



## A REVIEW ON SOUTH INDIAN EDIBLE LEAFY VEGETABLES

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## ABSTRACT

The overlapping nutritional and medicinal benefits of green leafy vegetables provide a better support for human wellbeing. There are hundreds of edible herbs which are used in day to day kitchen in different forms. The usages of green leafy vegetables are limited to a specific geographical location. In South India, several green leafy vegetables like *Allmania nodiflora*, *Alternanthera sessilis*, *Amaranthus caudatus*, *Amaranthus cruentus*, *Amaranthus tricolor*, *Amaranthus viridis*, *Basella rubra*, *Boerhavia diffusa*, *Brassica juncea*, *Cassia italic*, *Celosia argentea*, *Chenopodium album*, *Cleome gynandra*, *Coriandrum sativum*, *Cucurbita maxima Duchesne*, *Digera muricata*, *Hibiscus cannabinus*, *Hibiscussabdariffa*, *Hygrophila auriculata*, *Hygrophila auriculata*, *Menthaspicata*, *Mirabilis jalapa*, *Moring oleifera*, *Murraya koenigii*, *Portulaca pilosa*, *Portulaca quadrifida*, *Rumex vesicarius*, *Sesbania grandiflora*, *Spinacia oleracea*, *Tamarindus indica*, *Trigonella foenum-graecum* are used. The chemical constituents present in green leafy vegetables are of great pharmacological or medicinal importance. Phytonutrients present in green leafy vegetables produce many common health benefits like protection from eye problems, oxidative stress, iron deficiency etc., Consumption of green leafy foods benefits human health by improving nutritional status and reducing risks of specific diseases like diabetes, cancer and hepatotoxicity. The present study is on reviewing edible leafy vegetables available in South India and their pharmacological benefits, essential in this modern world to support the benefits of their consumption.

**Keywords:** Green leafy vegetables, Pharmacological activities, Health benefits

## INTRODUCTION:

Green leafy vegetables are used since ancient periods as source of food as they contain many nutrients and minerals which are helpful in maintaining human health. The health and nutrition of expanding world populations are major upcoming challenges especially in developing countries. Plant foods are sources of energy, micronutrients and nutrients essential to health, in addition to phytochemicals with further health benefits including glycemic control, immuno-stimulation or antioxidant activity<sup>1,2</sup>. Man has tremendous knowledge on edible plants since before civilization. Traditional vegetables are valuable sources of nutrition in rural areas where exotic sp. are not available. Leafy vegetables hold an important place in well-balanced diets.

Green leafy vegetables are the cheapest of all the vegetables within the reach of poor man, being richest in their nutritional value<sup>3</sup>. The lack of knowledge especially on the nutritive value of these green leafy vegetables among the public in general is the main drawback in their lower consumption.

Ethno botanists elucidate the overlapping roles of plants used have both nutritional and therapeutic context to promote health and respond to disease<sup>4</sup>. The ingestion of phytochemicals found in traditional foods has direct implications for the well-being of people. Plants used for their medicinal attributes may contain phytochemicals with pharmacological and physiological activities. Green leafy vegetables (GLV), represent an important proportion of foods with medicinal value. Limited information is available on the medicinal properties associated with leafy vegetable consumption in South India.

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Moreover, most ethno-botanical studies on leafy vegetables concentrate on wild and weedy species and do not take cultivated and managed species (in home gardens and pots, neighborhood trees, protected in fields) into account<sup>5</sup>. By documenting the traditional knowledge of South Indian green leafy vegetable foods and by describing their importance in terms of consumption, we highlight health, nutrition and cultivation relationships with potential impacts.

Green leafy vegetables (GLV), either locally gathered or cultivated are diversified sources of nutrients and phytochemicals. GLV are sources of nutrients and micronutrients of great interest to nutritionists such as iron and vitamin C, which are lacking from staple foods. In addition, GLV are primary sources of lutein and zeaxanthine<sup>6,7</sup>, which have been identified as

important eye protective agents. Green leafy vegetables (GLV) consumption has been reported to contribute to lowering the risk of age-related cataract. These are known to contain antioxidants necessary in neutralizing free radicals which are known human chemical hazards<sup>8</sup>. Green leafy vegetables have been identified as good sources of natural antioxidants such as tocopherols, vitamin C and polyphenols which are responsible for maintaining good health and protect against coronary heart diseases and cancer. GLV are the major sources of lutein and, in developing countries where access to animal food is restricted, contribute substantially to fighting retinol deficiencies by being rich sources of the provitamine A,  $\beta$ -carotene, not withstanding bioavailability issues.

**Table 1:** List of Green leafy vegetables of south-India and their Pharmacological and Health Benefits

S. No	Botanical Name & ( Family)	Pharmacological & Health Benefits
1	<i>Allmanianodiflora</i> L.(Amaranthaceae) <sup>9</sup>	Anti-diabetic, Hypolipidemic. Nutritive, appetizer
2	<i>Alternanthera sessilis</i> L.(Amaranthaceae) <sup>10,47</sup>	Nootropic, Anti-oxidant, Hepato-protective. Nutritive, eye health, appetizer, blood tonic
3	<i>Amaranthus caudatus</i> L. (Amaranthaceae) <sup>11</sup>	Anti-microbial, anti-oxidant. Nutritive, laxative, blood tonic.
4	<i>Amaranthus cruentus</i> L.(Amaranthaceae) <sup>12</sup>	Anti-oxidant. Nutritive, blood tonic
5	<i>Amaranthus tricolor</i> L.(Amaranthaceae) <sup>13</sup>	Hepato-protective Nutritive, blood tonic
6	<i>Amaranthus viridis</i> L. (Amaranthaceae) <sup>14</sup>	Anti-nociceptive, anti-pyretic. Blood tonic
7	<i>Basellarubra</i> L.(Basellaceae) <sup>15</sup>	Anti-diabetic, Provides beneficial hematological parameters.
8	<i>Boerhaviadiffusa</i> L.(Nyctaginaceae) <sup>16</sup>	Anti-nociceptive, Hepato-protective, Anti-oxidant, Anti-bacterial, Nutritive
9	<i>Brassica juncea</i> L.(Brassicaceae) <sup>17</sup>	Analgesic, Hypoglycemic, Wound healing activity, Nutritive, relieves joint pain
10	<i>Cassia italica</i> (Mill.) (Caesalpinaceae) <sup>18</sup>	Anti-oxidant, Nutritive
11	<i>Celosia argentea</i> L.(Amaranthaceae) <sup>19,20</sup>	Anti-oxidant, Anti-diarrhoeal, Anti-diabetic, Nutritive, increase bile juice, blood tonic
12	<i>Chenopodium album</i> L.(Chenopodiaceae) <sup>21,22</sup>	Anti-ulcer, anti-nociceptive and Hepato-protective. Nutritive
13	<i>Cleome gynandra</i> L.(Cleomaceae) <sup>23,24</sup>	Anti-oxidant, Anti-inflammatory. Relieves joint pain
14	<i>Coriandrum sativum</i> L.(Apiaceae) <sup>25</sup>	Anti-anxiety activity. Used to increase stamina, it is also recommended to use for Vitamin Deficiency and Disorders.
15	<i>Cucurbita maxima</i> D. (Cucurbitaceae) <sup>26,48</sup>	Anti-cancer, Anti-diabetic and Hepato-protective. Nutritive
16	<i>Digeramuricata</i> L. Mart. (Amaranthaceae) <sup>27</sup>	Anti-microbial, Anti-oxidant. Nutritive
17	<i>Hibiscus cannabinus</i> L.(Malvaceae) <sup>28</sup>	Hypo-cholesterolemic and Anti-oxidant. Blood tonic
18	<i>Hibiscus sabdariffa</i> L.(Malvaceae) <sup>29</sup>	Anti-nociceptive, Anti-pyretic, Anti-oxidant. Nutritive
19	<i>Hygrophila auriculata</i> (Schum.) (Acanthaceae) <sup>30</sup>	Hypoglycemic, Hematinic, Anti-oxidant and Hepato-protective. Nutritive, Provides body coolness.
20	<i>Menthaspicata</i> L.(Lamiaceae) <sup>31</sup>	Anti-inflammatory and Anti-oxidant. Nutritive, Mint helps in eliminating toxins from the body. Crushed mint leaves helps in whitening teeth and combat bad breath.
21	<i>Mirabilis jalapa</i> L. (Nyctaginaceae) <sup>32</sup>	Anti-bacterial and Anti-oxidant. Nutritive
22	<i>Moringaoleifera</i> L.(Moringaceae) <sup>33</sup>	Anti-hyperlipidemia, Anti-cancer, Anti-microbial, Anti-oxidant. Nutritive laxative, Relieves joint pain, maintains eye health, blood tonic
23	<i>Murrayakoenigii</i> L.Spreng (Rutaceae) <sup>34</sup>	Anti-ulcer, Anti-microbial, Cytotoxic activity, Phagocytic activity. Curry leaves juice keeps body cool. For children it will be good for bones and eyes. It will reduce depression and supply calcium to brain.
24	<i>Portulacacapillosa</i> L. (Portulacaceae) <sup>36</sup>	Anti-inflammatory, Hypoglycemic. Nutritive
25	<i>Portulacacadrifida</i> L.(Portulacaceae) <sup>35</sup>	Anti-ulcer, Nutritive
26	<i>Rumex vesicarius</i> L.(Polygonaceae) <sup>38,39</sup>	Anti-fungal, Diuretic activity. Nutritive, relieves pain of eye infection.
27	<i>Sesbaniagrandiflora</i> (L.) Poir. (Fabaceae) <sup>40</sup>	Anti-convulsant activity, Relieves joint pain
28	<i>Spinaciaoleracea</i> L.(Amaranthaceae) <sup>41</sup>	Anti-inflammatory activity, Nutritive, blood tonic
29	<i>Tamarindusindica</i> L.(Caesalpinaceae) <sup>42</sup>	Anti-microbial and Anti-helminthic activity Provides Coolness to body
30	<i>Trigonellafoenum-graecum</i> L.(Fabaceae) <sup>43</sup>	Anti-diabetic, anti-cancer, anti-inflammatory, anti-oxidant, Nutritive, blood tonic,

**Table 2:** Green leafy vegetables – their Vernacular names, Ecological area of availability and their Chemical constituents

Botanical name	Vernacular names	Ecological area of availability	Chemical constituents
<i>Allmaniano diflora</i> L <sup>9</sup> .	<b>Telugu:</b> Errabadhaku, Gurugaku. <b>Tamil:</b> Kumattikkirai, <b>English:</b> Node flower Allmania. <b>Malayalam:</b> Pee-coipa, Pee-tardavel. <b>Kannada:</b> Hasirubudde soppu,	Groundnut, tomato, green chillies and other fields, ponds as weed	Alkaloids, glycosides, flavonoids, saponins, tannins, carbohydrate and essential oils, steroids, carbohydrates, carotenoids, anthocyanins
<i>Alternanthera sessilis</i> L <sup>10,47</sup> .	<b>Telugu:</b> Ponnagantaku. <b>English:</b> Sessile Joy weed and Dwarf Copper leaf.	Ponds and fields as weed	Proteins, fat, vitamin A, vitamin C, vitamin E, vitamin K, vitamin B9 (folic acid), riboflavin, niacin, thiamine and minerals such as calcium, magnesium iron, Kaempferol at a Basella saponins, amino acid such as arginine, leucine, isoleucine, lysine, threonine and tryptophan, peptide, phenols
<i>Amaranthus caudatus</i> L <sup>11</sup> .	<b>Telugu:</b> Koyagura. <b>English:</b> love-lies bleeding, Pendant Amaranth, Tassel flower, Velvet flower, Foxtail amaranth	Tomato, green chillies, groundnut and other fields.	Glycosides. Saponins, phenols, proteins and amino acids.
<i>Amaranthus cruentus</i> L <sup>12</sup> .	<b>Telugu:</b> Thotaku. <b>English:</b> Blood Amaranth, Red amaranth, Purple Amaranth, Prince's feather and Mexican grain Amaranth. Marati: Shravanimaath.	Tomato, other fields	glycosides, flavonoids, saponins, tannins, carbohydrate and essential oils,
<i>Amaranthus tricolor</i> L <sup>13</sup> .	<b>Telugu:</b> SIRRaku, <b>English:</b> Jacob's coat <b>Malayalam:</b> Bayammerah, Bayamkadong	Tomato, groundnut, ragi and other fields	Proteins, fat, vitamin A, vitamin C, vitamin E, vitamin K, vitamin B9 (folic acid), riboflavin, niacin, thiamine and minerals such as calcium, magnesium iron, Kaempferol at a basella saponins, amino acid such as arginine, leucine, isoleucine, lysine, threonine and tryptophan, peptide, phenols
<i>Amaranthus viridis</i> L <sup>14</sup> .	<b>Telugu:</b> Dantaku, English: Pig weed, <b>Bengali :</b> Marissag, shaknatey, <b>Hindi :</b> Jangalichaulai	Tomato, groundnut, green chillies and other fields	Carotenoids, ascorbic acid, flavonoids and phenolic acids
<i>Basella rubra</i> L <sup>15</sup> .	<b>Telugu:</b> Bachalaku, <b>English:</b> Ceylon Spinach, Indian Saag <b>Hindi:</b> Poi, Saag. <b>Malayalam:</b> Remayong,	Fields	Calcium, iron, vitamins A, B, and C saponins A, B, C, and D, oleanane-type triterpenes oligo glycosides, together with betavulgaroside 1, spinacoside C and momordinsIIb and lic, $\beta$ -carotene, small amounts of $\alpha$ -carotene s 4-coumaroyl and feruloyl derivatives
<i>Boerhavia diffusa</i> L <sup>16</sup> .	<b>Telugu:</b> Atikimavidaku, Punarnava. <b>Hindi:</b> Gadha-cand, Shothagn. <b>English:</b> Hogweed, Horse purslane, Pigweed. <b>Sanskrit:</b> Punarnava, Shothagn <b>Kannada:</b> Omme. Tamil: Mukkurtaikkoti. <b>Malayalam:</b> Thazhuthama. <b>Marathi:</b> Gheto, <b>Bengali:</b> Punarmova	Tomato, groundnut and other fields	Alkaloids punarnavine, rotenoids (boeravinones A-F), amino acids, lignans (liriodendrons), $\beta$ sitosterols and tetracosanoic, esacosanoic, stearic and ursolic acids. rotenoids (known as boeravinones (A - F) Punarnavoside, a phenolic glycoside, 11,12 C-methyl flavone liriodendrin and syringaresinolmono- $\beta$ -D-glycoside, hypoxanthine 9-Larabinose. 15 dihydro iso furoxanthone-borhavine, phytosterols, punarnavine and punernavoside, potassium nitrate, ursolicacid.fatty acids and allantoinboerhavin and boerhavic acid, aegeline, agelinine, rutine, sterol, tannins, flavonoids, quercetin, volatile oils.
<i>Brassica juncea</i> L <sup>17</sup> .	<b>Telugu:</b> Avalaku, Sassaku. <b>English:</b> Indian Mustard.	Groundnut fields	Erucic acid, saponins, phenols, fatty acids and amino acids.
<i>Cassia italica</i> (Mill.) Spreng <sup>18</sup> .	<b>Telugu:</b> Nelathangedu, <b>English:</b> Italian senna, Port royal senna.	Hills	Ascorbic acid, saponins, proteins, amino acids and minerals.
<i>Celosia argentea</i> L <sup>19,20</sup> .	<b>Telugu:</b> Gurugaku, <b>English:</b> Feather cock's comb, Red spinach, Silver cock's comb.	Groundnut, tomato, ragi fields.	Acetic acid, tartaric acid, malic acid and citric acid, solanine, Alpha, $\beta$ , gamachaconines, Minerals, protein and ascorbic acid, oxalic acid.
<i>Chenopodium album</i> L <sup>21,22</sup> .	<b>Telugu:</b> Chakrantaku. <b>English:</b> Lamb's-quarters, Melde, Goose foot and fat-hen, <b>Hindi:</b> Bathua Orbathuwa	Tomato, green chillies and other fields	Alkaloids, apo carotenoids, xyloside, Limonene (23.2 %), $\alpha$ -terpinyl acetate (13.7 %), $\alpha$ - terpinene (12.3 %) and cisascaridole (12.2 %)
<i>Cleome gynandra</i> L <sup>23,24</sup> .	<b>Telugu:</b> Gabbettaku. <b>Sanskrit:</b> Ajagandha, <b>Marathi:</b> Tilavan,	Tomato, groundnut, other fields	Alkaloids, glycosides, flavonoids, saponins, tannins, carbohydrate and essential oils, steroids, carbohydrates, carotenoids, anthocyanins

	<b>English:</b> Shona cabbage or African cabbage.		
<i>Coriandrum sativum</i> L <sup>25</sup> .	<b>Telugu:</b> Kothimeera. <b>Sanskrit:</b> Dhanayaka, Kusthumbari. <b>English:</b> Coriander, Collender, Chinese Parsley. <b>Hindi:</b> Dhania, Dhanya	Commercial cultivation	S-(+)-linalool, mono terpenes, hydrocarbons viz. $\alpha$ -pinene, limpnene, $\gamma$ - terpinene, p-cymene, borneol, citronellol, camphor, geraniol, geraniol acetate, heterocyclic components like pyrazine, pyridine, thiazole, furan and tetra hydrofuran derivatives, iso coumarins, coriandrin, dihydro coriandrin, coriandrone A-E, flavonoids, pthalides, neochidilide, digustilide phenolic acids and sterols.
<i>Cucurbita maxima</i> Duchesne <sup>26,48</sup>	<b>Telugu:</b> Gummadaku. <b>English:</b> Pumpkin, Winter squash.	Fields	Tannins, saponins, polyphenolics, alkaloids, lignans, essential oils and steroids
<i>Digera muricata</i> L. Mart <sup>27</sup>	<b>Telugu:</b> Chenchulaku. <b>Hindi :</b> Latmahuria, Lesua <b>Sanskrit :</b> Aranya, Aranyavastuka, Kunanjara, Kuranjara <b>English:</b> False amaranth. <b>Tamil :</b> ToyaKeerai, KaatuKeerai <b>Kannada:</b> Chenchalisoppu <b>Marathi :</b> Gitana, Getna	Groundnut, tomato and other fields	Phenols, flavonoids, glycosides, tannins, terpenoids and minimum for saponins.
<i>Hibiscus cannabinus</i> L <sup>28</sup> .	<b>Telugu:</b> Gongura. <b>English:</b> Kenaf.	Groundnut, tomato, green chillies and other fields.	Tannins, saponins, polyphenolics, alkaloids, lignans, essential oils and steroids
<i>Hibiscus sabdariffa</i> L <sup>29</sup> .	<b>Telugu:</b> Bendlaku. <b>English:</b> Indian Sorrel, Red sorrel, Jasmine Sorrel.	Near forests	Ascorbic acid (Vitamin C) and tocopherol (Vitamin E), flavonoids, polyphenols.
<i>Hygrophila auriculata</i> (Schum.) <sup>30</sup>	<b>Telugu:</b> Gorimitaku. <b>Hindi:</b> Gokshur. <b>Sanskrit:</b> Chattraka, Bhadrakanta. <b>English:</b> Marsh Barbal.	Ponds	Minerals, protein and ascorbic acid, oxalic acid ,tocopherol and lipids. Ca,Cu , Fe, Mg, K, Na, Zn, Lipids, Ascorbic acid, Tocopherol
<i>Mentha spicata</i> L <sup>31</sup> .	<b>Telugu:</b> Pudina. <b>English:</b> Spearmint.	Commercial cultivation	Phenols, flavonoids, glycosides, tannins, terpenoids and minimum for saponins.
<i>Mirabilis jalapa</i> L <sup>32</sup> .	<b>Telugu:</b> Suryakantamaku. <b>English:</b> Clavillia, Four-o'clocks, Jalap, Maravilla	Gardens	Alkaloids, glycosides, flavonoids, saponins, tannins, carbohydrate and essential oils, steroids, carbohydrates, carotenoids, anthocyanins
<i>Moringa oleifera</i> L <sup>33</sup> .	<b>Telugu:</b> Munagaku. <b>English:</b> Horsh-radish tree <b>Malayalam:</b> Kacangkelo,	Gardens and fields.	4-(4'-O-acetyl- $\alpha$ -L-rhamnopyranosyloxy) benzylisothiocyanate, 4-( $\alpha$ -L-rhamnopyranosyloxy) benzyl isothiocyanate, niazimicin, pterygospermin, benzylisothiocyanate and 4-( $\alpha$ -L-rhamnopyranosyloxy) benzyl glucosinolate carotenoids (including $\beta$ -carotene or pro-vitamin A)
<i>Murraya koenigii</i> L.Spreng <sup>34</sup>	<b>Telugu:</b> Karivepaku. <b>English:</b> Curry leaf tree. <b>Sanskrit:</b> Kalasakh, Kaidaryah,	Gardens	Alkaloid, volatile oil, Glycozoline, Xanthotoxin and Sesquiterpine
<i>Portulaca oleracea</i> L <sup>35</sup> .	<b>Telugu:</b> Pappaku, Pavillaku. <b>English:</b> Purslane, Verdolaga, Pigweed, Little Hogweed, or Pursley	Groundnut and other fields	Omega-3 fatty acids, gallotannins, kaempferol, quercetin, apigenin, $\alpha$ -tocopherols, ascorbic acid and glutathione, free oxalic acids, $\beta$ -Carotene, omega-3 fatty acids, coumarins, flavonoids, mono terpene glycoside and anthraquinone glycosides
<i>Portulaca pilosa</i> L <sup>36</sup> .	<b>Telugu:</b> Chavatapayilaku. <b>English:</b> Akulikuli; Hairy Portulaca	Near ponds and sandy lands	Alkaloids, glycosides, flavonoids, saponins, tannins, carbohydrate and essential oils, steroids, carbohydrates, carotenoids, anthocyanins
<i>Portulaca quadrifida</i> L <sup>37</sup> .	<b>Telugu:</b> Esukapayilaku. <b>English:</b> Chicken weed	Fields and sandy waste lands	Alkaloids, astragaline, brevifolin, carboxylic acids, corilagin, cymene, saponins
<i>Rumex vesicarius</i> L <sup>38,39</sup> .	<b>Telugu:</b> Chukkaku. <b>English:</b> Bladder Dock	Commercially grown	Minerals, protein and ascorbic acid, oxalic acid, tocopherol and lipids. Ca, Cu , Fe, Mg, K, Na, Zn, Lipids, Ascorbic acid, Tocopherol
<i>Sesbania grandiflora</i> L.Poir. <sup>40</sup>	<b>Telugu:</b> Avisaku. <b>English:</b> West Indian Pea, White Dragon tree <b>Bengali:</b> Augusta, Bagphal, Bak, Bake	Commercial cultivation & gardens	Acetic acid, tartaric acid, malic acid and citric acid, solanine, Alpha, $\beta$ , gamachaonines, and alpha, beta gamma solanines Solanidine, Solanine, beta 2-solamargine, solamargine and d-galactotigonin. five non-saponin namely 6- methoxyhydroxy coumarin, syringaresinol-4-O-beta-D-glucopyranoside, pinosresinol-4-O-beta-D-glucopyranoside, 3, 4-dihydroxy benzoic acid (IV), p-hydroxy benzoic acid and 3-methoxy-4-hydroxybenzoic acid
<i>Spinacia oleracea</i> L <sup>41</sup> .	<b>Telugu:</b> Palakura. <b>English:</b> Winter Spinach.	Commercially grown	Tannins, saponins, polyphenolics, alkaloids, lignans, essential oils and steroids
<i>Tamarindus</i>	<b>Telugu:</b> Chintaku.	Forest & hilly	Alkaloids, glycosides, flavonoids, saponins, tannins,

<i>indica</i> L <sup>42</sup> .	<b>Tamil:</b> Amilam, Puli, Puliymaram. <b>Hindi:</b> Amli, Anbli, Imlı, Tamrul. <b>English:</b> Tamarind.	areas	carbohydrate and essential oils, steroids, carbohydrates, carotenoids, anthocyanins
<i>Trigonella foenum-graecum</i> L <sup>43</sup> .	<b>Telugu:</b> Menthaku. <b>English:</b> Fenugreek.	Commercially grown	Amino acid, fatty acid, vitamins, saponins, folic acid, disogenin, gitogenin, neogitogenin, homorientins aponaretin, neogigogenin, and trigogenin, 4, 5[delta]-cadinene(27.6%), [α]-cadinol, palmitic acid, linoleic acid oleic acid and stearic acid, hexanal, 2-methyl-2-butenal, 3-octen-2-one, flavonoids, saponins, polysaccharides, fixed oils: trigonelline, choline, Quercetin, galactomannan, polysaccharides.

### MEDICINAL IMPORTANCE OF GREEN LEAFY VEGETABLES

Green leafy vegetables (GLV) offer a cheap but rich source of a number of micronutrients and other phytochemicals having antioxidant properties. The potential of 30 GLV in the raw and cooked form as natural antioxidant supplements for vegetarian diets was assessed<sup>44</sup>. They are the rich sources of pro-vitamin A, vitamin C, folic acid and minerals like calcium, iron, phosphorus, sodium and potassium. Free radicals are generated under a number of conditions such as drinking alcohol, smoking and exercise. They are, however, often produced in normal cellular metabolism due to oxidation of bio-molecules for the production of energy to fuel biological processes. However, the uncontrolled production of oxygen-derived free radicals is involved in the onset of many diseases such as cancer, rheumatoid arthritis, cirrhosis and arteriosclerosis as well as in degenerative processes associated with ageing. Green leafy vegetables are known to contain antioxidants necessary in neutralizing free radicals which are known human chemical hazards<sup>45</sup>.

Signs of blood deficiency include vertigo, blurred vision or spots before the eyes ('floaters'), fatigue and lassitude, insomnia, poor muscle tone, muscle tightness and cramping, numbness in the extremities, pallor, dry skin and hair, pale tongue (also lips and nail beds), poor memory, PMS scanty, difficult or no menstrual periods, a persistent feeling of cold, heart palpitations, and anxiety / nervousness<sup>46</sup>. Note that not all of these symptoms need to be present for the diagnosis of Blood Deficiency to be accurate; often, groups of these symptoms will appear simultaneously. Iron or blood deficiency causes anemia which is a nutritional disorder afflicting large population groups in the world. It is prevalent amongst vulnerable infants, adolescent girls and pregnant women particularly in populations subsisting largely on

plant food sources. Anemia is not having enough iron in the blood. Iron is important since it carries oxygen through the blood to organs, helps produce red blood cells and helps in general health. Green leafy vegetables help increase iron in the diet and in the blood.

The biochemical analysis of lutein and zeaxanthine content of Green Leafy Vegetables will improve the understanding of the causal pathway, if any, between GLV consumption and cataract prevention<sup>10</sup>. Age-related cataract is responsible for more than 40% of the world's blindness and occurs principally in developing countries. 44% of blindness is attributable to cataract. Common Compounds and minerals present in green leafy vegetables that avoid eye problems are Ascorbic acid (vitamin C), Tocopherol (Vitamin E), Vitamin A (retinol and provitamin A), Lutein and zeaxanthine, Lycopene, Folate, Riboflavin, Niacin, Molybdenum, Selenium and Zinc. Hence it is evident that diversity of Green leafy vegetable consumption is related with age-related cataract prevention<sup>11</sup>. A majority of pharmacological studies on consumption of green leafy vegetables reported that the leafy vegetable intake is good for health; it acts as a blood tonic, joint pain reliever and helps in eye problem prevention. Xerophthalmia caused by a severe vitamin A deficiency is described by pathologic dryness of the conjunctiva and cornea. The conjunctiva becomes dry, thick and wrinkled. If untreated, it can lead to corneal ulceration and ultimately to blindness as a result of corneal damage. This eye problem of xerophthalmia is treated by consumption of Green Leafy Vegetables which are rich in vitamin A content.

### DISCUSSION:

Consumption of herbs is as old as human race itself. Green leafy vegetables represent an excellent component of the habitual diet in the tropical and temperate countries. Green leafy

vegetables in our country are known to be the most inexpensive source of several vital nutrients. Leafy vegetables are appreciated because they not only supply the protective nutrients and add variety to a monotonous diet, but also have an alternative taste, pleasing appearance and aroma<sup>20</sup>. Oxidative damage being an important feature of age-related cataract. The xanthophyll, lutein and zeaxanthine primarily found in GLV have been associated with preventive properties. Green leafy vegetables are also used to combat the problem of Iron deficiency or anemia which may cause many symptoms like vertigo, blurred vision or spots before the eyes ('floaters'), fatigue and lassitude, insomnia, poor muscle tone, muscle tightness and cramping, numbness in the extremities, pallor, dry skin and hair, pale tongue (also lips and nail beds), poor memory, PMS, scanty, difficult or no menstrual periods, a persistent feeling of cold, heart palpitations, and anxiety/nervousness<sup>27</sup>.

Free radicals accumulate when the mechanism of antioxidant protection becomes unbalanced. However, available evidence indicates that reparative processes do not fully eliminate free radical-induced damage of biological macromolecules<sup>27</sup>. Thus, a more effective way is the prevention of oxidant induced damage by reducing the levels of reactive chemical species with unpaired electrons (free radicals) to the barest minimum and reinforcing natural antioxidant action<sup>29</sup>. Along with common health benefits like protection from eye problems, oxidative damage, Iron deficiency the Green leafy vegetables contain chemical constituents which produce beneficial pharmacological activities like anti-diabetic activity against streptozotocin induced diabetes in rats, anti-cancer activity, anti-microbial activity, anti-inflammatory activity and hepato-protective nature.

#### CONCLUSION:

Green leafy vegetables found in south India, used as a source of food have many health benefits like protection from eye problems, iron deficiency and oxidative damage. They are most inexpensive sources of several phytonutrients like pro-vitamin A, vitamin C, folic acid and minerals like calcium, iron, phosphorus, sodium and potassium. Green leafy vegetables are of great medical importance due

to the health benefits produced. Green Leafy Vegetables contain several chemical constituents which are pharmacologically important as they are been proved to be beneficial in many specific diseases like cancer, diabetes, hepatotoxicity, nephrotoxicity and many microbial attacks.

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