

## A Study of Biological Potential of Amaranthus Viridis

Vaidya Akshada, Mhaske Pratiksha

Matoshri Radha College of Pharmacy, Virgaon, Maharashtra, India.

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### ABSTRACT-

Amaranthus Viridis is a vegetable commonly known as slender amaranth or green amaranth and it belongs to the family of Amaranthaceae. Commonly found phytoconstituents in it are Syringic acid, Rutin, Quercetin, Kaempferol, Cardiac glycosides, Histidine, Hydroxycinnamic acids (HCs), Vitexin, Vanillic acid, etc. Amaranthus Viridis is known for its analgesic, antimicrobial, antidiabetic, antitumor, hepatoprotective, bronchodilator, anti-inflammatory, spasmolytic, spermatogenic, antifertility, antimalarial, neuroprotective, antioxidant, anti-HMG-CoA reductase activities, anti-ulcer activities and anti-allergic properties. Many research studies have been conducted to evaluate its clinical efficacy. Keeping this view, a critical review of Amaranthus Viridis, an Ayurvedic medicinal plant, has been carried out based on authentic and scientific information documented in classics and various research studies. The present article is an attempt to compile the literature available for Amaranthus Viridis and to further analyze its probable potential use in the above areas, including few more other areas as well.

**KEY WORDS-** Amaranthus Viridis, Amaranthus Viridis extract, Pharmacological, Phytochemicals, antioxidant, anti-inflammatory, analgesic, antimicrobial, antidiabetic etc...

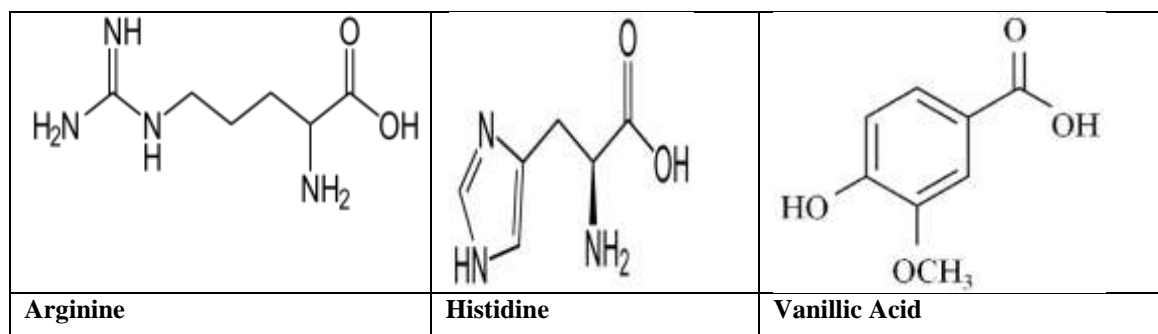
### I. INTRODUCTION-

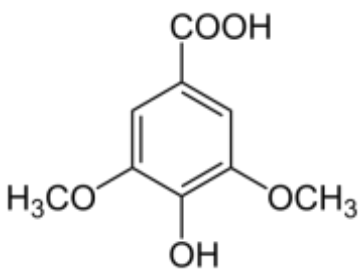
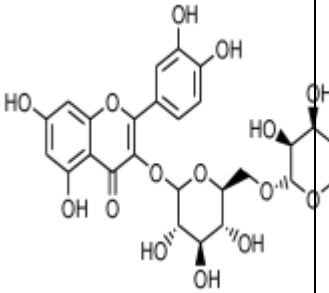
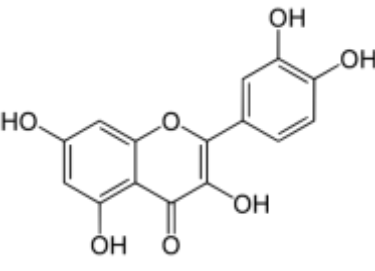
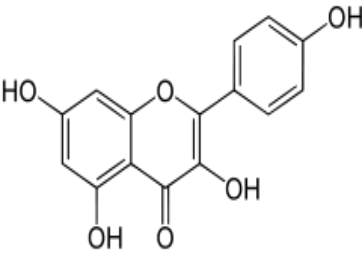
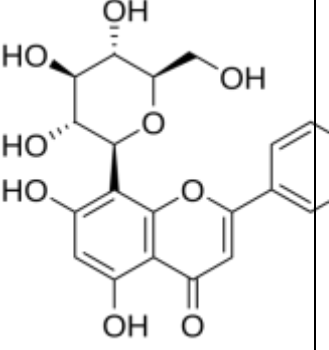
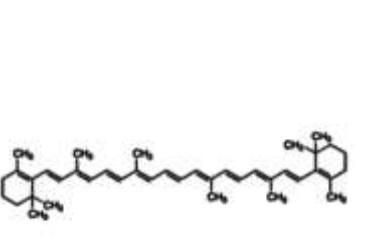
More than 60 species of Amaranthus Viridis occurring naturally in tropics and warm temperature regions including Japan, Asia, Indonesia, India, Europe, Australia, America.

Amaranthus Viridis Linn is traditionally used as a vegetable. It contains amino acids lysine, arginine, leucine, isoleucine, cysteine, histidine, valine, theonine, tyrosine, tryptophan & it also has ribosome inactivating proteins, beta-carotene. Its leaves show anti-inflammatory properties & contains vitamins like A, B, B2, C and minerals like calcium, iron, phosphorus. Seeds consist of various amino acids, various proteins and fat. Seeds are used to reduce labour pain and to treat stomach problems more popularly in Nepal. Many research studies have shown that Amaranthus Viridis has numerous medicinal properties including Anti-diabetic, anti-cholesterolemic, hepatoprotective, antioxidant, anti-microbial, anti-peptic ulcer, antibacterial, anti-diarrheal, anti-hyperlipidemic, analgesic, immunostimulant, diuretic, neuroprotective and cytotoxic activity. <sup>(1)</sup>

### PHYTOCHEMICAL CONSTITUENTS OF AMARANTHUS VIRIDIS-

Phytochemical analysis for Amaranthus Viridis L revealed that presence of active principles including amino acids, terpenoids, lipids, alkaloids, flavonoids, glycosides, phenolic acids, steroids, saponins, betalains, beta-sitosterol, stigmasterol, linoleic acid, rutin, catechuic tannins and carotenoids etc... Leaves consist of vitamins including A, B, B2, C & minerals such as calcium, phosphorus, iron etc.. It also contains amaranthoside, a lignan glycoside, amaricin, and a coumaroyl adenosine along with stigmasterol glycoside, betaine such as glycinebetaine and trigonelline. <sup>(2)(3)</sup>



|   |  |  |
|---|--|--|
|  |   |  |
| <b>Syringic acid</b>  | <b>Rutin</b>   | <b>Quercetin</b>   |
|  |  |  |
| <b>Kaempferol</b>   | <b>Vitexin</b>   | <b>β-carotene</b>  |

**MORPHOLOGICAL CHARACTERS-** It is an annual herb, erect, 10-75 (-100) cm stem, slender, branched, angular plant.

- ✓ Leaves - Dark green of upper surface and light green at lower surface.
- ✓ Flower - Flowers are unisexual and small with green or reddish tinge colour.
- ✓ Fruit - Fruits are sub globose, less than 1 mm long.
- ✓ Stem - The stem is light green in colour, cylindrical in shape with irritating
- ✓ Root - Whitish in colour, cylindrical in shape with pungent odour. <sup>(4) (5) (6)</sup>

**TAXONOMICAL CLASSIFICATION-**

- ✓ Kingdom : Plantae
  - ✓ Order : Caryophyllales
  - ✓ Family : Amaranthaceae
  - ✓ Genus : Amaranthus
  - ✓ Species : Viridis
  - ✓ Botanical name : Amaranthus Viridis L. <sup>(7)</sup>
- (8)

**PHARMACOLOGICAL ACTIONS-**

**1. Anti-inflammatory activity-** Studies reported that, when ethanolic crude extracts of Amaranthus Viridis given to rats, the anti-inflammatory properties of whole plant were

observed in carrageenan induced rat paw oedema model According to the findings of the current investigation, Amaranthus Viridis extract exhibits remarkable anti-inflammatory activity and is suggested for potential use as an anti-inflammatory treatment. <sup>(9)</sup>

**2. Anti-diabetic activity-** When the ethanolic extract of Amaranthus Viridis given to type-1 & type-2 diabetic rats, (Standard control drugs are- glibenclamide and metformin) then changes were in carbohydrate and lipid metabolism of rats as compared to negative control rats. Study revealed that, higher doses of extract significantly decreased plasma glucose levels, hepatic glucose-6-phosphatase activity and increased the hepatic glycogen content with a concurrent increase in hexokinase activity in both type 1 and 2 diabetic rats. Also a significant lowering in plasma and hepatic lipids, urea, creatinine levels and lipid peroxidation with an improvement in the antioxidant profiles of both type-1 and type-2 diabetic rats were observed hence, it is proved to be an anti-diabetic drug. <sup>(10)</sup>

**3. Anti-cholesterolemic activity-** In this study, anticholesterolemic activity of methanol extracts of leaves of *Amaranthus Viridis* was evaluated by administering a dose of 200 mg/kg and 400 mg/kg p.o. daily for 21 days and serum cholesterol, serum triglyceride; high density lipoprotein, low density lipoprotein and very low density lipoprotein were assessed anti-cholesterolemic activity.<sup>(11)</sup>

**4. Hepatoprotective and antioxidant activity-** Ethanolic extract of *Amaranthus Viridis* was used in d-galactosamine/lipopolysaccharide (d-GalN/LPS)-induced liver injury in rats which cause increase in hepatic marker enzyme levels. (aspartate transaminase, alanine transaminase, alkaline phosphatase, lactate dehydrogenase and gamma glutamyl transferase). All other parameters, i.e. cholesterol, triglycerides and free fatty acids were increased significantly in both serum and liver compared to the control group.<sup>(12)</sup> Rats were pretreated with *Amaranthus Viridis* extract (400 mg/kg), and study revealed that alteration in the all the reversed parameters of normal rats compared to the negative control group. The hepatoprotective and antioxidant activity of 50% ethanolic extract of whole plant of *Amaranthus Viridis* was studied against carbon tetrachloride (CCl<sub>4</sub>) induced hepatic damage in rats. The *Amaranthus Viridis* extract at dose of 100, 200 and 400 mg/kg were administered orally once daily for fourteen days. The substantially elevated serum enzymatic levels of serum glutamate oxaloacetate transaminase (AST), serum glutamate pyruvate transaminase (ALT), serum alkaline phosphatase (SALP) and total bilirubin were restored towards normalization significantly by the *Amaranthus Viridis* extract in a dose dependent manner. Higher doses of *Amaranthus Viridis* showed hepatoprotective activity against carbon tetrachloride induced hepatotoxicity in rats.<sup>(13)</sup>

**5. Anti-fertility Activity-** Water and ethanolic extract of *Amaranthus Viridis* were used for antifertility screening. At the end of the study, anti-implantation, abortifacient, estrogenic and anti-estrogenic activity in rats were observed. The water extract of the root of plant showed the decrease in number of implants and decrease in number of litters when compared with the ethanolic extract as the percentage of

implantation failure increased. Simultaneous administrations of extracts with ethinyl estradiol cause significant antiestrogenic activity. All these observations suggest that aqueous and ethanolic extracts of *Amaranthus Viridis* Linn. have weak antifertility effect.<sup>(14)</sup>

**6. Antimicrobial activity-** Disc diffusion method was used to assess the antibacterial activity of the *Amaranthus Viridis* extracts. After the infected extracts were evaluated, a zone reader was used to look for inhibition zones (in mm), which indicate antimicrobial activity. The discs (6 mm in diameter) were then placed on infected agar after being impregnated with 20 g/ml sample extracts (20 g/disc). As a positive reference, rifampicine (20 g/disc) (Oxiod) and fluconazol (20 g/disc) (Oxiod) were utilized for bacteria and fungi, respectively.<sup>(15)</sup>

The extract yields of active components from the leaves and seeds using pure and aqueous methanol. The extracts tested showed significant antimicrobial activity against selected bacterial and fungal strains, with MICs ranging from 179-645 g/ml. The seed extracts outperformed the other parts in terms of antioxidant and antimicrobial activity.<sup>(16)</sup>

**7. Antifungal Activity-** *Amaranthus Viridis* extracts were used to determine the Minimum Inhibitory Concentration (MIC), through dilution technique using 96 well microplate. After investigating the MIC in wells where no fungal growth was detected, the Minimum Fungicidal Concentration (MFC) was determined on plates containing dextrose Sabouraud agar. The experimental crude extracts of *Amaranthus* indicate activity against the fungi *Colletotrichum musae*.<sup>(17)</sup>

**8. Antipyretic activity -** Methanolic extract of *Amaranthus Viridis* leaves was screened for antipyretic activities. Antipyretic activity of methanolic extract of *Amaranthus Viridis* was measured by yeast induced pyrexia method at concentration of 200 and 400 mg/kg using paracetamol as standard drug. Methanolic extract of *Amaranthus Viridis* has showed significant (P<0.01) antipyretic activity.<sup>(18)</sup>

9. **Anti-malarial activity**- The 4-day suppressive antimalarial assay in mice which were inoculated with red blood cells parasitized with *Plasmodium berghei*.<sup>(19)</sup>

10. **Anti-pepticulcer activity** - Anti peptic ulcer activity of the leaves of *Amaranthus Viridis* Linn., a plant of Eastern Himalaya, was studied in peptic ulcer models in rats. Gastric and duodenal ulcers were induced by ethanol and cysteamine respectively. Results were compared with omeprazole, a standard drug for peptic ulcer. It was found out that the leaves of *Amaranthus Viridis* Linn. exerted anti peptic ulcer activity against ethanol and cysteamine induced peptic ulcerations but the activity was less than that of omeprazole<sup>(20)</sup>. Anti gastric ulcer activity of root stems and leaves of *Amaranthus Viridis* Linn. were studied against ethanol, hydrochloric acid, indomethacin, stress and pyloric ligation induced gastric ulceration in albino rats. Omeprazole was used as standard anti gastric ulcer drug. Significant anti gastric ulcer activity was noted in root, stem and leaves of *Amaranthus Viridis* Linn. Root of the plant, however, showed highest activity which was comparable to that of omeprazole.<sup>(21)(22)</sup>

#### MEDICINAL USES-

The plant is cooling and alexitic. Used for burning, hallucination, leprosy, bronchitis, piles, leucorrhoea, and constipation; also acts as a laxative, stomachic, appetiser, and antipyretic. An emollient is made from the leaves. The root reduces menstrual flow and has warming and expectorant properties that are beneficial for leucorrhoea and leprosy<sup>(23)</sup>.

#### II. CONCLUSION –

As per the review, it is concluded that the plant *Amaranthus Viridis* Linn is having ample phytoconstituents i.e saponins, tannins, phenols, flavonoids, alkaloids, cardiac glycosides, steroids, and triterpenoids. Which are related to many pharmacological activities briefly discussed in this review. Chemical component in *Amaranthus Viridis* has strong anti-inflammatory, antihepatotoxic, antiulcer, antiallergic, and antiviral properties. Additionally, they have antioxidant, antidiabetic, anti-HMG-CoA reductase, antibacterial, antipyretic and antihyperlipidemic properties.

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