalline substance of pleasant aromatic odor andstrong antiseptic properties.

CONCLUSION

The herbs and medicinal plants are rich sources of beneficial compounds including antioxidants and components that can be used in functional foods. Comprehensive research is necessary to process plant materials into medicine that are safe for human use. There is an increasing trend to use natural drugs for health issues. There are many Institutes/Universities in India carrying out research on herbal drugs and medicinal plants. Using 'reverse pharmacological' approach, several Institutes carry out basic and clinical research on the potential health benefits of herbal drugs. Newer approaches utilizing collaborative research and modern technology in combination with established traditional health principles will yield rich dividends in the near future towards improving health.

REFERENCES

1. Sharangi, A.B., 2010. Spices Not Just Spicy: Role in Human Health with Medicinal and Therapeutic Potentalities. In: Advances in Food Science and Technology, Haghi, A.K. (Ed.). Nova Science Publishers, Hauppauge, New York.
2. Aggarwal, B.B., A.B. Kunnumakkara, K.B. Harikumar, S.T. Tharakan, B. Sung and P. Anand, 2008. Potential of spice-derived phytochemicals for cancer prevention. Planta Med., 74: 1560-1569.
3. WHO, 1992. Energy and protein requirement. Report of a Joint FAO/WHO Ad Hoc Expert Committee, World Health Organization, Geneva.
4. Ihekoronye, A.I. and P.O. Ngoddy, 1985. Food Science and Technology for the Tropics. Macmillian Publishers, London, Basignstoke, pp: 293, 311, 106, 108, 127, 130, 194-200.
5. Oselebe, H.O., C.V. Nnamani and E.O. Okporie, 2012. Ethnobotanical studies of traditional leafy vegetables and spices of Ebonyi State, Nigeria: Potentials for improved nutrition, food security and poverty reduction. Anim. Res. Int., 9: 1485-1496.
6. Oselebe, H.O., C.V. Nnamani and E.O. Okporie, 2013. Ethnobotanical survey of underutilized crops and spices of some local communities in Nigeria: Potentials for improved nutrition, food security and poverty reduction. Iosr J. Pharmacy, 3: 21-28.
7. Umesh Rudrappa, 2014. Cilantro (Coriander leaves) nutrition facts. http://www.nutrition-and-you.com/cilantro.html.
8. Saskatchewan Herb and Spice Association, 2008. Herbs for the Prairies: Coriander. http://web.archive.org/web/20070818114016/http://paridss.usask.ca/specialcrop/commodity/herb_spice/tour/coriander.html.
9. Grotto, D., 2008. 101 Foods that Could Save Your Life. Bantam Publisher, New York.
10. Opalchenova, G. and D. Obreshkova, 2003. Comparative studies on the activity of basil, an essential oil from *Ocimum basilicum* L. against multi-drug resistant clinical isolates of the genera *Staphylococcus*, *Enterococcus* and *Pseudomonas* by using different test methods. J. Microbiol. Methods, 54: 105-110.
11. Devi, S.L., S. Kannappan and C.V. Anuradha, 2007. Evaluation of *in vitro* antioxidant activity of Indian bay leaf, Cinnamomum tamala (Buch. -Ham.) T. Nees and Eberm using rat brain synaptosomes as model system. Ind. J. Exp. Biol., 45: 778-784.
12. Diaz-Maroto, M.C., M.S. Perez-Coello and M.D. Cabezudo, 2002. Effect of drying method on the volatiles in bay leaf (*Laurus nobilis* L.). Agric. Food. Chem., 50: 4520-4524.
13. Matsuda, H., T. Kagerura, I. Toguchida, H. Ueda, T. Morikawa and M. Yoshikawa, 2000. Inhibitory effects of sesquiterpenes from bay leaf on nitric oxide production in lipopolysaccharide-activated macrophages: Structure requirement and role of heat shock protein induction. Life Sci., 66: 2151-2157.
14. Broadhurst, C.L., M.M. Polansky and R.A. Anderson, 2000. Insulin-like biological activity of culinary and medicinal plant aqueous extracts *in vitro*. J. Agric. Food Chem., 48: 849-852.
15. Diet Health Club, 2011. Diet and wellness. Waterfront Media, Inc. http://www.diethealthclub.com/articles/cat/diet-and-wellness.html.
16. Del-Bano, M.J., J. Castillo, O. Benavente-Garcia, J. Lorente, R. Martin-Gill, C. Acevedo and M. Alcaraz, 2006. Radioprotective-antimutagenic effects of rosemary phenolics against chromosomal induced in human lymphocytes by gamma-rays. J. Agric. Food Chemical, 54: 2064-2068.
17. Moss, M., J. Cook, K. Wesnes and P. Duckett, 2003. Aromas of rosemary and lavender essential oils differentially affect cognition and mood in healthy adults. Intl. J. Neurosci., 113: 15-38.
18. Moss, M. and L. Oliver, 2012. Plasma 1,8-cineole correlates with cognitive performance following exposure to rosemary essential oil aroma. Therapeutic Adv. Psychopharmacol., 2: 103-113.
19. Duke, J., 2014. Dr. Duke?s phytochemical and ethnobotanical databases. Online Database. http://www.ars-grin.gov/duke/.