



E-ISSN: 2321-2187  
P-ISSN: 2394-0514  
IJHM 2016; 4(6): 120-123  
Received: 19-09-2016  
Accepted: 20-10-2016

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## Essential Leafy Vegetables for Healthy Eyes

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### Abstract

Eyes are the most precious organs in the human body, which is useful for sight. The diseases of the eye are much more important than any other physical disability. In traditional India, leafy vegetables and vegetables are used in wide range and its medicinal values are well documented in Ayurvedic classical texts. It provides nutritional value like vitamins, minerals along with health benefits. *Chakshushya dravya* are having the capacity to protect, restore and regeneration of the eyesight. Acharya Yogaratnakara exclusively mentioned all leafy vegetables are achakshusya except Sakapanchaka i.e. *Jivanthi, Vasthuka, Matsyakshi, Meganadha, Punarnava* in his text. These all leafy vegetables are having anti-inflammatory, anti-biotic, analgesic, anti-oxidant activity etc. In present paper an attempt has been made to analysis of five essential leafy vegetables.

**Keywords:** Chakshusya, Sakapanchaka, Yogaratnakara, anti –oxidant, anti- inflammatory

### 1. Introduction

As per Ayurvedic principles, disease can be prevented and cured by use of proper diet, lifestyle along with a proper use of medicine. Fruits and vegetables are rich in natural oxidants and have been health promoting effects and these positive effects have been related with their antioxidant activity [1]. Ingestion of several synthetic antioxidants such as butylated hydroxytoluene (BHT) and butylated hydroxyanisole has been reported toxic to man [2]. Recently, there has been a worldwide trend towards the use and ingestion of natural antioxidants present in different parts of plants due to their phytochemical constituents [3, 4]. Therefore, the use of natural antioxidant has gained much attention from consumers because they are considered safer than synthetic antioxidants. Even today, tribal people and rural population are still dependent on the herbs and plants of medicinal interest. Some reports revealed that more than 80% of the world population relies on herbal and traditional medicine [5, 6]. It is estimated that roughly 1500 plant species in Ayurveda and 1200 plant species in Siddha have been used for drug preparation [7, 8]. These medicines are popular due to their efficiency, low toxicity and absence of side effects. Acharya Yogaratnakara coated “*Sarvam sakamachaksusyam chaksusyam sakapanchakam jeevanthi vasthu matshakshi meghanaada punarnavaa*” in his Yogaratnakara [9]. He has exclusively mentioned all leafy vegetables are achakshusya except five. They are *Jivanthi, Vasthuka, Matsyakshi, Meganadha, Punarnava*. *Punarnava* i.e. leafy vegetables are used not only in poly herbal products but also recommended in daily food against wide range of health ailment and physiological disorders. *Boerhaavia diffusa* known as punarnava (Punar + nava). Punar means - again, nava means - becoming new (renews the body and re-grown). It grows profusely in the rainy season. Literally the word punarnava means, one which Plant dries up during the summer season and regenerates again during the rainy season. Thus the plant generally perennates through the roots in the soil. *Leptadenia reticulata* (Retz), traditionally known as Jivanti, is a much branched twining shrub belongs to Asclepiadaceae family. *Chenopodium album* is common weed during summer and winter in waste places in the field of wheat, barley, mustard, gram and reduces their yield. *Amaranthus graecizans*, is an annual species commonly called as tumbleweed or pig weed. Amaranth consists of 60-70 species, Over 400 varieties within these species are found throughout the world in both temperate and tropical climates, and fall roughly into one of four categories: grain, vegetable, ornamental or weed. Many fall into more than one [10]. *Alternanthera sessilis* Linn. commonly known as sessile joy weed a well known herb with fleshy leaves.

### 2. Geographical Distribution

*Boerhaavia diffusa* is distributed in the tropical, subtropical, and temperate regions of the world. It is found in throughout the warmer parts of India, Pakistan, Australia, China, Sudan, Sri Lanka, Egypt, South Africa, USA and in several countries of the Middle East. *Leptadenia reticulata* (Retz) grows throughout India, Especially it grows in the sub-Himalayan tracts of

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Punjab to Sikkim, Khasi hills, Utter Pradesh, Gujarat and throughout the Deccan Peninsula up to an altitude of 900 m and found particularly in hedges in India <sup>[11]</sup>. *Chenopodium album* distributed throughout world. About 21 species occur in India <sup>[12]</sup>, particularly in Western Rajasthan, Kulu valley

and Shimla <sup>[13]</sup>. *A. graecizans* is native of Africa, south Europe and asia <sup>[14]</sup>. *Alternanthera sessilis* grows in the flood plain wetlands, margins of rivers, streams, canals, ponds, reservoirs, tanks in India.

**Table 1:** Vernacular Name In Various Languages

|           | <i>Boerhaavia diffusa</i> | <i>Leptadenia reticulata</i> | <i>Chenopodium album</i> | <i>Amaranthus gracizans</i> | <i>Alternanthera sessilis</i> |
|-----------|---------------------------|------------------------------|--------------------------|-----------------------------|-------------------------------|
| Sanskrit  | Punarnava                 | Jivanthi                     | Vasthuka                 | Meganada                    | Matshakshi                    |
| English   | Hog Weed                  | Leptadenia                   | Pigweed                  | Amaranth                    | Sessile joyweed               |
| Hindi     | Gadapurna                 | Dori                         | Bathua sag               | Chaulai                     | Gudrisag                      |
| Telugu    | Atikamamidi Erra galijeru | Kalasa                       | Pappukura                | Totakura                    | Ponnaganti kura               |
| Kannada   | Kommeberu                 | Hiriyahalle                  | Kaduoma                  | Harive soppu                | Honagone soppu                |
| Gujarati  | Dholisaturdi              | Methidodi                    | Chaakvt                  | Dhimdo                      |                               |
| Marathi   | Ghetuli                   | Haranvel                     | Chaakvt                  | Bhaji                       | Kanchari                      |
| Tamil     | Mukurattai                | Palaikkodi                   | Paruppukkirai            | Mullukkeerai                | Ponnankanni                   |
| Malayalam | Chuvanna                  | Kuruninvali                  | Vastuccira               | Kattumullenkeera            | Meenamgani                    |

**Table 2:** Scientific Classification

|                | <b>Punarnava</b>          | <b>Jivanthi</b>                     | <b>Vasthuka</b>          | <b>Meganada</b>                | <b>Matshakshi</b>                        |
|----------------|---------------------------|-------------------------------------|--------------------------|--------------------------------|--|
| Botanical Name | <i>Boerhaavia diffusa</i> | <i>Leptadenia reticulata</i> (Retz) | <i>Chenopodium album</i> | <i>Amaranthus gracizans</i> L. | <i>Alternanthera sessilis</i> (L.) R.Br. |
| Kingdom        | Plantae                   | Plantae                             | Plantae                  | Plantae                        | Plantae                                  |
| Class          | Magnoliopsida             | Angiospermae                        | Magnoliopsida            | Magnoliopsida                  | Magnoliopsida                            |
| Order          | Caryophyllales            | Gentianales                         | Caryophyllales           | Caryophyllales                 | Caryophyllales                           |
| Family         | Nyctaginaceae             | Asclepiadaceae                      | Chenopodiaceae           | Amaranthaceae                  | Amaranthaceae                            |
| Genus          | <i>Boerhaavia</i>         | <i>Leptadenia</i>                   | <i>Chenopodium</i>       | <i>Amaranthus</i>              | <i>Alternanthera</i>                     |
| Species        | <i>diffusa</i>            | <i>reticulata</i>                   | <i>album</i>             | <i>gracizans</i> L.            | <i>sessilis</i> (L.)R.Br.                |

### 3. Morphology

*Boerhaavia diffusa*: It is a perennial creeping weed, prostrate or ascending herb, up to 1 m long or more, having spreading branches. The stem is prostrate, succulent, cylindrical, purplish, and hairy. Leaves are simple, thick, fleshy, arranged in unequal pairs. The upper surface of the leaves is green, smooth, and glabrous, whereas it is pinkish white and hairy beneath. The flowers are minute, subcapitate, present 4-10 together in small bracteolate umbrellas, hermaphrodite, pedicellate, and white, pink, or pinkish-red in colour. Mainly red or rose, but the white varieties are also known. The achene fruit is detachable, ovate, oblong, pubescent, five-ribbed and glandular, anthocarpous and viscid on the ribs. It has a large root system, the roots are stout and fusiform with a woody.

*Leptadenia reticulata* (Retz): Stem is cylindrical and bent occasionally at places. The surface is rough, longitudinally ridged, Wrinkled and furrowed, transversely cracked and with vertically elongated lenticels at places. Leaves are ovate to cordate, 4 to 8 cm long, 2 to 5.5 cm broad, entire, acute, subacute, to mucronate, base symmetrical. Flowers are greenish yellow. The roots are externally rough, white with longitudinal ridges and furrows.

*Chenopodium Album*: Stem is rarely slender, angled, often striped green, red or purple. The leaves are simple, rhomboid, waxy-coated, unwettable and mealy in appearance, with a whitish coat on the underside. Flowers are radial, symmetrical and grow in small cymes on a dense branched inflorescence, 10-40 cm long. Flowers contain shining black seeds. Fruits are a pair of slender, ovoid to oblong, sub woody and turgid follicles, 6-8cm × 2-2.5 cm, apex tapering to blunt apex, glabrous.

*Amaranthus*: Stem slender to stout, angular, globrous or thiny to moderate furnished crisped hairs. Leaves are globrous or sometimes sparingly furnished on the lower surface of the principal veins with very short, gland like hairs, long petiole (variable in length), lamina broadly ovate or rhomboid – ovate

to narrowly linear or linear. Margins of leaves are entire, plane, apex, subacute, obtuse or emarginated, mucronulate. Seeds are smooth, shining, compressed, black. Flowers are all in axillary cymose clusters, male and female inter mixed, males commonest in the upper whorls.

*Alternanthera sessilis*: Stem is herbaceous, weak, cylindrical, with spreading branches from the base; yellowish-brown to light-brown. Leaves are sessile, linear-oblong, or elliptic, obtuse or sub acute. Fruits are utricle 1.5 mm. long, orbicular, compressed with thickened margins; no characteristic odour and taste. Flower in small axillary sessile heads, white often tinged with pink, bracteoles about 1 cm long, ovate, scarious. Cylindrical, cream to grey, numerous roots arising from the main tap root as lateral rootlets.

### 4. Phytochemical Studies

The *Boerhaavia diffusa* plant contains a large number of such compounds as flavonoids, alkaloids, steroids, triterpenoids, lipids, lignins, carbohydrates, proteins, and glycoprotein's. Punarnavine, boeravinone, hypoxanthine 9-L-arabinofuranoside, ursolic acid, punarnava side, Liriodendron (lignans), B-sitosterol (Phytosterols) and two lignans, liriodendron and syringaresinol mono-β- D-glucoside, have also been reported in the roots. The herb and roots are rich in proteins and fats.

*Leptadenia reticulata* (Retz) contain many important phytoconstituents of various part of plant like α-amyryne, β-amyryne, ferulic acid, luteolin, diosmetin, rutin, β-sitosterol, Stigmaterol, Hentriacontanol, A triterpene alcohol simiarenol, apigenin <sup>[15]</sup>. Leaves contain two resins and also contain bitter neutral principal, albuminous and colouring matter, ca oxalate glucose, carbohydrate and tartaric acid <sup>[16]</sup>.

*Chenopodium album* contains b-sitosterol, lupeol, 3 hydroxy nonadecyl henicosanoate, ascorbic acid, b-carotene, catechin, galocatechin, caffeic acid, p-coumaric acid, ferulic acid, campesterol, xanthotoxin, stigmaterol, imperatorin, ecdysteroid, cinnamic acid amide alkaloid, phenol, saponin,

apocarotenoids, cryptomeridiol, n-trans-feruloyl-4-O-methyl dopamine and syringaresinol. The abundant constituents of the oil were: p- cymene (40.9 %), ascaridole (15.5 %), pinane-2-ol (9.9 %),  $\alpha$ - pinene (7.0 %),  $\beta$ -pinene (6.2 %) and  $\alpha$ -terpineol (6.2 %) [17, 18].

*Amaranthus* species having several active constituents like alkaloids, flavonoids, glycosides, phenolic acids, steroids, amino acids, terpenoids, lipids, saponins, betalains, b-sitosterol, stigmasterol, linoleic acid, rutin, catechuic tannins and carotenoids. *Amaranthus spinosus* contains 7-p-coumaroyl apigenin 4-O-beta-D-glucopyranoside, a new coumaroyl flavone glycoside called spinoside, xylofuranosyl uracil, beta-D-ribofuranosyl adenine, beta-sitosterol glucoside, betaxanthin, betacyanin; gomphrenin, betanin and beta-carotene [19-21].

*Alternanthera sessilis* (L.) R.Br. contains 2, 4-methylenecycloartanol and cycloeucalenol, choline, oleanolic acid. Saponins have been isolated from the leaves. Roots contain lupeol. The  $\beta$ - sitosterol possess potent anti-inflammatory by reducing the secretion of pro inflammatory cytokines and TNF. The young shoots of *A.sessilis* contains carotenoids, triterpene [22], saponins [23], flavonoids, steroids, stigmasterol,  $\beta$ - sitosterol [24].

### 5. Pharmacological Activities Related To Eye

The root powder of Punarnava, when mixed with *mamira* (*Thalictrum foliolosum*), is used to treat eye diseases. It cures corneal ulcers and night blindness [25]. Punarnava leaf juice is used in the eyes for topical application. Fresh root juice of Punarnava is put into eyes so as to get relief from various eye ailments like night blindness and conjunctivitis. Leaf juice with honey is dropped into the eyes for chronic ophthalmia [26].

*Leptadenia Reticulata* (Retz): It promotes health and vigour, improve voice and three dosa like vatta, pita and kapha, It also cure Eye, blood, cough, dyspnoea, burning sensation [27]. The leaves are also used to treat eye disease in swine. *L. reticulata* is an ingredient of *Dabur chyawanprash*, a traditional poly herbal formulation [28]. Flowers are good for eye sight [29]. It is occasionally used in nose, eye and ear troubles, while the leaves and roots are useful in skin affections and wounds [28]. Flowers of *Leptadenia Reticulata* are good for eye sight [30].

*Amaranthus*: The plant sap is used as an eye wash to treat ophthalmia and convulsions in children [31].

*Alternanthera sessilis* Linn: The leaves are used in eye diseases, cuts, wounds and antidote to snake bite; skin diseases [32]. Traditional literatures mentioned *Alternanthera sessilis* is transforms body into golden luster and he visualize the stars even in broad day light when this green is consumed periodically [33]. Medicated oil prepared with sessile plant juice as chief ingredient, used as bathing oil, gives cooling effect to eyes & body, neuritis, treating 96 types of eye diseases, piles, Halitosis. Dried whole plant is used as blood purifier and cures Skin diseases [34]. Lot of pharmacological studies has been carried out with extract of the different parts of these plants. Still Many pharmacological properties of the plant are remaining unexplored.

### 6. Pharmacological and Biological Activity

*Boerhaavia diffusa*: Diuretic, Anti-inflammatory, Antioxidant, Emetic, Blood Purifier, Hepatoprotective, Hepatotonic, Immunomodulatory, Immuno- suppressive Expectorant, Antibacterial, Anti-viral, Anti-stress, Lactagogue, Laxative, Ophthalmic, Anti-flatulent, Appetite

Stimulant, Stomachic, Cholagogue, Anticonvulsant, Abortifacient, Aphrodisiac, Anthelmintic activity. Indicated in Liver, Heart, Eye, Menstrual, Renal disorders, Anemia, Cough, Asthma, Cholera, Dropsy, Dyspepsia, Oedema, Gonorrhea, Hemorrhages, Inflammation, Jaundice, Rheumatism, Snakebite, Enlarged Spleen, Albuminuria, Cystitis, Hepatitis, Nephritis, Hydropsy, Sclerosis, Sterility, Urticaria, Epilepsy, Dysmenorrhagia, Abdominal Pain, Ascites, Abdominal Cancer etc.

*Leptadenia reticulata* (Retz): Stimulant and restorative, general tonic, vasodilator, Transient negative inotropic, chronotropic and prolonged hypotensive effect. Used in Eye diseases, Ear and Nose diseases, General weakness, Involuntary seminal discharge, Cough, Dyspnoea, Sore throat, Asthma, Tuberculosis, Fever, Constipation, Snake bite, Gonorrhoea, Diarrhea, Abdominal tumors, Piles, Odema, Toothache, Skin infections, Burning sensation etc.

*Chenopodium album*: Laxative, blood purifier, Anti-inflammatory, Antibacterial, antifungal, anthelmintic, antipruritic, Spasmolytic and analgesic, antinociceptive and hypotensive properties. Round and hook worms, hepatic disorders, spleen enlargement, intestinal ulcers, burns, stomach ache, joint pains, diarrhoea, oedema, renal stones, anaemia etc.

*Amaranthus species*: Febrifuge, antipyretic, laxative and diuretic, galactagogue, haematinic, stomachic, appetizer, It also having analgesic activity, antidepressant activity, antidiarrhoeal activity; cytoprotection activity and gastro protective activity etc. Other *Amaranthus* specis having antidiabetic, antitumor, antimicrobial, anti-inflammatory, spasmolytic, bronchodilator, hepato-protective, spermatogenic, antifertility, antimalarial, antioxidant properties etc. Bronchitis, Bilioussness, Nausea, Flatulence, Anorexia, Blood Diseases, Burning Sensation, Leucorrhoea, Leprosy, Piles, Internal Bleeding, Diarrhoea, Excessive Menstruation, Leucorrhoea, Leprosy, Hallucination, Healing of Wounds, Rheumatism etc.

*Alternanthera sessilis* (L.) R.Br.: Cholagogue, galactogue, Febrifuge, intellect promoting, wound healing activity, natural antioxidant etc. It has been proved through in-vitro and in-vivo studies that this Green has proven anti-microbial, wound healing activities, anti-oxidant activities, antipyretic activity, nootropic activity, hepatoprotective activity, hematinic activity, anti-ulcer activity, hypoglycemic activity, anti-diarrhoeal property, anti- Inflammatory activity [33]. Used in Inflammatory conditions, Eye diseases, Pain, Dysentery, Diarrhea, Constipation, Leprosy, Dyspepsia, Kidney Diseases, Intestinal Inflammation, Cuts, Wounds, Snake Bite, Scorpion Sting, Skin diseases, Piles, Irritating or Itchy Rashes, Generalized Oedema, Mastitis, Halitosis, Ulcerated Conditions of The Mouth and Throat ulcers etc.

### 7. Conclusion

In conclusion, these all leafy vegetables are having anti-inflammatory, anti-biotic, analgesic, anti-oxidant activity etc. So it can be used in inflammation, pain, redness of eyes. The previous pharmacological studies reported in this review confirm the therapeutic value of these plants. However, very less information is available regarding the phytoanalytical properties of these five plants. Phytochemical studies have been reported but still it needs to progress. Thus, there is enormous scope for future research and further pharmacological investigation on these plants.

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