



Pharmaceutical Activity of Medicinal Plant *Amaranthus Viridis* Linn. Due to its Chemical Constituents: A Review

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Abstract

Background: *Amaranthus viridis* L. an herbal plant belonging to the family Amaranthaceae, has gained significant attention in the field of traditional medicine due to its rich chemical composition. This plant is known to contain various bioactive components that contribute to its pharmaceutical value. With its extensive range of chemical compounds, *Amaranthus viridis* L. has found applications in the therapeutic, pharmaceuticals, and cosmetic industries. In this study, we aim to explore the medicinal potential of *Amaranthus viridis* and investigate its various pharmaceutical activities. **Methods:** The process of writing this review involved conducting comprehensive electronic research using reputable sources, including international and national article databases, along with books accessed through platforms like Google Scholar, PubMed, IEEE Xplore, ScienceDirect, and others. The gathered data is subsequently analyzed, followed by employing synthetic approaches with narrative methods to derive meaningful conclusions and interpretations. **Results:** *Amaranthus viridis* L. displays potent antioxidant and anti-inflammatory properties, attributed to its rich composition of flavonoids, cardiac glycosides, and zinc. Its diverse pharmaceutical activities make it a promising contender for medicinal use, addressing labor pain, skin conditions like eczema and psoriasis, and respiratory issues, while also exhibiting antimicrobial effects against bacteria, fungi, and parasites. It can be accomplished by Extraction with solvent, Phytochemical screening, and Isolation and purification. **Conclusion:** *Amaranthus viridis* L. an herbal plant, shows significant potential in the therapeutic, pharmaceuticals, and makeup industries. Its bioactive compounds, including flavonoids, cardiac glycosides, and zinc, contribute to its diverse pharmaceutical activities, such as antioxidant, anti-inflammatory, antibacterial, antifungal, antidiabetic, and anthelmintic properties.

Keywords: *Amaranthus viridis* L.; chemical constituents; pharmaceutical importance; traditional uses.

Introduction

Amaranthus viridis L. is associated with the Amaranthaceae family, in the local language it is recognized as "Chowlai", it is a herb that expands wild, predominantly harvested in Africa, Asia, and America (Amin et al., 2006). The central origin of *Amaranthus viridis* L. is Asia but at present, it can grow worldwide in humid and temperate areas of the world, it can grow everywhere but at a distance to moderate areas (e.g. in Europe, Asia, N. America, and Australia) (Brenan, 1981). It is spread in hot climate areas of the world (Eluwa, 1977). It shows resistance against hot climates, drought, and pests also called pseudocereals and can perform an attractive part in the accommodation of food (Saxena et al., 2007). During the past decades, *Amaranthus viridis* L. has broadened its uses from diet to medicinal ways mainly for the patient allergic to some cereals (Berti et al., 2005). Due to the presence of antioxidants, it shows an inhibitory role against oxidative stress controlling deep-rooted diseases (Halvorsen et al., 2002). As a result of oxidation reactive oxygen species and reactive nitrogen species are produced that are linked to various syndromes for instance



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aging, malignancy, inflammation, osteoporosis, and heart complications (Willcox, Ash et al. 2004).

Medicinal value and various functions performed by plants in life depend upon their phytochemical components (Huseini et al., 2005). Amaranth species show great potential as an antioxidant that's why it is highly recommended (Ozsoy et al., 2009). The antioxidant potential of Amaranthus species and green vegetables has been discussed (Akçin & Yalçin, 2007). Most herbal plants contain consists of bioactive constituents like carotenoids, flavonoids, phenolic, and anthocyanin (Nisar et al., 2010), (Kaleemr et al., 2012). The leaves of this plant are used for eczema and rashes (Kirtikar, 1981). Also used as an anti-inflammatory agent for urinary tract anti-rheumatic, treatment of asthma and eye problems (Agra et al., 2007). It possesses anti-fungal activity as well as anti-proliferative (Sena et al., 1998; Gallagher and Cardina, 1998) and also plays a role anti-viral (Gallagher and Cardina, 1998).

The isolation and thorough characterization of these phytoconstituents are of utmost importance. Additionally, understanding the mechanisms of action of the isolated compounds through rigorous research is vital. Furthermore, conducting clinical trials of these compounds is necessary to establish their safety and efficacy in human subjects. In the current global context, there is a growing interest in medicinal plants for primary healthcare purposes. Therefore, the provided information holds promise in guiding further research endeavors. Future studies can focus on identifying and screening the compounds responsible for various bioactivities associated with *Amaranthus viridis* L. and elucidating the molecular mechanisms underlying their actions.

Method

The methodology for this review involved conducting electronic literature searches with a focus on *Amaranthus viridis* L. The research was carried out using renowned databases, such as Google Scholar and ScienceDirect, in addition to other credible sources, such as PubMed, JSTOR, IEEE Xplore, and ACM Digital Library. The selection of articles and books was guided by relevant keywords related to *Amaranthus viridis* L., including "chemical constituents," "pharmaceutical importance," and "*Amaranthus viridis* L.". Titles and abstracts of the retrieved sources were carefully reviewed and categorized based on their relevance to the review's objectives. The selected literature was then utilized to gather essential information and insights for the writing of this review. As many as 75 sources 70 international and 3 National, consisting of 65 research journals, 4 review journals, and 5 books.

Table 1. Taxonomic classification of *Amaranthus viridis* L.

	Taxonomic classification	Reference
Kingdom	Plantae	
Subkingdom	Tracheobionta	
Super division	Spermatophyte	
Division	Magnoliophyta	
Class	Magnoliopsida	
Subclass	Caryophyllidae	(Kaur et al., 2006)
Order	Caryophyllales	
Family	Amaranthaceae	
Genus	Amaranthus	
Species	Vridis	

Discussion

Morphology

Amaranthus viridis L. is elongated upward or may ascend. Its length is about 1m tall. It can be an annual or perennial herb with a short life span. Leaves are arranged alternately having petioles (up to 10cm), and sinuate margins. Mostly terminal spikes are present and often have axillary spikes, cyme is placed in slender with a length of 12cm. flowers are green

in color, sub sessile, unisexual, lanceolate ovate, bracts and bracteoles are present, and an ovary is superior. The fruit is wrinkled and has a subglobose capsule, 1 seeded, and the seed is also sub globosely and compressed, color is glossy black and 1mm in diameter (Brenan, 1981) shown in Figure 1.



Figure 1. Parts of *Amaranthus viridis* L., (a) plant of *Amaranthus viridis* L., (b) inflorescence of *Amaranthus viridis* L., (c) fruit of *Amaranthus viridis* L.

Chemical Constituents

Amaranthus viridis L. shows the range of chemical constituents that contribute to its medicinal value leaves and seeds are rich in components valuable according to the medicinal point of view. Leaves of *Amaranthus viridis* L. contain reducing sugar, resin, tannin (Eluwa, 1977), cardiac glycosides, Phlobatannins, flavonoids (Muhammad et al., 2012), zinc, protein, calcium, alpha-linoleic acid, linoleic acid, iron, magnesium (Sena et al., 1998) and Beta-carotene (Kheyroдин, 2009). Roots of the *Amaranthus viridis* L. contain Amasterol (Brenan, 1981). Seeds of *Amaranthus viridis* L. contain Triacontane, Saponins, Ecdysteron, Pentatriacontane, Hentriacontane, Hexatriacontane, 6-Pentatriacontane (Musharaf, Shahana et al. 2011), and Cardiac glycosides (Muhammad et al., 2012). Barren palatable plants contain Oxalic acid and carotenoids (Kheyroдин, 2009) shown in Table 2.

Table 2. Important chemical compounds of plant *Amaranthus viridis* L.

Parts	Biochemical Constituents	Source
Leaf	Reducing sugar Resin Tannin	(Eluwa, 1977)
Leaf/seed	Cardiac glycosides	(Muhammad et al., 2012)
Leaf	Phlobatannins Flavonoids Zinc Protein Calcium Alpha-Linoleic acid Linoleic acid Iron Magnesium	(Sena et al., 1998)
Root	Amasterol	(Brenan, 1981)
Seed	Triacontane Saponins Ecdysteron Pentatriacontane Hentriacontane Hexatriacontane 6-Pentatriacontane	(Musharaf et al., 2011)
Barren palatable plants Leaves	Oxalic acid Beta-carotene	(Kheyroдин, 2009)
Barren palatable plants	carotenoids	

Antioxidant and Antimicrobial Actions of *Amaranthus viridis* L.

The leaf and kernel of *Amaranthus viridis* L. show anti-microbial and anti-oxidant properties. By using aqueous and pure methanol extract yield is obtained which ranges from 5.4 to 6.0 % and 2.4 to 3.7 % of leaves and seeds respectively. This extract showed the antioxidant and antimicrobial constituent yields including flavonoid contents (18.4 to 5.42 QE, g/100 g), phenolic contents (1.03 to 3.64 GAE, g/100 g), and 1-diphenyl-2-

picrylhydrazyl (DPPH) (14.25 - 83.43 µg/ml). It shows antimicrobial and antioxidant assets counter bacteria and fungi with the least inhibitory deliberations fluctuating from 179 to 645 µg/ml. Leaf and seeds of *Amaranthus viridis* L. can be used as antioxidants and antimicrobials for pharmaceuticals and food (Muhammad et al., 2012; Kumar et al., 2012) shown in Table 3.

Table 3. Antioxidant and antimicrobial constituents

Constituents	Yield
Flavonoid contents	18.4 - 5.42 QE, g/100 g
Phenolic contents	1.03 - 3.64 GAE, g/100 g
Minimum inhibitory concentrations (MIC)	179 - 645 µg/ml
1-diphenyl-2- picrylhydrazyl (DPPH)	14.25 - 83.43 µg/ml

Anti-inflammatory Activity of *Amaranthus viridis* L.

The ether, petroleum aqueous, and alcohol extract *Amaranthus viridis* L. in dosage intensities of 50, 100 and 200 mg/kg are applicable for anti-inflammatory analysis. Ethanol and aqueous extract show a principal anti-inflammatory effect but the lowest inhibitory effect is shown by petroleum ether extract (Sowjanya et al., 2014).

Pharmacological Activities of Plant *Amaranthus viridis* L.

It performs cardio-protective activity (Saravanan et al., 2013). *Amaranthus viridis* L. also perform an antioxidant activity (Muhammad et al., 2012; Kumar et al., 2012). *Amaranthus viridis* L. is an antiviral agent (Nordeide et al., 1996). Also act as an antimicrobial (Muhammad et al., 2012), anti-inflammatory (Reyad-ul-Ferdous et al., 2015), anti-diabetic (Kumar et al., 2012), anti-hyperglycemic (Reyad-ul-Ferdous et al., 2015), Antihyperlipidemic (Kumar et al., 2012), antiviral (Nordeide et al., 1996), antifungal (Carminate et al., 2012), Antihelmintic (Kumar et al., 2010) and antipyretic (Eluwa, 1977).

Traditional uses in medicines of *Amaranthus viridis* L.

Amaranthus viridis L. is an herbal plant used in ayurvedic as well as local medicinal remedies to cure many diseases some are shown in table 4. The whole plant of *Amaranthus viridis* L. is eaten to reduce labor pain (Kirtikar, 1981). Bruised leaves of the plant are used for eczema, rashes, and psoriasis (Quisumbing, 1951). The whole plant either eaten dried or fresh is helpful as a diuretic, and laxative, for breathing complications, eye problems, and asthma (Agra et al., 2007; Islam et al., 2010; Kirtikar, 1981). The whole plant is also helpful for pain and fever (Kumar et al., 2009). Leaves are used against bacterial diseases (Nguta et al., 2010). Roots are eaten for edema (Ediriweera, 2010). Its leaves are also chewed against fungal infections (NRC, 1984).

Table 4. Medicinal usages of distinctive segments of *Amaranthus viridis* L.

Part of plant	Uses	Reference
Whole plant	Lessen labor pain	(Kirtikar, 1981)
Bruised Leaves	eczema, rashes, and psoriasis	(Quisumbing, 1951)
Whole plant	Diuretics, laxatives, respiratory problems, eye problems, and asthma	(Agra et al., 2007), (Islam et al., 2010), (Kirtikar, 1981)
Whole plant	Pain and fever	(Kumar et al., 2009)
Leaves	As anti-bacterial	(Nguta et al., 2010)
Leaves and seeds	Fungal and bacterial diseases	(NRC, 1984)
Roots	Edema	(Ediriweera, 2010)

Conclusions

Amaranthus viridis L. fit in to the family (Amaranthaceae) normally identified as "Chowlai" and is a public barren plant of agriculture. *Amaranthus viridis* L. comprises numerous constituents like amino acids, cysteine, methionine, phenylalanine, leucine, valine, threonine lysine, arginine, histamine, isoleucine, tyrosine, etc. In an examination of novel events and natural objects, a phytochemical inspection of the extract from leaves of

Amaranthus viridis L. specifies the existence of naturally vigorous elements such as glycoside, tannins, phenols, flavonoids, alkaloids, cardiac, Saponins, steroid and triterpenoids. *Amaranthus viridis* L. has certain biochemical rudiments show effective anti-inflammatory, antiulcer, hepatotoxic, antiviral, and ant allergic functions. *Amaranthus viridis* L. consumed in Nepalese and Indian customary systems to slacken labor agony and act as an antipyretic. The Negritos of the Philippines spread over the battered leaves directly to rashes, psoriasis, eczema, etc. Other customary practices variety from an anti-inflammatory mediator of the urinary tract, diuretic, venereal syndromes vermifuge, antiulcer, anti-aching, antiemetic, anodyne, eye problems, laxative, antilep-rotic, enhancement of desire for food, dealing of breathing and, to the handling of asthma. Overall, the findings from such research can contribute significantly to the development of new and effective therapeutic interventions, thus addressing healthcare needs more effectively in the present scenario.

Declaration statement

The authors reported no potential conflict of interest.

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