J. Biodivers. Conservation 9(2): 108-115 ISSN: 2457-0761 (online)
2025 http://www.aprfjournal.in

Review Article

Ethnomedicinal uses of *Amaranthus spinosus* L. (Amaranthaceae)

Anju Kumari Thakur[1], Rajkumari Supriya Devi[2], Subhalakshmi Rout[2] and Gulshan Kumar[1*]

[1]Division of Botany, Career Point University, Hamirpur, Himachal Pradesh, India

[2]Ambika Prasad Research Foundation, Odisha, India

*E-mail: gulshan.botany@cpuh.edu.in; ORCID: https://orcid.org/0009-003-3483-1726

DOI: https://doi.org/10.5281/zenodo.15368754

Article Details: Received: 2025-03-25 | Accepted:2025-05-08 | Available online: 2025-05-09

Abstract: Wild leafy vegetables, like *Amaranthus spinosus*, has been a nutritional item in the Indian kitchens which also possess medicinal properties. This plant species is rich in essential vitamins and minerals and contains various phytochemical constituents, including betalains, flavonoids, saponins, and phenolic compounds, that contribute to its medicinal properties and potential health benefits. The ethnomedicinal uses of *A. spinosus* include treating skin issues, urinary tract infections, rheumatic problems, and snakebites, among others. This study reviews the importance of documenting the traditional ethnomedicinal knowledge and phytochemical constituents with potential activity for promoting sustainable food systems and to unlock the potential of wild leafy vegetables like *A. spinosus* as a nutraceutical plant that also helps to alleviate diverse ailments of human health.

Keywords: Traditional therapeutic, phytochemical constituents, wild leafy vegetables

Introduction

India is home to a diverse range of nutritious wild leafy vegetables that have been used in traditional medicine and cuisine for centuries. They are rich in essential vitamins and minerals, including vitamins A and C, iron, calcium, potassium, and fiber. Some of these wild leafy vegetables also contain high levels of antioxidants and phytochemicals, which can provide various health benefits (Ganjare and Raut, 2019). They can be used in a variety of dishes and offer a sustainable and locally-sourced food option. However, it's essential to harvest them sustainably to ensure their continued availability and avoid depleting plant populations or contaminating with pollutants. *Amaranthus spinosus*, also known as Spiny Amaranth or Prickly Amaranth, is a plant native to tropical America but naturalized in many parts of the world, including Asia and Africa. Its leaves and shoots are edible and used as a nutritious vegetable, rich in vitamins A and C, calcium, and iron (Asha et al., 2016). The plant is also valued in

traditional medicine for treating various health issues, such as diarrhea, dysentery, and skin conditions. Characterized by its spiny stems and leaves, *A. spinosus* grows in diverse environments, including waste areas, roadsides, and cultivated fields, and is known by different names in various regions, such as Kanta bhaji in Hindi and Odia and Mullu keerai in Tamil (Vidyabharati, 2020). It is an annual herb characterized by its erect or ascending stems, often branched and covered with spines or sharp points. Its leaves are ovate to lanceolate, typically 2-6 cm long and 1-3 cm wide, with distinctive spines at the base of the petiole. The plant produces small, greenish flowers in dense axillary or terminal inflorescences, with male and female flowers often mixed. The seeds are shiny, black, and rounded, approximately 1-1.5 mm in diameter. The plant's morphology, including its spiny stems and leaves, helps identify *A. spinosus* and distinguish it from other *Amaranthus* species (Figure 1; Gotyal et al., 2016; Rahman and Gulshana, 2014). The study aims to document the ethnomedicinal uses of *A. spinosus,* its active constituents present for preserving traditional knowledge, promoting nutrition and health, and supporting sustainable food systems (Kumar et al., 2014; Ahmad, 2018). Many indigenous communities have valuable knowledge about the uses of these plants, which is at risk of being lost due to urbanization and cultural changes. Additionally, documentation can provide a basis for scientific validation, leading to further research and development of these plants. The uses of wild leafy vegetables can help unlock their potential and support sustainable food systems, nutrition, and health.

Ethnomedicinal uses of *A. spinosus*

A. spinosus is a versatile plant that thrives in diverse environments, making it accessible to various tribal and indigenous communities. These communities have developed a deep understanding of its nutritional and medicinal properties, utilizing different parts of the plant in unique ways (Figure 2). The leaves are employed to treat skin issues like rashes, eczema, and inflammation, as well as other ailments such as urinary tract infections, rheumatic problems, and snakebites (Haider et al., 2023; Ruth et al., 2021; Asha et al., 2016; Pal et al., 2013; Basu et al., 2019). The roots are used to address various health concerns, including vomiting, toothaches, and fever (Asha et al., 2016). The seeds are used as a poultice for broken bones (Ruth et al., 2021), while the plant sap is used to treat eye problems like ophthalmia and as an eye wash, and in some cases, to alleviate convulsions in children (Asha et al., 2016). The detailed list of ethnomedicinal uses of *A. spinosus* is given in Table 1. These wide range of ethnomedicinal uses highlights the plant's significance in traditional medicine.

Table 1: Ethnomedicinal uses of *A. spinosus*

Plant part(s) used	Medicinal use(s)	Source(s)
Boiled leaves	Jaundice.	Ruth et al., (2021)
Bruised leaves	Use as a good emollient.	Ruth et al., (2021)

Bruised leaves	Ulcerated mouths, eczema, burns, wounds, boils, earache, haemorrhoids and antibacterial, diabetes, Peptic ulcer, abdominal pain, chicken pox, dysentery, dysurea, fever, hysteria, malaria, mania, tonsillitis, and vomiting.	Asha et al., (2016), Deshpande et al., (2017)
Juice of plant	Swelling around stomach.	Peter and Gandhi, (2017)
Leaf infusion	Anaemia.	Asha et al., (2016)
Leaves	Gastroenteritis, gall bladder inflammation, abscesses, arthritis, and snakebites.	Ruth et al., (2021)
Leaves	Malaria.	Asha et al., (2016)
Leaves and roots use as poultice	Relief bruises, abscesses, burns, wound, inflammation, menorrhagia, gonorrhoea and eczema, refrigerant, diuretic, purgative, enema for stomach problem and against piles and cholera.	Asha et al., (2016)
Plant decoction	Used in digestion, kidney problems, as mouth wash for toothache.	Asha et al., (2016)
Plant sap	Use as eye wash to treat ophthalmia and convulsions in children.	Asha et al., (2016)
Pollen	Antigenic, analgesic, hematological, antibacterial activity.	Tanmoy et al., (2014)
Root	Toothaches and diuretic.	Asha et al., (2016)
Root decoction	Gonorrhoea, applied as an emmenagogue and in fever.	Asha et al., (2016)
Root extract	Vermicide.	Peter and Gandhi, (2017)
Root paste with honey	Vomiting.	Asha et al., (2016)
Roots of *A. spinosus* mixed with *Phyllanthus emblica*, bark of *Saraca asoca* and *Berberis aristata*	Leucorrhoea.	Sattar et al., (2024)
Seeds	Use as poultice for broken bones	Ruth et al., (2021)
Stem	Antidiabetic, antimalarial, gastrointestinal activity.	Tanmoy et al., (2014)
Whole plant	Internal bleeding, diarrhoea, and excessive menstrual bleeding and induce abortion.	Ruth et al., (2021)
Whole plant	Excessive bleeding and profuse vaginal discharge.	Sattar et al., (2024)

Whole plant	Urinary issues, as lotion and cooling agent that alleviate pain during pregnancy and treat skin diseases.	Sattar et al., (2024)
Whole plant	As expectorant and to relieve breathing in acute bronchitis.	Asha et al., (2016); Ahirwar et al., (2021)
Whole plant	Snake-bite.	Asha et al., (2016)
Whole plant decoction/ infusion	Chronic diarrhoea.	Ruth et al., (2021)

Table 2: Bioactive constituents present in *A. spinosus*

Bioactive compound(s)	Potential activity.	Source(s)
Polyphenols & phenolic acid	Antioxidant activity.	Sattar *et al.,* (2024)
Squalene	Hepatoprotective activity.	Sattar *et al.,* (2024)
HMG-CoA reductase	Cholesterol-lowering.	Sattar *et al.,* (2024)
Aminoacids, flavonoids and phenolic compounds	Chemoprotective and antioxidant activities.	Asha *et al.,* (2016)
Quercetin	Antioxidant activity.	Asha *et al.,* (2016)
Spinoside	Pest and even lice in human.	Jadhav and Biradar, (2016)
New coumaroyl flavone glycoside	Antioxidant and anti-inflammatory properties.	Jadhav and Biradar, (2016)
7-p-coumaroyl apigenin 4-o-beta-Dglucopyranoside, spinoside, xylofuranosl uracil, beta – Dribofuranosyl adenine, beta-sitosterol glucoside, hydroxycinnamates, quercetin and kemferol glycoside	Anti-inflammatory, antioxidant, and α-glucosidase inhibitory effects.	Pal *et al.,* (2020)
Betalains, betaxanthin, betacyanin, amaranthine and isomaranthine, gomphrenin, betanin, stigmasterol, linoleic acid, 0.15% rutin and betacarotene	Antioxidant, anti-inflammatory, and antimicrobial properties.	Pal *et al.,* (2020)
Amaranthine, isoamaranthine, hydroxycinnamates, quercetin, stigmasterol glycoside, Saponin I- β-D- glucopyranosyl-(1-2)-β-D-glucopyranosyl-(1-2)-β-D-glucupyranosyl-(1-3)-α-spinasterol Saponin-II- β-D-glucopyranosyl-(1-4)-β-D-glucopyranosyl-(1-3)-α-spinasterol	Radical scavenging activity; anti-inflammatory, anti-tumor, antimicrobial, and hepatoprotective.	Tanmoy *et al.,* (2014); Sarker and Oba, (2019)
Rutin, Quercetin, Amaricin, β-sitosterol glycoside, amaranthoside, stigmasterol glycoside	Antioxidant, hepatoprotective, anti-inflammatory and antiulcer activity.	Abir and Ahmad, (2021)

Figure 1: Vegetative parts of *Amaranthus spinosus*

Phytochemical constituents present in *A. spinosus*

A. spinosus contains various phytochemical constituents, including betalains like amaranthine and isoamaranthine, which are responsible for the plant's antioxidant (Adegbola *et al.,* 2020; Pal *et al.,* 2020) and medicinal properties; flavonoids like rutin, found in the whole plant powder, quercetin, present in stems and whole plant, kaempferol glycosides reportedly identified in stems, 7-p-coumaroyl apigenin 4-O-β-D-glucopyranoside, isolated from the n-butanol fraction of methanol extract; saponins like β-D-glucopyranosyl-(1-4)-β-D-glucopyranosyl-(1-4)-β-D-glucuronopyranosyl-(1-3)-oleonolic acid, found in roots, saponin I, reported in whole plant; steroids and terpenoids like α-Spinasterol, found in roots and leaves, stigmasterol glycoside, isolated from whole plant, oleanolic acid, identified in leaves and stems, hectriacontane, present in leaves and stems. Furthermore, the plant contains glycosides like amaranthoside and amaricin, as well as phenolic compounds like hydroxycinnamates, tannins, and phenol. Other compounds identified in the plant include β-sitosterol glucoside, α-xylofuranosyl uracil, and β-D-ribofuranosyl adenine. These phytochemicals contribute to the plant's medicinal properties and potential health benefits (Abir and Ahmad 2021; Tanmoy *et al.,* 2014). Other list of bioactive compounds and its potential activity present in *A. spinosus* are given in Table 2.

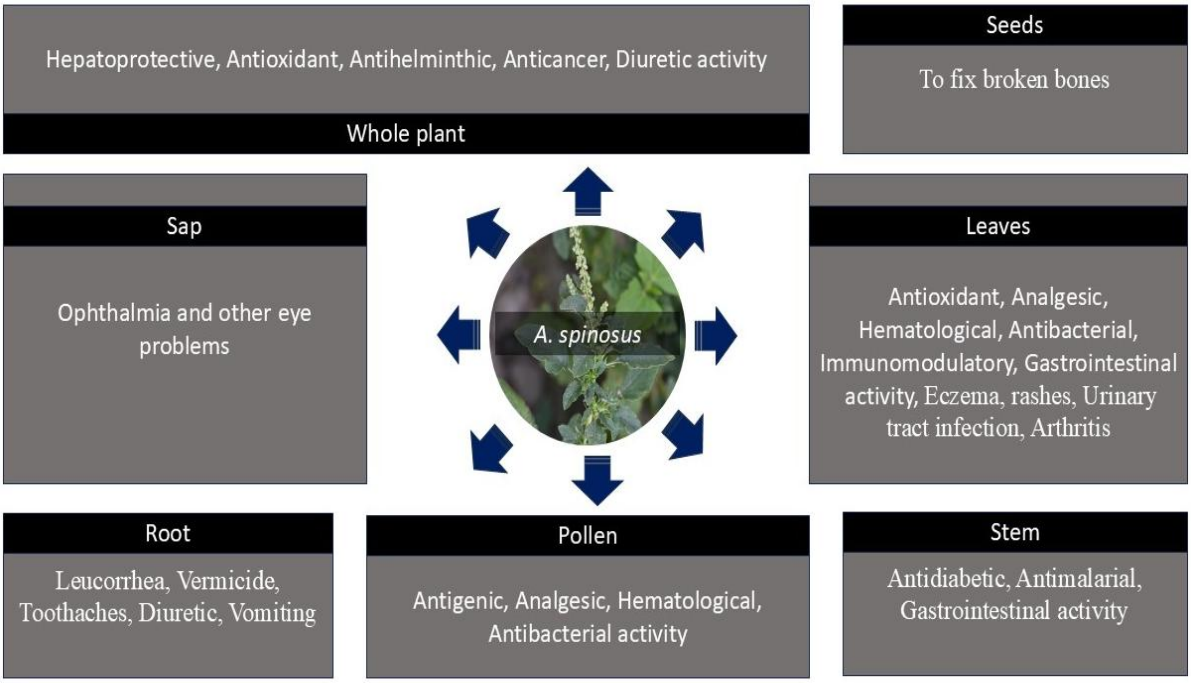

Figure 2: Medicinal uses and related plant parts

Conclusion

Amaranthus spinosus is a valuable plant species that offers a wealth of nutritional and medicinal benefits, with a rich history of traditional use in various communities. The plant's diverse phytochemical constituents, including betalains, flavonoids, saponins, and phenolic compounds, contribute to its medicinal properties and potential health benefits. The documentation of its ethnomedicinal uses and phytochemical profile highlights the importance of preserving traditional knowledge and promoting sustainable food systems. By exploring the potential of *A. spinosus* and other wild leafy vegetables, we

can unlock new opportunities for nutrition, health, and sustainable development, while also preserving the cultural heritage and traditional knowledge of indigenous communities. Further research and development of these plants can lead to the discovery of new medicines, foods, and other products that can benefit human health and well-being.

References

Abir MH and Ahmad M. (2021). Phytochemical, Nutritional and Pharmacological Potentialities of *Amaranthus spinosus* Linn.: A review. Archives of Ecotoxicology. 3(2): 49-59.

Adegbola PI, Adetutu A and Olaniyini TD. (2020). Antioxidant activity of *Amaranthus species* from the Amaranthaceae family-A review. South African Journal of Botany. 133: 111-117.

Ahirwar K, Kujur A, Tirkey R and Triparthy V. (2021). An observational study of traditional and reported health benefits of ethnomedicinal plant Amaranth found in Sarguja Chhattisgarh. International Journal of Biology, Pharmacy and Allied Sciences. 10(10): 235-242.

Ahmad M. (2018). *Amaranthus spinosus* Linn: A potential medicinal plant in Unani medicine. International Journal of Unani and Integrative Medicine. 2(1): 52-54.

Asha S, Rekha R and Sadiq AM. (2016). *Amaranthus spinosus* – A review. Bulletin of Environment, Pharmacology and Life Sciences. 5(9): 102-107.

Basu S, Ghosh T, Mitra P and Mitra PK. (2019). *Amaranthus spinosus* Linn.- Past, present and future. World Journal of Pharmaceutical Research. 8(6): 352-365.

Deshpande B, Chandrakar V and Pandey B. (2017). Antibacterial activity of plant extract of *Amaranthus spinosus*. Indian Journal of Scientific Research. 12 (2): 041-044.

Ganjare A and Raut N. (2019). Nutritional and medicinal potential of *Amaranthus spinosus.* Journal of Pharmacognosy and Phytochemistry. 8(3): 3149-3156.

Gotyal DM, Hiremath SK and Sarangi MS. (2016). A review of *Amaranthus spinosus* Linn: A potential medicinal plant. Indian Journal of Ancient Medicine and Yoga. 9(1): 13-16.

Jadhav V and Biradar SD. (2016). Evaluation of Antifungal Activity of *Amaranthus spinosus* L. (Amaranthaceae). International Journal of Current Microbiology and Applied Sciences. 5(9): 38-43.

Kumar RP, Shammy J, Nitin G and Rinu R. (2014). An inside review of *Amaranthus spinosus* Linn: A potential medicinal of India. International Journal of Research in Pharmacy and Chemistry. 4(3): 643-653.

Pal KK, Das A and Nag S. (2020). A review on medicinally important two plants of Amaranthaceae. Plant Archives. 20(1): 2636-2638.

Pal VC, Singh OV, Singh B and Ahmad A. (2013). Pharmacognostical studies of *Amaranthus spinosus* Linn. UK Journal of Pharmaceutical and Biosciences.1(1): 32-37.

Peter K and Gandhi P. (2017). Rediscovering the therapeutic potential of Amaranthus species: A review. Egyptian Journal of Basic and Applied Sciences. 4: 196–205.

Rahman AHMM and Gulshana MIA. (2014). Taxonomy and Medicinal Uses on Amaranthaceae Family of Rajshahi, Bangladesh. Applied Ecology and Environmental Sciences. 2(2): 54-59.

Ruth ON, Unathi K, Nomali N and Chinsamy M. (2021). Underutilization versus nutritional-nutraceutical potential of the *Amaranthus* food plant: A mini-review. Applied Sciences. 11(6879). DOI: 10.3390/app11156879

Sarker U and Oba S. (2019). Nutraceuticals and antioxidant pigments, and phytochemicals in the leaves of *Amaranthus spinosus* and *Amaranthus viridis* weedy species. Scientific Reports. 9: 20413. DOI: 10.1038/s41598-019-50977-5

Sattar M, Saeed F, Afzaal M, Rasheed A, Asif A, Sharif S, Hussain M, Rehman HAU, Raza MA, Munir H and Jbawi EA. (2024). An overview of the nutritional and therapeutic properties of amaranth. International Journal of Food Properties. 27(1): 263-272.

Tanmoy G, Arijit M, Tanushree S, Jagadish S and Kumar MT. (2014). Pharmacological Actions and Phytoconstituents of *Amaranthus spinosus* Linn: A Review. International Journal of Pharmacognosy and Phytochemical Research. 6(2): 405-413.

Vidyabharati VNB. (2020). Phytochemical investigation and ethnomedicinal study of wild vegetable: *Amaranthus spinosus* L. International Interdisciplinary Research Journal (Special Issue of National Conference on Recent Advances in Chemical Sciences-NCRACS). 163-166.