

A critical review on importance of green 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 central 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*, *Tamarindusindica*, *Trigonella foenum-graecu* 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

Key Words : Vegetables, Green leafy vegetables, Health benefits, Medicinal properties, Raipur

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. 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. 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 low consumption. 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.

Cite this Article: Banerjee, S., Joglekar, A. and Mishra, M. (2015). A critical review on importance of green leafy vegetables. *Internat. J. Appl. Home Sci.*, 2 (3&4) : 124-132.

Table 1: List of green leafy vegetables of and their pharmacological and health benefits		
Sr. No.	Botanical name and (Family)	Pharmacological and health benefits
1.	<i>Allmanianodiflora</i> L.(Amaranthaceae)9	Anti-diabetic, Hypolipidemic. Nutritive, appetizer
2.	<i>Alternantherasessilis</i> L.(Amaranthaceae) 10,47	Nootropic, Anti-oxidant, Hepato-protective. Nutritive, eye health, appetizer, blood tonic
3.	<i>Amaranthuscaudatus</i> L. (Amaranthaceae)11	Anti-microbial, anti-oxidant. Nutritive, laxative, blood tonic.
4.	<i>Amaranthuscruentus</i> L.(Amaranthaceae)12	Anti-oxidant, Nutritive, blood tonic
5.	<i>Amaranthus tricolor</i> L.(Amaranthaceae)13	Hepato-protective Nutritive, blood tonic
6.	<i>Amaranthusviridis</i> L. (Amaranthaceae)14	Anti-nociceptive, anti-pyretic. Blood tonic
7.	<i>Basellarubra</i> L.(Basellaceae)15	Anti-diabetic, Provides beneficial hematological parameters.
8.	<i>Boerhaviadiffusa</i> L.(Nyctaginaceae)16	Anti-nociceptive, Hepato-protective, Anti-oxidant, Anti-bacterial, Nutritive
9.	<i>Brassica juncea</i> L. (Brassicaceae)17	Analgesic, Hypoglycemic, Wound healing activity, Nutritive, relieves joint pain
10.	<i>Cassia italica</i> (Mill.) (Caesalpinaceae)18	Anti-oxidant, Nutritive
11.	<i>Celosia argentea</i> L.(Amaranthaceae)19,20	Anti-oxidant, Anti-diarrhoeal, Anti-diabetic, Nutritive, increase bile juice, blood tonic
12.	<i>Chenopodium album</i> L.(Chenopodiaceae)21,22	Anti-ulcer, anti-nociceptive and Hepato-protective. Nutritive
13.	<i>Cleome gynandra</i> L.(Cleomaceae)23,24	Anti-oxidant, Anti-inflammatory. Relieves joint pain
14.	<i>Coriandrum sativum</i> L.(Apiaceae)25	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)26,48	Anti-cancer, Anti-diabetic and Hepato-protective. Nutritive
16.	<i>Digeramuricata</i> L. Mart. (Amaranthaceae)27	Anti-microbial, Anti-oxidant. Nutritive
17.	<i>Hibiscus cannabinus</i> L.(Malvaceae)28	Hypo-cholesterolemic and Anti-oxidant. Blood tonic
18.	<i>Hibiscus sabdariffa</i> L.(Malvaceae)29	Anti-nociceptive, Anti-pyretic, Anti-oxidant. Nutritive
19.	<i>Hygrophilaauriculata</i> (Schum.) (Acanthaceae)30	1. Hypoglycemic, Hematinic, Anti-oxidant and Hepato-protective. Nutritive, provides body coolness. 2. Anti-inflammatory and Anti-oxidant. Nutritive, Mint helps in eliminating toxins
20.	<i>Menthaspicata</i> L.(Lamiaceae)31	from the body. Crushed mint leaves helps in whitening teeth and combat bad breath.
21.	<i>Mirabilis jalapa</i> L. (Nyctaginaceae)32	Anti-bacterial and Anti-oxidant. Nutritive
22.	<i>Moringaoleifera</i> L.(Moringaceae)33	Anti-hyperlipidemia, Anti-cancer, Anti-microbial, Anti-oxidant. Nutritive laxative, Relieves joint pain, maintains eye health, blood tonic Anti-ulcer, Anti-microbial, Cytotoxic activity, Phagocytic activity. Curry leaves

Contd... Table 1

Table contd...1

23.	<i>Murrayakoeniigi</i> L.Spreng (Rutaceae)34	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>Portulacopilosa</i> L. (Portulacaceae)36	Anti-inflammatory, Hypoglycemic. Nutritive
25.	<i>Portulacaquadrifida</i> L.(Portulacaceae)35	Anti-ulcer, Nutritive
26.	<i>Rumexvesicarius</i> L.(Polygonaceae)38,39	Anti-fungal, Diuretic activity. Nutritive, relieves pain of eye infection.
27.	<i>Sesbaniagrandiflora</i> (L.) Poir. (Fabaceae)40	Anti-convulsant activity, Relieves joint pain
28.	<i>Spinaciaoleracea</i> L.(Amaranthaceae)41	Anti-inflammatory activity, Nutritive, blood tonic
29.	<i>Tamarindusindical</i> L.(Caesalpinaceae)42	Anti-microbial and Anti-helminthic activity Provides Coolness to body
30.	<i>Trigonellafoenum-graecum</i> L.(Fabaceae)43	Anti-diabetic, anti-cancer, anti-inflammatory, anti-oxidant, Nutritive, blood tonic

Table 2 : Nutritive value of green leafy vegetables

Name of GLV	Energy (Kcals)	Moisture (g)	Protein (g)	Fat (g)	Mineral (g)	Fibre (g)	Carbo-hydrate (g)	Calcium (mg)	Phosphorus (mg)	Iron (mg)
Agathi	93	73	8	1	3	2	12	1130	80	4
Amaranth caudatus	26	90	3	1	3	1	2	200	40	-
Amaranth gangeticus	45	86	4	0	3	1	6	397	83	3
Amaranth paniculatus	67	79	6	1	4	2	9	530	60	18
Amaranth polygonoides	33	90	3	0	2	-	5	251	55	27
Amaranth spinisus	43	85	3	0	4	1	7	800	50	23
Chakravarthikeerai	57	81	4	1	4	2	8	321	71	18
Koyakeerai	37	88	3	0	1	2	5	292	51	2
Amaranth tritis	44	87	3	0	2	-	7	364	52	38
Amaranth viridis	38	82	5	0	3	6	4	330	52	19
Beet greens	46	86	3	1	2	1	6	380	30	16
Betel leaves	44	85	3	1	2	2	6	230	40	11
Bottle gourd leaves	39	88	2	1	2	1	6	80	59	-
Broad bean leaves	71	78	6	0	1	4	11	111	149	-
Brussels sprouts	52	85	5	0	1	1	7	43	82	2
Cabbage	27	92	2	0	1	1	5	39	44	1
Carrot leaves	77	77	5	0	3	2	13	340	110	9
Cauliflower	66	80	6	1	3	2	8	626	107	40
Celery leaves	37	88	6	1	2	1	2	230	140	6
Celery stalk	18	93	1	0	1	1	3	30	38	5
Colocasai leaves	56	83	4	1	2	3	7	227	82	10
Coriander leaves	44	86	3	1	2	1	6	184	71	1
Cow pea leaves	38	89	3	1	2	1	4	290	58	20
Curry leaves	108	63	6	1	4	6	19	830	57	1
Drumstick leaves	92	76	7	2	2	1	12	440	70	1
Fenugreek leaves	49	86	4	1	1	1	6	395	51	2
Gogu	56	86	2	1	1	-	10	172	40	1

Table 2 contd...

Table 2 Contd....

Knol khol greens	43	87	3	0	1	2	6	740	50	13
Kuppameni	64	80	7	1	3	2	6	667	99	17
Lettuce	21	93	2	0	1	0	2	50	28	2
Manathakkali	68	82	6	1	2	-	9	410	70	20
Mayalu	32	91	3	0	2	-	4	200	35	10
Mint	48	85	5	1	2	2	6	200	62	16
Modakanthan keerai	61	83	5	1	2	-	9	-	-	-
Mukarrate keerai	61	84	6	1	1	-	7	667	99	18
Mustard leaves	34	90	4	1	2	1	3	155	26	16
Nerringi	68	79	7	0	5	-	9	1550	82	9
Parsley	87	75	6	1	3	2	13	390	175	18
Paruppu keerai	27	90	2	1	2	1	3	111	45	15
Ponnanganni	73	77	5	1	2	3	12	510	60	2
Pumpkin leaves	57	82	5	1	3	2	8	392	112	-
Radish leaves	28	91	4	0	2	1	2	265	59	0
Rape leaves	48	85	5	0	2	1	6	370	110	12
Safflower leaves	33	91	2	1	1	-	4	185	35	6
Shepu	37	88	3	0	2	1	5	190	42	17
Spinach	26	92	2	1	2	1	3	73	21	1
Spinach stalks	20	93	1	0	2	-	4	90	20	2
Tamarind leaves, tender	115	70	6	2	1	2	18	101	140	0
Turnip greens	67	82	4	1	2	1	9	710	60	28

Source : Gopalan. C, Rama Sastri B.V. and Balasubramanian, S.C., 2004, Nutritive Value of Indian Foods National Institute of Nutrition (NIN), ICMR, Hyderabad

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. By documenting the traditional knowledge of 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^{6,7}, 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 hazards⁸. 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, β -carotene, not withstanding bioavailability issues.

METHODOLOGY

The Study has been undertaken by collecting published information on Green Leafy Vegetables which are covering the various health and pharmacological aspects on importance of green leafy

vegetables. Books, research papers and other readily published information were used for the study.

Reviews on 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. 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.

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 / nervousness⁴⁶. 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 prevention¹⁰. Age-related cataract is responsible for more than 40 per cent of the world's blindness and occurs principally in developing countries. 44 per cent 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.

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 exophthalmia is treated by consumption of Green Leafy Vegetables which are rich in vitamin A content.

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. 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. 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 macromolecules²⁷. 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 action²⁹. 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.

RESULTS AND DISCUSSION

Leafy vegetables hold an important place in well-balanced diets. The idea itself of a well-balanced diet changed in recent years and lesser amounts of red meat and more vegetable and fruits are advised. The nutritive value of greens remains underutilized due to lack of awareness and promotion of appropriate technologies for their effective utilization. Responding to the query on improving the nutritive value of food through GLVs, present investigation highlighted on the nutritional properties, brought out constraints on their extensive use, shared experiences of the efforts towards inclusion of GLVs in the recipes and suggested ways of most of the respondents does not cultivate these wild vegetables and also do not store the seeds of these wild vegetables. Also wild vegetables are easy to cook having good taste without addition of any spices, and give a very good taste even without cooking oil and food additives. Wild vegetables can bring variety, vitamins and other nutrients. They are inexpensive yet high quality sources of nutrition especially for low income and marginalized sectors of the economy. This health promoting attributes of green leafy vegetables linked with their nutritional and non nutrient content bioactive properties.

Conclusion:

Green leafy vegetables found Chhattisgarh, 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

On the basis of this preliminary data it is noted that the plants noted are used as vegetables as well as to cure various disorders. So that it is believed that these species must contain some potentially important bioactive components.

To conserve this traditional knowledge there is an urgent need of public awareness about these nature's doctors.

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