ISSN: 2322 - 0902 (P)
ISSN: 2322 - 0910 (O)

International Journal of Ayurveda and Pharma Research

Review Article

TANDULIYAKA (*AMARANTHUS VIRIDIS*): A HIGHLY NUTRITIONAL HERB

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ABSTRACT

In the past 20 years, very little progress has been achieved in reducing food insecurity, child malnutrition and hunger in Africa. Under-nutrition and micronutrients deficiencies are widespread and affect mainly women and children. To address these problems, increased consumption of African leafy vegetables is promoted as sources of both micronutrients and bio-active compounds. Widely promoted African leafy vegetables include Amaranthus sp., Species of this genus are used as pseudo-cereals in Europe and America, and are mostly planted as vegetables in Africa. Amaranthus has been rediscovered as a promising food crop mainly due to its resistance to heat, drought, diseases and pests, and the high nutritional value of both seeds and leaves. Leaves are rich in proteins and micronutrients such as iron, calcium, zinc, vitamin C and vitamin A. All parts of the plant are used as medicine to heal many diseases in African communities. *Tanduliyaka* (*A. viridis*) is grown and utilized in many areas of the world as both a wild and cultivated pot herb. The plant is rich in calcium and iron and is a good source of vitamins B and C. Due to its small seed size and use as a pot herb, *A. viridis* is moved, both on purpose and unwittingly, throughout the world. The seeds can survive in the digestive tract of chickens. It is good cattle fodder, and is used medicinally and for making soap, but is poisonous to pigs.

KEYWORDS: *Tanduliyaka*, *Amaranthus viridis*, nutritional value, green leafy vegetable.

INTRODUCTION

Green leafy vegetables are rich in carotenoids (Vitamines) as well as in iron, calcium, ascorbic acid, riboflavin folic and appreciable amounts of other minerals. Vegetables occupy an important place in the vegetarian diets of India. India having a variety of natural surroundings and varying climates and seasons, has a number of species of edible leafy vegetables such as spinach, amaranthus, bengal gram leaves, cauliflower leaves, mint and coriander. These leafy vegetables and herbs are relatively inexpensive, easily and quickly cooked and rich in several nutrients especially beta-carotene and iron which are essential for human health[1]. Protein malnutrition is still prevalent in the developing countries of the world. Micronutrient deficiencies affect mainly women and children and contributes significantly to the global disease burden of children by limiting proper cognitive development, impairing physical development, and increasing susceptibility to infectious diseases[2]. Most countries in Africa are still struggling to address problems of under-nutrition and micronutrient deficiencies. They are highly nutritious, contain vitamins and minerals. The leaves, shoots, tender stems and grains are eaten as pot herb in sauces or soups, cooked with other vegetables, with a main dish or by itself. Traditionally, the boiled leaves and roots are used as: laxative, diuretic, anti-diabetic, antipyretic, anti-snake venom, antileprotic, anti-gonorrheal, expectorant, to relieve breathing in acute bronchitis[3]. It also has anti-inflammatory properties, immuno-modulatory activity, anti-androgenic activity and anthelmintic properties. Both leaves and seeds contain protein of an unusually high quality. The grain is milled for flour or popped like popcorn. The leaves of both the grain and vegetable types may be eaten raw or cooked[4]. The leaves of this plant, known as *Massaagu* in Dhivehi, have been used in the diet of the Maldives for centuries in dishes such as mas huni[5].

Amaranthus Viridis

Scientific Classification / Taxonomy

Domain: Eukaryota
Kingdom: Plantae
Subkingdom: Viridaeplantae
Phylum: Tracheophyta
Subphylum: Euphyllophytina
Infraphylum: Radiatopses
Class: Magnoliopsida
Subclass: Caryophyllidae
Superorder: Caryophyllanae
Order: Caryophyllales
Suborder: Chenopodiineae
Family: Amaranthaceae
Subfamily: Amaranthoideae
Tribe: Amarantheae
Genus: Amaranthus
Specific epithet: viridis - L.
Botanical name: *Amaranthus viridis*

Vernacular Names

Hindi: *Chauraiya*

Kannada: Chelakeerae soppu, Dagglisoppu, keere soppu

Malayalam: Cerhiraa, Mullanchira

Sanskrit: *Thanduliya*

Tamil: Kuppaikkeerai

Telugu: Chilaka thota koora

GENERAL DESCRIPTION

Amaranthus viridis belongs to the family Amaranthaceae. The Amaranthaceae family consists of hardy, weedy, herbaceous, fast growing, cereal like plants. Amaranth is one of those rare plants whose leaves are eaten as a vegetable while the seeds are used as cereals[6]. (*Tanduliyaka) Amaranthus viridis* grows annually as an erect, monoecious herb (individual flowers are either male or female, but both sexes can be found on the same plant), up to 100-300cm tall, much branched. Leaves are alternate, simple, petiolate, base tapering (markedly attenuate), margins entire (sometimes sinuate), apex acute or obtuse or retuse or emarginate (and often mucronulate), Blade glabrous[7].

Nutritional Value

Amaranthus is highly nutritious, both the grain amaranth and leaves are utilized for human as well as for animal food (Tucker, 1986).

On a zero moisture basis, 100gm. of leaves of (*Tanduliyaka*) *Amaranthus viridis* contains[8]

1. Calories - 283	9. Iron - 27mg
2. Protien - 34.2gm	10.Sodium - 336mg
3. Fat - 5.3gm	11.Potassium - 2910mg
4. Carbohydrate - 44.1gm	12.Vit. A - 50mg
5. Fibre - 6.6gm	13.Thiamine - 0.07mg
6. Ash - 16.4gm	14.Riboflavine - 2.43mg
7. Calcium -2243mg	15.Niacin - 11.8mg
8. Phosphorous - 500 mg	16.Ascorbic acid - 790mg

USES

- The herb is used as astringent, emollient, in dysentery, inflammation, constipation, eczema, bronchitis, antidiabetic, anaemia and leprosy, Plant is used as sag for cooking and fodder plant.
- Leaves are emollient and anthelmintic. Roots/ shoots are used to control excessive menstruation, blood purifier, digesting agent, piles.
- The Negros of the Philippines apply the bruised leaves directly to eczema, psoriasis, and rashes with good results.
- The leaves make a good emollient preparation available in some of the Filipino villages for insect bites, sunburn, and regular burns.
- The reddish-brown fiber from the leaves are soaked and use for eye treatments.
- The decoction of young roots is used for the treatment of respiratory complaints, asthma.
- Provides energy: Highly packed with carbohydrates, proteins, vitamin K, folate, riboflavin, vitamin A, vitaminB6, and vitamin C, amaranth leaves boost energy in the body.
- Prevents electrolyte imbalance: Amaranth leaves are terrific source of manganese, iron, copper, calcium, magnesium, potassium and phosphorus necessary for maintaining proper mineral balance in the body.
- Excellent gluten-free diet: Vegetarians with gluten-intolerance or those suffering from celiac diseases can meet daily recommended dose of protein from amaranth greens. Compared to other plant sources namely wheat, rye, rice and oats, Amaranth contains 30% more protein with complete set of amino acids.
- Improves digestion: High dietary fiber content (3 times that of wheat) in the greens improve digestive health and reduces constipation. It is easily digestible and good for both young ones and elders.
- Aids in weight management: Protein in the leaves help to reduce insulin levels in the blood and also release a hormone that lessen hunger pranks and prevent "binging catastrophe".
- Reduces bad cholesterol: One of the key benefits of amaranth leaves is cholesterol-lowering ability. Being fibrous, this leafy vegetable is effective in reducing LDL levels in the blood and promotes weight loss. Presence of tocotrienols (a type of vitamin E) also aids in cholesterol-lowering activity.
- Good for anemic patients: Iron-rich (5 times that of wheat) red amaranth leaves promote coagulation and increase hemoglobin content and red blood cell counts.
- Decreases risk of cardiovascular disease: Amaranth leaves are an excellent dietary source of phytosterols that lowers blood pressure and prevents heart ailments including stroke.
- Fight-off cancer: Presence of lysine (an essential amino acid) along with vitamin E, iron, magnesium, phosphorus and potassium and vitamin C helps to fight against free radicals responsible for aging and formation of malignant cells.
- Ayurvedic treatments: Juice extracted from fresh amaranth leaves are prescribed for treating diarrhea, and hemorrhage conditions.
- Stop hair loss and graying: Besides regular consumption, applying juice from the leaves prevent brittle hair falling. This wonderful cosmetic benefit of amaranth leaves also retards the onset of premature graying[9].
- Prevents calcium-deficiency ailments: Calcium present in amaranth leaves reduce risk of osteoporosis and other calcium deficiencies because it has twice the calcium as milk. Indeed good news for lactose-intolerance.
- Improves eyesight: Vitamin C found in the leaves contribute to towards healthy vision.
- Green amaranth also has clusters of nutty edible seeds, which can be eaten as snacks or used in biscuits. A porridge can be made by boiling the seeds in water. Unlike other amaranths, the seeds can be easily harvested by scraping the ripe spikes of seeds between the fingers.

- *Amaranthus viridis* is used as a medicinal herb in traditional Ayurvedic medicine, under the Sanskrit name *Tanduliya*.

Pharmacological Activity

Narong Chungsamarnyart et al., studied the antiviral activity against the Foot and Mouth Disease virus (FMDV) type O, local strain KPS/005/2545 of forty-seven ethanol crude-extracts of 42 plants. The leaves and stem extracts of (*Tanduliyaka*) *Amaranthus viridis* were used. The concentration 0.024µg/µl of (*Tanduliyaka*) *Amaranthus viridis* L. leaves and stems inhibited the FMDV concentration 1X102.44 TCID50. It has antiviral proteins against tobacco mosaic virus.

Navjot Kaur et al., has purified lectin from the seeds of (*Tanduliyaka*) *Amaranthus viridis* Linn Anti-Proliferative Effect. *Amaranthus* lectin was found inhibitory to HB-98 cells and partially to PD-388D1 cell lines.

Kwon S.Y et al., has purified an antiviral protein from the leaves of (*Tanduliyaka*) *Amaranthus viridis* was named amaranthin.

Jana Kalinova et al., studies were conducted to confirm the presence of rutin, one of the most common quercetin glycosides, and other quercetin derivatives in plants of genus Amaranthus.

Liu D et al., studied the effects of different concentrations (10(-6)M, 10(-5)M and 10(-4)M) of K2Cr2O7Cr(VI) on some minerals (Mn, Fe, Cu and Zn), lipid peroxidation, activities of antioxidant enzymes, photosynthetic function, and chlorophyll fluorescence characteristics were investigated in hydroponically grown (*Tanduliyaka*) *Amaranthus viridis* L. Results indicated that chromium was accumulated primarily in roots.

Kwon S.Y et al., acDNA library was constructed in Uni-ZAP XL vector with poly(A) RNA purified from leaves of (*Tanduliyaka*) *Amaranthus viridis*.

Zain-ul-Abedin M et al., were able to develop cultures from the cut-end parts of this plant tissue. The commonly used media were modified to achieve good and fast growth. Results have been obtained on the techniques, histology, chromosomal, and biochemical studies which indicate that the plant could be useful as a research tool to study problems in crop improvement at the cellular level.

Simone Mendonca et al., studied amaranth's protein cholesterol-lowering effect and investigates its mechanisms hypercholesterolemia was induced in male hamsters through diet rich in casein (300 g/kg diet) containing regular levels of cholesterol (0.5 kg/g) fed during 3 weeks. They suggested that amaranth protein has a metabolic effect on endogenous cholesterol metabolism.

B.S.Ashok Kumar et al., showed the Invitro anthelmintic propertiy of methanol extract of (*Tanduliyaka*) *Amaranthus viridis* linn,115 Antinociceptive and antipyretic Activities116 and estimation of Bioflavonoids in (*Tanduliyaka*) *Amaranthus viridis* Linn By HPLC.

A. viridis (*Tanduliyaka*) is grown and utilized in many areas of the world as both a wild and cultivated pot herb (Uphof, 1968). The plant is rich in calcium and iron and is a good source of vitamins B and C (Morton, 1981). Due to its small seed size and use as a pot herb, (*Tanduliyaka*) A. viridis is moved, both on purpose and unwittingly, throughout the world. The seeds can survive in the digestive tract of chickens (Rodriguez et al., 1983). It is good cattle fodder, and is used medicinally and for making soap (Dalziel, 1937), but is poisonous to pigs (Salles et al., 1991).

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Cite this article as:
Ritu singh, D.C.Singh Chauhan, Pravesh Tomar. Tanduliyaka (Amaranthus Viridis): A Highly Nutritional Herb. International Journal of Ayurveda and Pharma Research. 2016;4(5):53-55.
Source of support: Nil, Conflict of interest: None Declared

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