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Therapeutic Effects of Winter Greens

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Introduction

The health supplement industry suddenly bloomed exponentially after the first hit of pandemic in the beginning of 2020. People started exploiting antioxidants, immune boosters, health supplements, probiotics and multi-vitamins etc. to a level that a scarcity of these products was developed. It is then the importance of diet to enhance our immunity naturally was emphasized by the national and international health regulatory organizations. Research has always highlighted that consumption of green leafy vegetables and fruits can improve our immunity due to their functional components like fiber (soluble and insoluble), vitamins (Vitamin A, K, C, and B-12), minerals (iron, folic acid, calcium, potassium, phosphorous and magnesium), flavonoids, tannins and other phenolic compounds etc. Hence in this article we will discuss some of the winter greens helpful to strengthen our immunity and health.

The winter season offers several nutritious fruits and vegetables. During this time green leafy vegetables that are abundant in Indian markets starts from spinach (palak), amaranth (chaulai), fenugreek (methi), chenopodium album (bathua) to mustard leaves. These green leafy vegetables (GLVs) are not only power house of nutrients but also effective in prevention of a wide spectrum of diseases, which are proven by researchers time and again.

Spinach (Palak)

Spinach (*Spinacia oleracea*) is cultivated as an annual green leafy vegetable in India (Vazquez *et al.*, 2013). It is a rich source of mineral (Fe, Mn, zinc, and magnesium), and also contains a trace amount of vitamin E, A, C, K, folate, thiamine, pyridoxine, and riboflavin. Additionally, it has a low calorie count and is a good source of fiber. Spinach is an excellent source of plant-based iron which can be helpful in preventing anemia during pregnancy for vegetarian mothers. This leafy green contains an antioxidant known as alpha-lipoic acid which helps to maintain healthy blood glucose levels when consumed raw in forms like salad,

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sandwitches etc. (Saha, *et al.*, 2018). The antibacterial, anti-carcinogenic, and antioxidant properties of spinach are widely known (Vazquez *et al.*, 2013). Additionally, adding spinach to the diet can improve post-ischemic stroke brain damage recover, likely due to anti-apoptosis, antioxidant, and anti-inflammatory mechanisms (Wang *et al.*, 2005). Again many studies have highlighted that eating spinach more than twice a week reduced the risk of developing breast cancer and the spread of prostate cancer compared to people who didn't eat spinach (Asai *et al.*, 2004, Longnecker *et al.*, 1997).

Amaranth (chaulai)

Amaranth (*Amaranthus*) plant belongs to the family Amaranthaceae. It has 70 different species out of which, 17 are cultivated for their edible leaves (Jensen, 1978). Amaranth leaves are a good economic sources of carotenoids, essential amino acids (methionine and lysine), dietary fiber and minerals, such as Mg, Ca, K, Cu, P, Zn, iron, and manganese (Sarker *et al.*, 2020). Because of these higher Ca, and Fe levels *Amaranthus* spp. can be used as a source of biogenic calcium and iron for vegetarians. It is also abundant in several distinct pigments, such as carotenoids, chlorophylls, amaranthine, anthocyanins, betalains, betaxanthins, and betacyanins (Sarker *et al.*, 2018a). Amaranth have seven times higher content of beta-carotene than in tomatoes and thus help to treat anaemia. The presence of natural antioxidants such as vitamin C, beta-carotene, favonoids, and phenolic acids in this green suggests its potential role against free-radical associated oxidative damage and related degenerative diseases involving metabolic stress, genotoxicity and cytotoxicity. Intervention study conducted on postmenopausal women reported that amaranth leaf powder consumption, can increase serum retinol, serum ascorbic acid, haemoglobin, SOD, and can significantly decrease fasting blood glucose levels in postmenopausal women, (Kushwaha *et al.*, 2014). Similarly intervention with sun-dried amaranth leaf improved bioavailability of serum β-carotene and retinol levels, while improving baseline hemoglobin levels among preschool children; reflecting its utility in fighting vitamin-A deficiency and anaemia, among children and lactating mothers in developing countries. Other than the above cited properties amaranth possesses health benefits like- anti-diabetic, anti-inflammatory, anti-cancerous, gastroprotective, anti microbial, antinoceceptive, cardio- protective, and hepatoprotective etc. (Peter & Gandhi, 2017). Hence amaranth leave and stems are a must to include GLV in our winter diets.

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Fenugreek leaves (Methi)

The tender leaves and seeds of fenugreek (*Trigonella foenumgraecum*) are used as a spice in Indian curries and in many other therapeutic formulations. Fresh fenugreek leaves are rich source of ascorbic acid, β-carotene, calcium, iron and zinc. Methi leaves are a powerful anti-diabetic meal that improves glycosylated haemoglobin levels, lowers hyperglycemia, raises insulin levels, and boosts liver glycogen content, among other health benefits. These leaves have the ability to change the levels of essential carbohydrate metabolic enzymes that are brought on by diabete and to reverse the lipid buildup in the serum, liver, heart, and kidney (Devi, *et al.*, 2003, Annida, *et al.*, 2004). It is also effective in reduction of oxidative stress as by decreasing the levels of thiobarbituric acid reactive substances and concomitant increase in levels of reduced glutathione and activities of catalase and superoxide dismutase in liver, heart, and kidney (Annida, *et al.*, 2005).

Mustard leaves (Sarson saag)

Mustard (*Brassica juncea*) is a cruciferous vegetable used as a food, spice, and folk medicine. Mustard greens contain a large amounts of dietary fiber, chlorophylls, β-carotene and ascorbic acid, and certain bioactive components such as glucosinolates (sinigrin) and their degradation products and polyphenols (flavonoids and anthocyanins), (Kim *et al.*, 2007). Additionally, mustard greens contain calcium, iron, potassium, riboflavin (vitamin B2), magnesium, and thiamine (vitamin B1), as well as small amounts of zinc, selenium, phosphorus, niacin (vitamin B3), and folate. According to research by Jie et al. (2014), the main glucosinolate sinigrin substantially reduces the growth of liver cancer cells and prevents the development of tongue cancer in male ACI/N rats (Tanaka *et al.*, 1992). The data that is currently available indicates that mustard green also has antibacterial, antidepressant, anti-inflammatory, and antioxidant properties. Mustard extract has also been demonstrated to protect against renal ischemia injury, lower plasma cholesterol, enhance high-density lipoprotein cholesterol, and inhibit angiotensin-converting enzymes.

Bathua saag

Bathua/*Chenopodium album* is a wild edible weed cultivated as a leafy vegetable in India. It is commonly consumed as raw in salads or cooked as traditional recipes in different states. *C. album* leaves are rich in proteins, fiber, iron, calcium, vitamins (A & C), carotenoids and essential amino-acids like lysine, leucine, and isoleucine. Bathua is

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considered as mineral rich green because of its higher concentration of some pivotal minerals like sodium, zinc, nitrogen, phosphorus, potassium, calcium, magnesium, iron and manganese. Due to its flavonoid (caempferol, quercetin, and isoramnetin) and carotenoid contents it acts as a potent antioxidant that can scavenge free radicals like hydroxyl, superoxide, hydrogen peroxide, and nitric oxide. C. album is useful in curing anorexia, cough, dysentery, diarrhoea, piles, inflammation and also helps in relieving pain. Again studies have reported that it is an anti breast cancer bioagent that reportedly prevents progression of cell growth and enhances cell toxicity in human breast cancer cell lines (Khoobchandani *et al*., 2009). Also Bathua is a strong anti-fungal and a strong antibacterial agent against *Staphylococcus aureus* and *Pseudomonas aeruginosa* (Singh *et al.*, 2011). Intake of nutrient- and phytochemical-rich vegetables, such as C. album, results in a better immunological response than consumption of vegetables high in fiber but low in nutritional or phytochemical content, such as common cabbage. Because of its varied amino acid levels, C. album when added to grains and legumes would result in a nutritious diet suitable for all age groups. Hence, it should be encouraged to include GLVs like bathua in diets to boost our nutritional status and strengthen immunological systems. It is best to use this plant as a food or medicinal ingredient during the winter (especially in February), because it has a good taste and is rich in bioactive phenolics with high antioxidant properties (Poonia & Upadhayay, 2015).

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